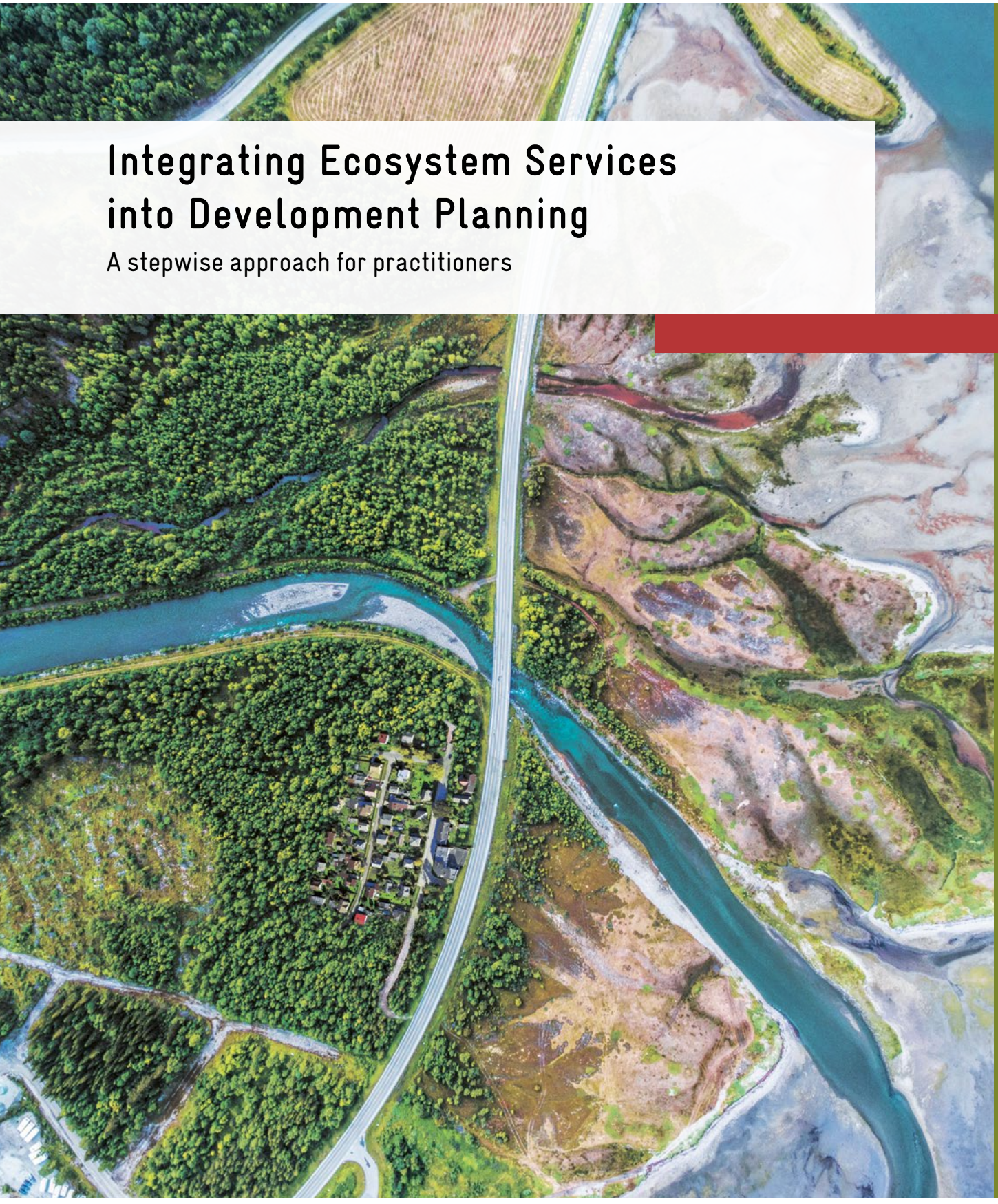
Integrating Ecosystem Services into Development Planning

A stepwise approach for practitioners



INTEGRATING ECOSYSTEM SERVICES IES Values

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

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Since 2012 the project provides practitioners and decision makers in partner countries with the skills to select and effectively use methods and instruments to identify, prioritize, assess, value and integrate ecosystem services into national and local policies and strategies. Additionally, since 2015 ValuES has been supporting the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) on its concept of multiple values of nature and benefits, on the catalogue of policy support tools and methodologies, and on its capacity building programme. www.aboutvalues.net

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PREFACE

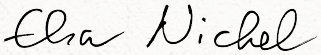
Biological diversity is the basis for a wide range of ecosystem services for humans. These include the provision of drinking water, food and forms of energy, protection against natural disasters such as floods, the provision of active ingredients for medicine and other raw materials, and natural spaces for our health and recreation.

With these ecosystem services, biological diversity is also an elementary foundation for economic activity. Therefore the conservation of biological diversity makes sense economically. The international study "The Economics of Ecosystems and Biodiversity" showed that the overexploitation of nature leads to waste of trillions of dollars worldwide and that, at the same time, the value of ecosystem services far exceeds the costs of nature conservation. Healthy ecosystems provide economic services that would otherwise require costly technical solutions or would lead to high costs for society.

Entire sectors such as agriculture and forestry, pharmaceutical manufacturing and tourism are directly dependent on nature. But many other sectors also benefit from nature's services. The latest studies show that when it comes to biodiversity loss, humankind is crossing the proposed *safe* planetary boundary and serious impacts can no longer be avoided.

This is why Germany has been a strong supporter of the **Convention on Biological Diversity** (CBD) since it was established in 1994. Germany will also advocate an ambitious, post-2020 framework on biodiversity following on from the current Strategic Plan 2011-2020. Furthermore, since 2012 the **German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety** (BMU) strongly supports the **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services** (IPBES).

Since 2008, the **International Climate and Biodiversity Initiative** (IKI) of the **Federal Ministry for the Environment, Nature Conservation and Nuclear Safety** (BMU) has been funding projects to conserve biodiversity, mitigate climate change, maintain natural carbon sinks, and adapt to the effects of climate change. IKI projects in the field of biodiversity are designed to implement the targets of the Strategic Plan for Biodiversity 2011-2020 of the International CBD. In order to achieve this goal, these projects support the development and implementation of **National Biodiversity Strategies And Action Plans** (NBSAPs) by also strengthening the capacity of governments and civil society. Until 2017, BMU has invested more than 849 million € in conserving, restoring and sustaining the use of biological diversity and ecosystems worldwide.



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PREFACE

The ecosystem services approach is key for addressing effectively drivers of ecosystem degradation and biodiversity loss, which makes it an important element of mitigation and adaptation strategies in the context of climate change as well as for the achievement of the objectives of the **Convention on Biological Diversity** (CBD).

Ecosystem services are essential to plan and implement a successful landscape approach as well as for clarifying linkages, dependencies and impacts among stakeholders and nature by making them more visible, tangible and manageable. The work on ecosystem services helps to visualize how people and ecosystems are related to each other and how they are connected to nature. People all over the world obtain numerous benefits from nature, such as for instance fresh water, nutrition, or a great variety of raw materials. Without these ecosystem services social and economic development, and ultimately human progress and survival, would not be possible.

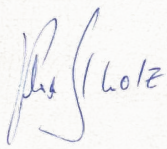
Making good use of ecosystems services and biodiversity values to address global challenges not only makes ecological but also economic sense. It is therefore of critical importance to ensure that ecosystem services are incorporated into development planning and decision making throughout all sectors.

Since 2012 the **German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety** (BMU) strongly supports the **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services** (IPBES) and a diversity of different supraregional, regional and bilateral projects worldwide, which focus on implementing the ecosystem services approach.

This manual on **Integrating Ecosystem Services into Development Planning** (IES) aims to assist advisors, project staff and development planners in partner countries in recognizing relevant links between nature and development. Its step-wise approach considers the environmental and economic trade-offs associated with development measures and assists the elaboration of sustainable development strategies. Thus, this document can assist stakeholders to take the recommendations of the **International Panel for Biodiversity and Ecosystem Services** (IPBES) into practice.

Since the first edition of the IES guide in 2012, the manual was translated into seven languages. In collaboration with several projects of the **German Development Cooperation**, the project **ValuES** has assisted in more than 100 IES training events in 25 countries around the globe, strengthening capacities of more of 3000 people, building local and international training capacities and supporting national and regional IES processes.
This second edition incorporates lessons learnt from practical application during the last years. Additional concepts and tools have been integrated, linking the manual more directly to the products and findings of IPBES.

The work of GIZ is guided by the principles of sustainability, which builds the core of our corporate values. This manual contributes to the understanding of how these principles can be achieved through capturing the value of ecosystem services and biodiversity for human development in the context of our daily work.



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SUMMARY OF THE 6-STEP APPROACH TO INTEGRATING ECOSYSTEM (IES) SERVICES TO DEVELOPMENT PLANNING

STEP 1: DEFINING THE SCOPE AND SETTING THE STAGE

- What are the main development and management issues that need to be addressed by the IES process, and for which purpose?
- Who are the relevant stakeholders and how should they participate in the IES process?
- What are the milestones and expected outcomes of the IES process?
- What staff, funds and other inputs are required to carry out the IES exercise?
- How will key messages be communicated to target groups?

STEP 2: SCREENING AND PRIORITIZING ECOSYSTEM SERVICES

- How does the development plan (including associated economic activities and livelihoods) depend and impact on ecosystem services?
- Which stakeholders stand to be affected by the development plan and by changes in ecosystem services?
- What costs and benefits are associated with these changes and how will they be distributed between different groups?
- Do potential areas of conflict, competition or synergies emerge?
- Which are the most important ecosystem services for the development plan and why?

STEP 3: IDENTIFYING CONDITIONS, TRENDS AND TRADE-OFFS

- What information and evidence on ecosystem service conditions and trends exists and what are the main information gaps?
- What are the current conditions and likely future trends in ecosystem service demand and supply?
- What are the main drivers of change?
- What trade-offs might arise between development goals and ecosystem services and how will these affect different stakeholders?

STEP 4: APPRAISING THE INSTITUTIONAL AND CULTURAL FRAMEWORK

- Which organisations and institutions govern ecosystems and their services?
- Who participates in decision-making and in what role?
- Which policies, regulations and incentives influence ecosystem use and management? Who or what do they target? How are they enforced?
- Are there conflicts or inconsistencies between different institutional, policy, legal and cultural frameworks and associated incentive systems?
- Which other needs, interests, values and rights drive ecosystem management choices?

STEP 5: PREPARING BETTER DECISION-MAKING

- What are the ecosystem service-related risks and opportunities to the development plan?
- Could economic valuation be useful? If so, how?
- What are the most feasible policy options and entry points for reducing or avoiding risks and capturing ecosystem service opportunities?
- How can policy measures, instruments and interventions build on existing experiences?

STEP 6: IMPLEMENTING CHANGE

- Are the proposed policy options realistic, feasible, acceptable and consistent with the development plan?
- Are the necessary financial, technical, human resource and institutional capacities in place to deliver the selected policy options?
- Who will be involved in implementing the policy measures and in what role?
- How will the impacts of the policy measures be monitored?
- How will learning be generated, shared and communicated?

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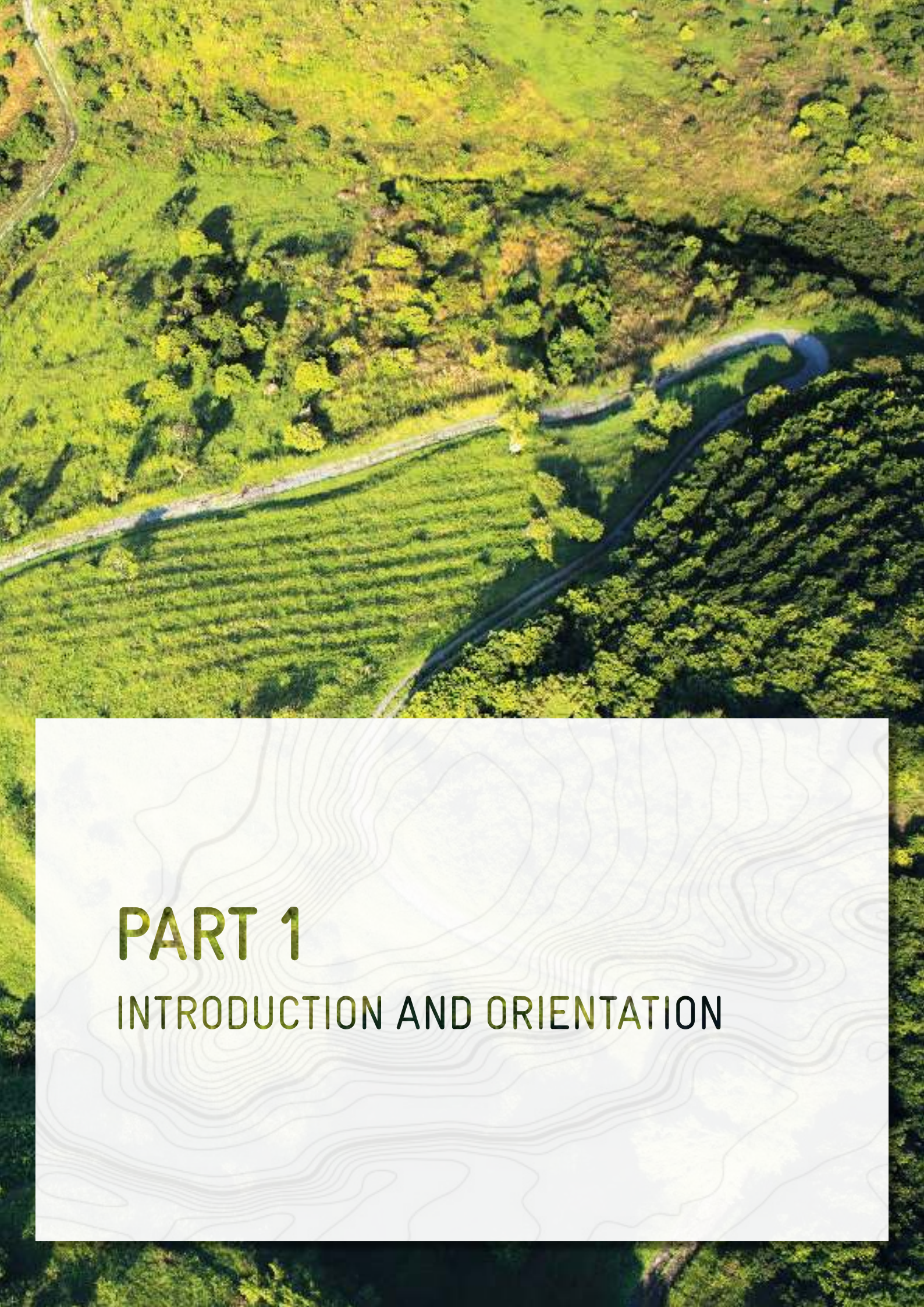


PART 1

INTRODUCTION AND ORIENTATION

BACKGROUND TO THE GUIDE AND HOW TO USE IT

ECOSYSTEM SERVICES...

...are the benefits people obtain from ecosystems. The term refers to the many different ways we depend on nature.

The ecosystem services framework focuses on the ways that the natural environment supports, enables and enhances human wellbeing. This makes it particularly relevant to decision-makers in most development sectors.

A suite of approaches have emerged which are based on the ecosystem services concept and framework. These are increasingly used across the globe to support both conservation and sustainable development processes.

Why are ecosystem services important to development planning?

The concept of 'ecosystem services' addresses the many ways that humans depend on nature. Healthy ecosystems deliver many different benefits to people.

Nature is the source of life. Our well-being relies on the benefits we derive from it. Ecosystem services such as clean water, soil fertility, pollination and flood protection are essential for food, healthcare, energy, shelter, disaster risk reduction and the other basic conditions that are required for secure livelihoods and sustained growth. In addition, humans value nature for the non-material benefits it provides, such as artistic inspiration, cultural significance and spiritual enrichment.

The concept of ecosystem services relates to both our dependence on nature and the impact of our activities on it. It offers a means of systematically considering the importance of nature's values across all sectors of the economy and society. It also provides the basic rationale for choosing ecosystem-friendly development pathways, which will respect and maintain these benefits.

One major challenge is that ecosystem services have long been under-valued in decision-making. The benefits and costs associated with their conservation and degradation have been largely excluded from the policies, markets and prices that shape people's production and consumption patterns, investment choices, land uses and resource management practices. This means that many decisions have been made on the basis of only partial information, leading to ecosystem degradation. As a result, development opportunities have been missed and significant economic costs and losses have often been incurred.

It is therefore of critical importance to ensure that ecosystem services are incorporated into development planning, because they are essential to equitable and sustainable growth and development. At the same time, most people, businesses and governments cannot afford to bear the long-term economic and social costs associated with ecosystem degradation and loss.

What is the objective of the guide?

This guide to Integrating Ecosystem Services into Development Planning (IES) aims to assist development planners in recognising the links between nature and development, considering the trade-offs associated with different development plans and incorporating ecosystem service-related opportunities and risks into decision-making.

The IES framework proposes a stepwise approach to the integration of ecosystem services into development planning, which can be used to:

- Demonstrate the dependence and impacts of development on ecosystem services.
- Highlight needs and opportunities to reduce the negative impacts of development activities and increase the supply of ecosystem services upon which they depend.
- Identify concrete measures to build positive synergies between ecosystem services and development processes.
- Assessing ecosystem conditions, trends and associated development risks and opportunities.
- Developing strategies and measures to manage these risks and opportunities.

The document provides guidance to development planners on applying the IES framework in the course of their work, including:

- Understanding people's dependence and impacts on ecosystem services.
- Identifying ecosystem services that are crucial for the success of a development process.

When and how to use the IES stepwise approach?

The IES approach offers a structured methodology to help development planners take account of the risks and opportunities that arise from people´s dependence and impacts on ecosystem services. It is a flexible and process-oriented approach that is straightforward to apply, and applicable in most contexts.

Throughout this guide, reference is made to applying the IES process to a "development plan". This term is used for clarity and brevity. In reality, the development plan may be a government policy or plan, a project or investment proposal, spatial plan, livelihood development plan, business plan, protected area management plan or one of any number of plans. In principle, the IES approach can be applied at any level or scale – across an entire country, in a particular site or for a specific sector, company or community. *The IES approach is particularly relevant at local and sub-national levels.* This is because the assessment process requires context-specific data and proposes context-specific responses, which can become too generalised when they are applied at a larger scale. The approach is therefore most easily carried out, and its results tend to be most robust, when it is used in more focused situations.

The IES approach can be applied to any sector. It has obvious relevance to projects and programmes that have direct impacts or dependencies on the natural environment. It identifies multiple entry points for integrating ecosystem services into development planning and policy implementation. Various policy options and instruments can be used to provide information, set incentives and plan and regulate ecosystem service use.

The IES approach can be introduced at any stage of the project cycle. For example, it can be applied during the review of an existing programme or plan. Another option is to use IES to help to design or initiate a new sectoral or spatial planning process that is just getting underway. The IES approach can also generate decision support information to feed into required planning, appraisal and evaluation procedures, such as **Strategic Environmental Assessment** (SEA), **Environmental Impact Assessment** (EIA) or **Costs-Benefit Analyses** (CBA).

What is required to implement the IES approach?

Certain technical expertise and data are needed to apply the IES approach. Because of its emphasis on participatory planning, it also requires a process which allows for stakeholder consultation and engagement. → *Table 1.1* provides an overview on the resources required to apply the IES approach.

Table 1.1: Resource requirements for applying the IES approach

STEP	Data & information needs	Main technical expertise/ skills	Time requirement
Step 1: Defining the scope and setting the stage	• Development plan • Stakeholders • Challenges to be addressed • Policy issues that mobilise public opinion	• Process design and facilitation • Advocacy • Stakeholder engagement • Communication	• Approx. 1 week (stakeholder workshop and process design)
Step 2: Screening and prioritizing ecosystem services	• Main economic activities and livelihoods • Basic biophysical information about the area. • Information on ecosystem services (if available). • Dependence and impacts of development activities on ecosystem services	• Socio-economic assessment • Ecosystem service assessment	• Approx. 1 week
Step 3: Identifying conditions, trends and trade-offs	• Biophysical and socio-economic data	• Social/cultural assessment	• Approx. 4-6 weeks, depending on assessment methods
Step 4: Appraising the institutional and cultural framework	• Stakeholder characteristics • Policies and incentive structures	• Social/cultural assessment	• Approx. 1-2 weeks
Step 5: Preparing better decision-making	• Synthesis of information gathered in the **steps 1–4** • Policy options • Best practices	• Development planning • Policy analysis • Economic valuation	• Approx. 1-2 weeks
Step 6: Implementing change	• Feasibility analysis	• Process design and facilitation • Advocacy • Communication	• Approx. 1 week (stakeholder workshop, elaboration of work plan)

The length and cost of the IES assessment will of course vary, depending on the topics and issues it seeks to address and the development process in which it is embedded. These determine the type and amount of data required, the number of stakeholders to be involved, the complexity, uncertainty and level of detail. It should be emphasised, however, that integrating an ecosystem services perspective into development planning need not (and should not) be a costly or difficult exercise. It introduces a new way of thinking, but does not add a separate planning process. In most situations, it is possible to use already-available capacities and skills and build upon existing data and information. It is not usually necessary to employ a large number of external consultants or initiate major new studies.

Nevertheless, in most cases, a shift in perspective will be required, if ecosystem services are to be fully integrated into the development planning process. Those involved will need to spend time reading, reflecting and preparing themselves to address these new topics and challenges. It is worth noting that, in order to apply the IES approach successfully, it will usually be necessary to brief and prepare the participants, especially if the concepts and terminology surrounding ecosystem services are new to them. Some form of training or awareness raising will usually be required.

Content of the guide

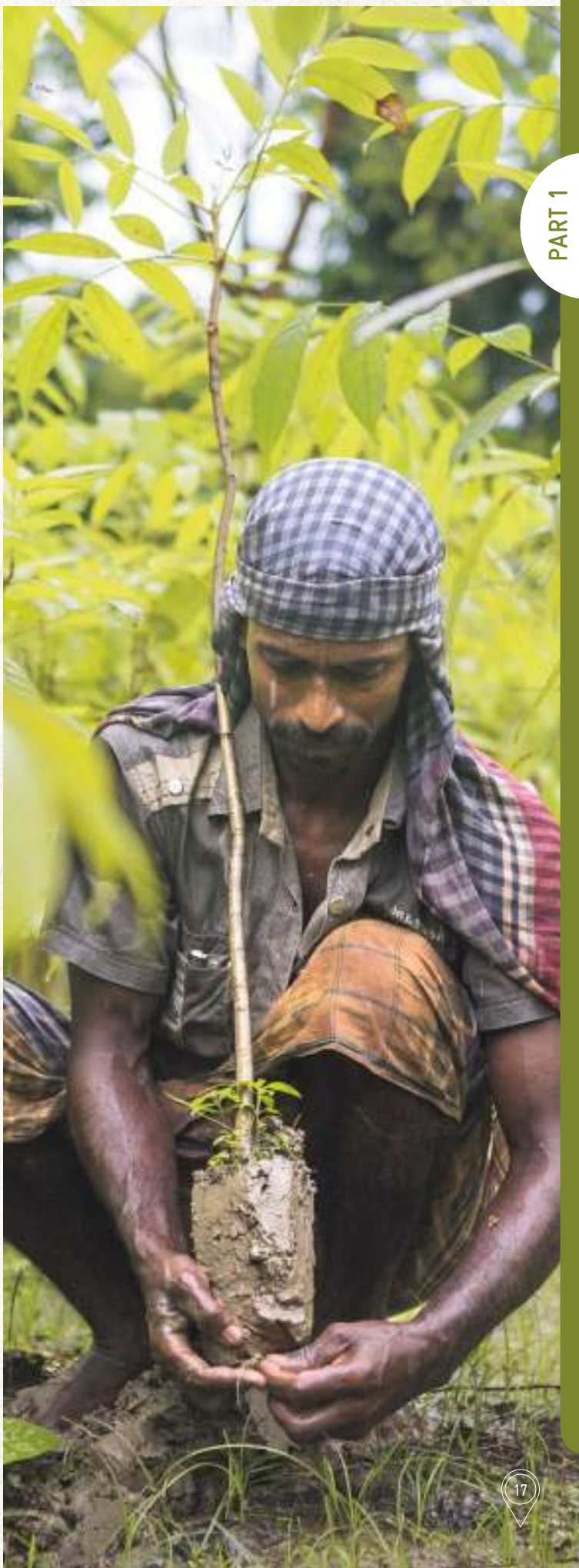
The guide is divided into four sections:

- **Part 1**, introduction and orientation (this section), presents the rationale for the guide and summarises its content. It also describes the theoretical and conceptual basis to the IES approach. Part 1 is particularly important for those who are not yet familiar with the ecosystem services-human wellbeing framework.

- **Part 2**, applying a stepwise approach to integrating ecosystem services into development planning, elaborates the 6-step IES approach. It starts by giving a general overview and then goes on to present each step in detail. For every step of the process, the guide explains what to do, how to do it and what the expected outcome might be.

- **Part 3**, glossary and references, contains a list of literature and explains key terms and concepts that have been used in the guide.

- **Part 4**, annexes, provides additional resources that may be useful when carrying out an IES assessment process.



UNDERSTANDING ECOSYSTEM SERVICES IN A DEVELOPMENT CONTEXT

This section underlines the rationale for integrating ecosystem services into development planning, and provides an overview of the concepts that underlie the IES approach.

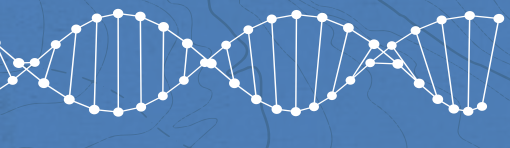
The concept of ecosystem services

The concept of ecosystem services lies at the core of the IES approach. This came into common usage as a result of the work of the **Millennium Ecosystem Assessment** (MEA). The MEA was a major assessment of the human impact on the environment, called for by the United Nations Secretary-General Kofi Annan in 2000, launched in 2001 and published in 2005. It involved more than 1,300 contributors from around the world. The MEA categorises ecosystem services as the "benefits people obtain from ecosystems," grouped into four basic categories (MEA 2005).

These include *provisioning services* such as food, water, timber, fibre, and genetic resources; regulating services such as the regulation of climate, floods, disease, and water quality as well as waste treatment; *supporting services* such as soil formation, pollination, and nutrient cycling; and *cultural services* such as recreation, aesthetic enjoyment, and spiritual fulfilment. This standard categorisation is now commonly-accepted and widly-used at the international level in various forms and guises,[1] and has been adopted throughout this guide.

→ *Annex 1* provides an overview of ecosystem services and categories.

The ValuES website also provides a series of factsheets with further information:
http://www.aboutvalues.net/ecosystem_services/



BIODIVERSITY AND ECOSYSTEM SERVICES

The Convention on Biological Diversity (described later on in this chapter) is a global multilateral agreement concerning the conservation, sustainable use and equitable benefit sharing of biological diversity (commonly known as “biodiversity”). It defines biodiversity as

“the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.”

Biodiversity is the foundation of ecosystem services. It plays an important role in the delivery of the benefits people obtain from ecosystems, because it sustains key ecosystem functions, its structure and processes. More information about the relationship between biodiversity and ecosystem services and the concepts’ usefulness for informing decision-making can be found under:

http://www.openness-project.eu/

1 The Economics of Ecosystems and Biodiversity, for example, adopts the modified categories of provisioning, regulating, habitat and cultural services. The Common International Classification of Ecosystem Services (CICES), developed from the work on environmental accounting undertaken by the European Environment Agency (EEA), proposes a much more detailed and comprehensive breakdown in provisioning, regulating and maintenance and cultural sections (see link at the end of this chapter).

Development principles

Development planning takes place in many different contexts, and has wide-ranging goals and targets. Four generic categories of 'bigger picture' goals that typically drive development efforts can however be identified:

- **Sustainable development**
- **Poverty alleviation**
- **Sectoral production**
- **Output and business performance**

These provide the over-arching context within which the IES approach will, in most cases, be applied.

Sustainable development requires that society only uses nature's resources at the rate at which they can be replenished naturally. Maintaining an adequate quantity and quality of ecosystem services obviously plays a critical role in these processes, and in achieving the global targets that are associated with them (such as the **Sustainable Development Goals** or SDGs → *described on page 24)* and related development goals at national and sub-national levels.

The sustainable use and management of ecosystems is also key to efforts at **poverty alleviation** and poverty reduction, which lie at the core of most development strategies and plans. Ecosystem services tend to be particularly important to the livelihoods of the poor, and their degradation and loss can have devastating impacts on their well-being, as well as undermining efforts to reduce the incidence of poverty. In turn, the management and governance of ecosystem services should promote equity and inclusion, and pay special attention to the needs of the poor, their particular dependencies and impacts.

Almost all **sectoral production** and output depend in some way on ecosystem services, either directly or indirectly. While these linkages are evident in natural resource-based sectors (such as forestry, fishing or agriculture), they are often equally important for other industrial and service sectors (for example health, water and sanitation, energy or urban development). This is largely due to the important role that supporting and regulating services play in enabling, maintaining and protecting production, consumption and infrastructure. Ecosystem services support and underpin sectoral output; they also typically help to reduce costs and expenditures. Through the identification of dependencies and impacts, the use of the ecosystem services approach contributes to visualising the interdependences between sectors, people and nature in a more tangible and understandable way, setting the stage for better informed negotiations.

Many development planning processes involve the private sector as primary participants. It is therefore important to consider how and why ecosystem services are key to **business performance**. Ecosystem degradation affects business risks and opportunities and impacts on corporate profits, production and marketing opportunities. Many companies and industries are now recognising that considering ecosystem services in decision-making can help them to address a wide range of issues and topics more effectively, helping to optimise and sustain profits, access new markets and investment possibilities, meet consumer and shareholder demands and comply with regulatory and legal requirements.[2]

2 Various industry associations or coalitions (such as the World Business Council for Sustainable Development and the Natural Capital Coalition), address the need to integrate ecosystem services and biodiversity in different business initiatives and companies. Some sectors or companies have also adopted voluntary guidelines, principles or standards for their operations which attempt – usually among other things – to safeguard biodiversity and ecosystem services, over and above what is legally required of them in different countries. Examples include forest, aquaculture and fisheries certification, social or ethical charters, carbon neutrality or zero deforestation.

Recognising the links between ecosystem services, human well-being and development

The key to sustainable development is achieving a balance between the exploitation of natural resources for socio-economic development and conserving ecosystem services that are critical to people' s wellbeing and livelihoods (Falkenmark et al., 2007). There is no blueprint for obtaining this balance. However, an understanding of how ecosystem services contribute to livelihoods and of who benefits and who loses from changes arising from development interventions, is essential (MacCartney et al., 2015).

Very simply, natural ecosystems are a core part of development infrastructure: the stock of facilities, services and equipment that is needed for the economy and society to function properly and to grow (Emerton 2008). This is because they provide a valuable, and cost-effective, way of delivering on development goals and supporting development processes, especially for the poor. It is frequently far cheaper to maintain ecosystem services than to invest in more expensive (and often less effective) man-made alternatives. Not only is a failure to invest in ecosystems short-sighted in economic terms, but the costs, losses and damages that result from this neglect may ultimately undermine key development goals. Recognising the connections between development goals, human well-being and ecosystem services can make the difference between a successful development strategy and one that fails because of unexamined consequences or changes in the flow of ecosystem services and thus on the stated development goals themselves (WRI 2008).

The need to conserve biodiversity and ecosystem services is now widely accepted. It is reflected in both national policies and global-level goals and agreements (key aspects of the international framework relating to biodiversity and ecosystem services are described below). However, biodiversity and ecosystem services are not yet fully integrated or mainstreamed in sectoral development thinking. **Mainstreaming** can be defined as "the integration of biodiversity and ecosystem services concerns into defined sectors and development goals, through a variety of approaches and mechanisms, so as to achieve sustainable biodiversity and development outcomes" (IIED 2013). It is not about imposing or forcing biodiversity and ecosystem services on other sectors. Rather, mainstreaming involves widening the perspectives of planners, and changing 'business as usual' approaches.

MAINSTREAMING...

means promoting coherence between biodiversity and development policies by *"embedding biodiversity considerations into policies, strategies and practices of key public and private actors that impact or rely on biodiversity, so that it is conserved, and sustainably used, both locally and globally"* (Huntley and Redford 2014). It is an important concept, because multi-sectoral, multi-stakeholder collaboration is required to tackle the underlying causes of biodiversity loss. It is explicitly mentioned in several global targets and policy statements, including:

The Convention on Biological Diversity (CBD) Strategic Plan for Biodiversity 2011-2020 includes the goal to address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society, and the target that: *"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 15.9 of the UN-2030-Agenda for Sustainable Development is *"by 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts."*

The OECD **Development Assistance Committee** (DAC)'s Policy Statement on Integrating Biodiversity and Associated Ecosystem Services into Development Cooperation (OECD-DAC, 2010) highlights the need for development cooperation agencies to support partner countries to *"integrate biodiversity and ecosystem services into development policies, sector plans and budget processes"* and to support the development of tools, practices, capacity, awareness and governance frameworks necessary for mainstreaming processes to succeed.

One of the main challenges to mainstreaming is that development planners tend to treat the environment as an **externality** that is outside their direct concern and control. To a certain extent this arises because of a lack of information and awareness: there is little appreciation of the wider impacts of ecosystem degradation. It also arises due to weak or unenforced environmental laws, penalties and reward systems. In many cases, there is also a lack of political will for change because "biodiversity issues are often competing with other development priorities that have greater political influence" (Bass, Roe and Smith, 2010). In all too many cases environmental sustainability objectives are seen as being distinct from – or sometimes even as conflicting with – development goals. In the face of pressing needs for economic growth and poverty reduction, and given the scarcity of public and donor funding, the environment tends to remain a low priority in development planning and policy formulation. A key concern is to effect a shift from the view that ecosystem services are a luxury that development planners cannot afford, to one where they are seen as a necessity that they cannot afford not to invest in (UNDP and UNEP 2008).

Applying an ecosystem services framework helps to show that environmental externalities matter to development processes. It makes these linkages explicit, and seeks to better integrate ecosystem services into development planning (and, equally, development needs into ecosystem conservation planning). A key component of the IES approach is therefore to trace through and respond to the processes and connections which characterise these coupled socio-ecological systems *(→ Figure 1.1)*.

The focus is on how socio-economic systems and development needs both depend and impact on ecosystem services, and how these relationships are influenced and mediated by means of various institutions, regulations and policies.

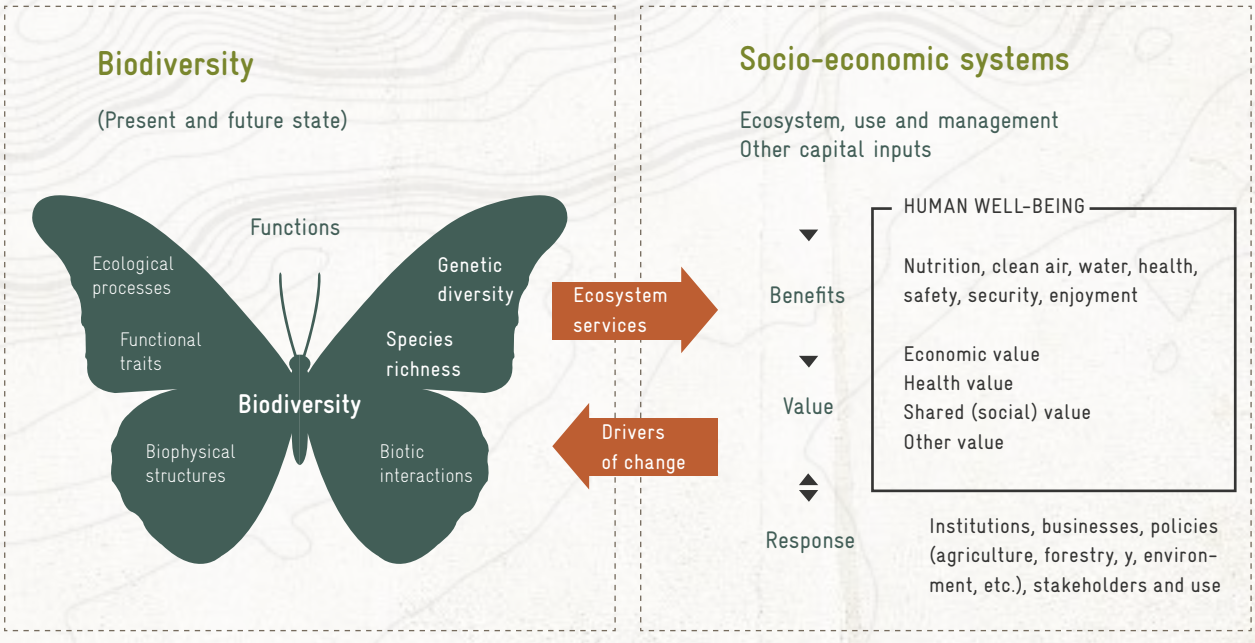
AN EXTERNALITY...

can be defined as the positive or negative consequence of an economic activity that is experienced by unrelated third parties that is not reflected in the price of the goods or services being produced and for which no compensation is paid or received.

These costs or losses are felt by others, by the wider economy, or even as trans-boundary effects or by future generations. An example of a positive environmental externality is when one landholder's investment in upper catchment conservation benefits other downstream users. An example of a negative externality is when the extraction of water upstream leaves insufficient flow or quality for human and natural systems downstream.

Source: Emerton and Howard (2008)

Figure 1.1: The coupled social-ecological system



Source: Maes et al. (2013)

Another cross-cutting principle is the wish to make explicit the diversity and multiplicity of stakeholders in both ecosystems and socio-economic systems. One of the defining characteristics of the ecosystem services concept (and the IES approach) is to position people and human development processes at the centre of environmental planning. Integral to this is the recognition that many different stakeholders are affected, both positively and negatively, by changes in ecosystem services. In line with this focus, the concept of value pluralism, or **multiple values**, has emerged as a key issue over recent years. This recognises the ways in which people value ecosystem services differs, depending on their cultural and institutional backgrounds, worldviews, principles and preferences. In turn, any effort to assess, measure or otherwise represent ecosystem services involves recognising, making visible and respecting these diverse perceptions.

The concept of **MULTIPLE VALUES** reflects on the different ways that people value nature and its benefits, depending on the natural space they live in, their cultural and institutional backgrounds, as well as their worldviews, principles and preferences. These values can be either synergistic or at odds with each other (e.g. maintaining forest for multiple purposes such as groundwater provision, habitat and recreation versus timber production). This generates a need for action from policymakers to appropriately account for these differences into their decisions.

The **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services** (IPBES) guide on diverse conceptualization of multiple values attempts to shift attention from merely using economic arguments for ecosystem-related decisions to a more comprehensive assessment process. The guide considers five value categories: bio-physical, socio-cultural, health, economic and holistic.

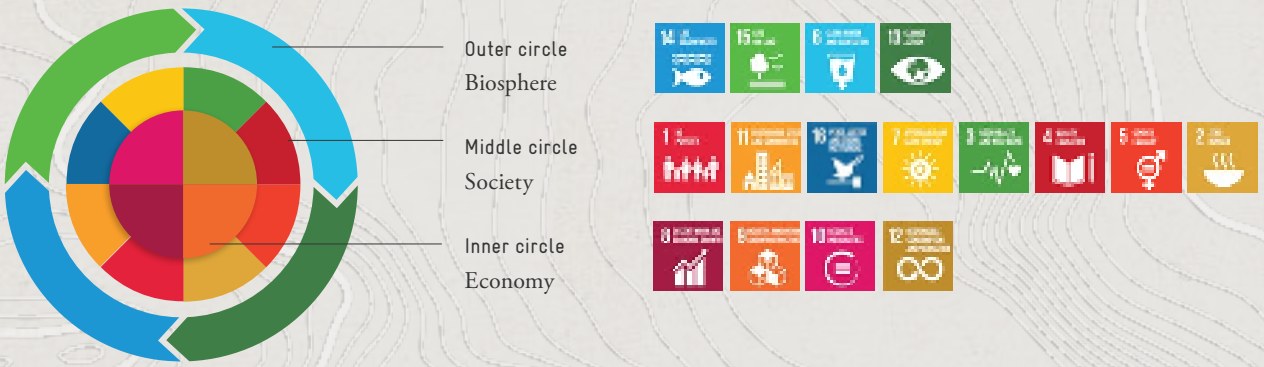
Source: IPBES (2015)

The international framework for integrating ecosystem services into development panning

United Nations (UN) 2030 Agenda for Sustainable Development and Sustainable Development Goals (SDGs)

The UN's 17 **Sustainable Development Goals** (SDGs) build on the earlier **Millennium Development Goals** (MDGs). The MDGs, adopted in 2000 and with a target date of 2015, addressed an array of issues that included slashing poverty, hunger, disease, gender inequality, and access to water and sanitation. The new SDGs, and the broader sustainability agenda, extend these targets. They address the root causes of poverty and the universal need for development that works for all people (UNDP 2016). Of the 17 SDGs, two refer specifically to biodiversity: Goal 14 (conserve and sustainably use the oceans, seas and marine resources for sustainable development) and Goal 15 (protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss). The attainment of many of the other SDGs are closely connected with these two goals and thus synergies and co-benefits may be generated. However, reaching some other goals may lead to adverse impacts on nature. **More information**: *http://www.un.org/sustainabledevelopment/*

Figure 1.2: Economies and societies as embedded parts of the biosphere



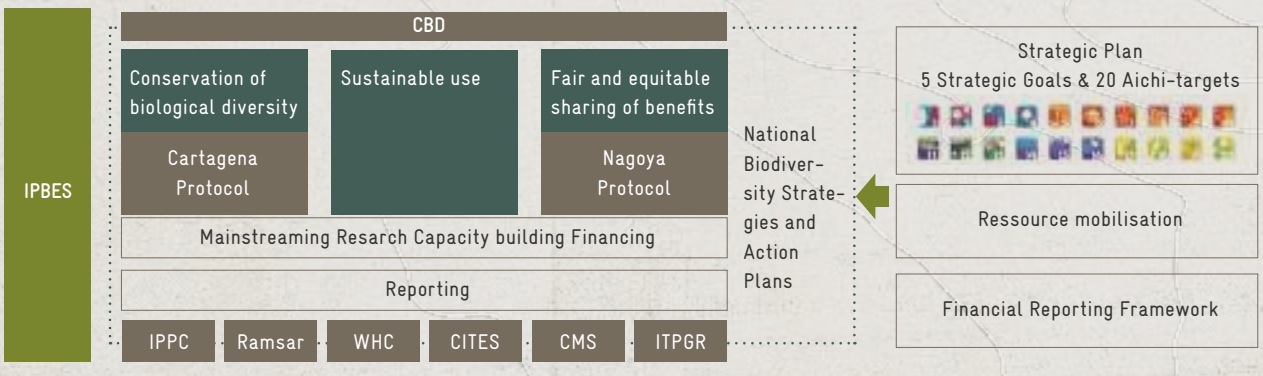
Source: Rockström & Sukhdev (2016)

Convention on Biological Diversity (CBD) Strategic Plan 2011-2020 and Aichi targets

The Convention on Biological Diversity (CBD) is an international legally-binding treaty with three main goals: conservation of biodiversity, sustainable use of biodiversity and fair and equitable sharing of the benefits arising from the use of genetic resources. It covers biodiversity at all levels (ecosystems, species and genetic resources) and addresses multiple sectors. In October 2010, at the 10th Conference of the Parties to the CBD in Nagoya, Japan, the Parties adopted a new Strategic Plan for 2011-2020 along with the so-called "Aichi targets". The Aichi targets involve 20 targets grouped under 5 strategic goals which seek to stimulate "effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication." Parties to the CBD are invited to set their own targets within this flexible framework, taking into account national needs and priorities.

More information: *https://www.cbd.int/sp/targets/*

Figure 1.3: The CBD and its protocols, the other biodiversity related conventions and IPBES



Source: Azote Images for Stockholm Resilience Centre

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

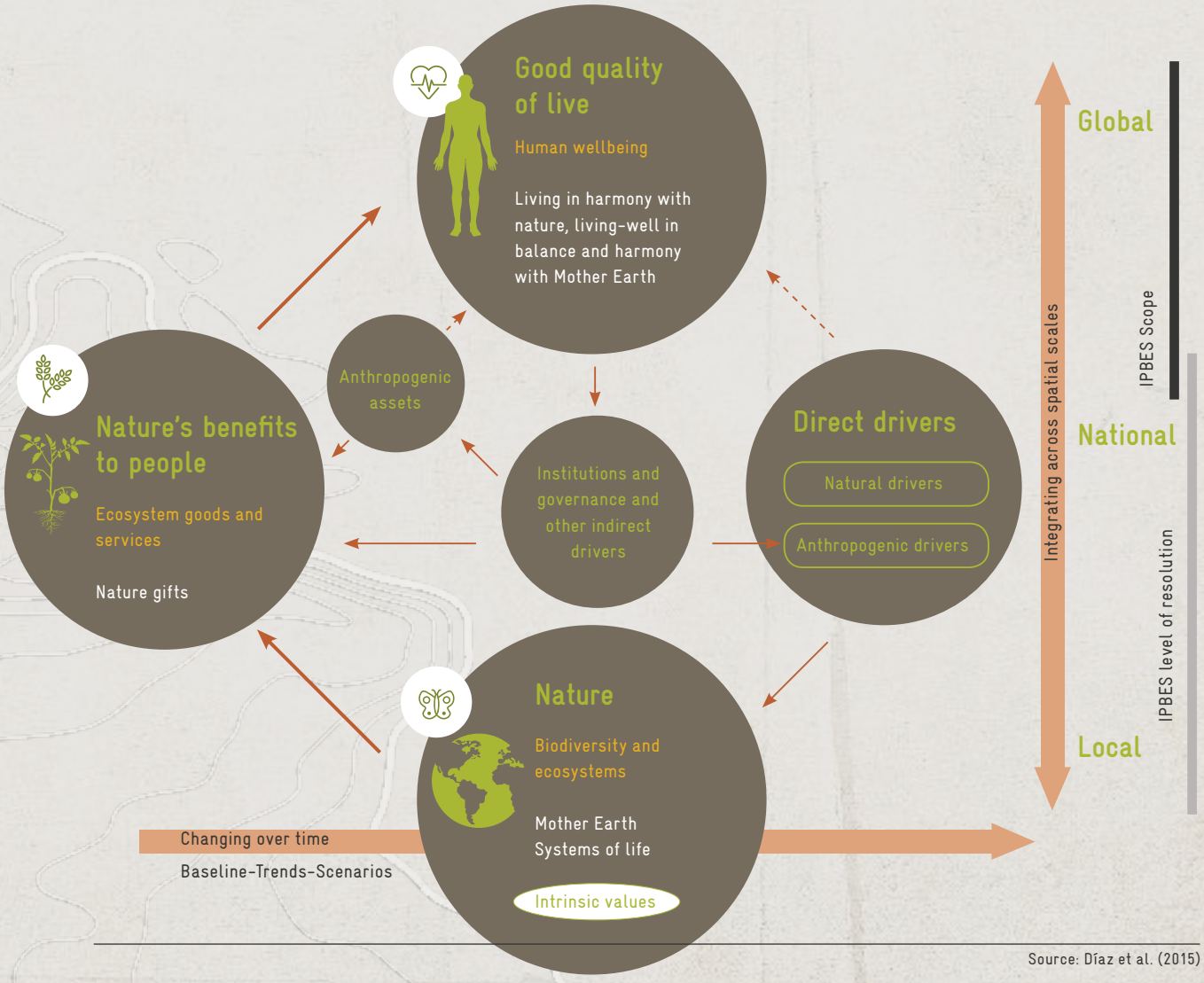
IPBES, established in 2012, is an independent intergovernmental body for assessing the state of the planet's biodiversity, its ecosystems and the essential services they provide to society. IPBES was designed to be an interface between the scientific community and policy makers, seeking to build capacity for and strengthen the use of science in policy making at local, national and global levels. The platform addresses the needs of Multilateral Environmental Agreements that are related to biodiversity and ecosystem services (such as the CBD), and builds on existing processes so as to enhance synergy and complementarity between different institutions' work.

The IPBES conceptual framework is a highly simplified model of the complex interactions between the natural world and human societies. This is illustrated in → *Figure 1.4*, which shows the elements of nature and society that form the main focus of IPBES.

- In each of the boxes, the headlines in green are inclusive categories that should be intelligible and relevant to all stakeholders involved in IPBES and embrace the categories of western science (in yellow) and equivalent or similar categories according to other knowledge systems (in white). These yellow and white categories are illustrative, not exhaustive.
- Solid arrows denote the influence between elements, while the dotted arrows denote links that are acknowledged as important, but are not the main focus of IPBES.
- The anthropocentric values of nature are embedded in the boxes showing nature, nature's benefits to people and good quality of life boxes, and in the arrows connecting them.
- The intrinsic values of nature (represented by a white oval at the bottom of the nature box) are independent from human experience.
- The thick coloured arrows below and to the right of the central panel indicate that the interactions between the elements change over time (horizontal bottom arrow) and occur at various scales in space (vertical arrow).

Further information: *http://www.ipbes.net*

Figure 1.4: IPBES conceptual framework



Source: Díaz et al. (2015)

Communicating ecosystem service values and addressing trade-offs

Unfortunately, ecosystem service values have not, traditionally, been considered when the costs and benefits of different development options, activities and investments are weighed up. With few exceptions, the official figures used by governments and donors to track development and economic performance massively underestimate both the contribution of ecosystem services and the negative impacts of economic activities on the environment.

Conventional techniques for project and programme appraisal have also largely failed to consider ecosystem service costs and benefits. At best, development planning has traditionally focused on provisioning services such as food, fibre and fresh water, which already have a value in the market place (WRI 2008). It has long been recognised that provisioning services are closely linked to many core development goals (such as food security, income generation, employment, health and nutrition). The less obvious contribution of supporting, regulating and cultural services has not usually been taken into account – even though these underlying functions may actually underpin the achievement of most basic development needs such as clean and regular water supplies, sustained crop and fisheries production, disaster risk reduction and adaptation to climate change. In many cases this has led to unintended negative economic costs or losses. As we shall examine in more detail below, it has also meant that opportunities to generate income, employment and other development benefits at a broader societal level have often been missed.

Numerous examples now exist, from many different countries and sectors, of the high economic benefits that ecosystem services yield for human well-being and development processes (and, conversely, of the damages losses they help to avoid). These kinds of economic evidence and arguments can provide an extremely powerful tool for persuading development planners and decision-makers to acknowledge the contribution of ecosystem services to pro-poor growth, to buy into policies that encourage their sustainable use and management, and to ensure that adequate resources are invested in ecosystems.

It is worth underlining that, however good this data and evidence is, it will have little impact or influence over decision-makers unless they are packaged carefully and communicated effectively so as to make a credible and persuasive economic case for mainstreaming ecosystem services into development planning (UNDP and UNEP 2008). *Communication therefore is an integral part of the IES approach outlined in this guide.*

TRADE-OFFS AND SYNERGIES BETWEEN ECOSYSTEM SERVICES, STAKEHOLDERS AND DEVELOPMENT GOALS

In general terms, trade-offs can be described as the state of reaching a balance or equilibrium between incompatible features or outcomes, which involves some level of loss of one quality or service in return for gaining another quality or service. In other words, it involves an exchange between different groups, goals or results. In the IES context, trade-offs mean achieving a compromise between two competing or conflicting development and ecosystem conservation goals.

These relationships and balances are not, however, always negative. Synergies, or positive co-variation (more of one means more of another) may also exist – or have the potential to be developed. The search for positive synergies between ecosystem services and development processes lies at the heart of the IES approach.

Example: The Great Barrier Reef system in Australia (including both the upper watershed and the coastal/marine area) is threatened by declining water quality associated with agricultural run-off. In order to address these environmental problems, it is necessary to recognize a variety of trade-offs between linked ecosystem services and stakeholders. The most direct trade-off is between food and fibre production (and the farmers that are involved in this) versus water quality regulation (and the coastal communities, tourists and fishermen). In addition, this trade-off has spatial, as well as distributional, implications because it involves upstream and downstream groups who are located in different places (as well as sectors) in the landscape. At the same time, other ecosystem services and stakeholders display positive synergies, as well as a spatial match. One example is between water quality regulation (and downstream water users) and floodplain fisheries (both recreational and commercial fishermen). Being able to articulate and better understand these trade-offs and synergies allowed for the analysis of "winners" and "losers" in land use change, which is important for designing and evaluating environmental and economic policy aiming to balance food, fibre, fisheries, recreation and water supply needs.

Source: Butler, J. et al. (2013)

Integrating ecosystem services into development planning almost inevitably necessitates dealing with some form of **trade-off**. Some ecosystem services are mutually exclusive. It is not possible, for instance, to manage the same forest area for both intensive timber production and habitat protection. Changes in the quantity or quality of one ecosystem service frequently affect the supply of other ecosystem services. The expansion or intensification of agriculture can, for example, increase food security, but it might cause the loss of wildlife habitat, nutrient runoff, sedimentation of waterways, greenhouse gas emissions, and agrochemical pollution. While the benefits of dam construction may include increased supply of electricity, irrigation water and fisheries production, the dam might affect other ecosystem services such as downstream water flow, flood protection and the supporting services of riparian and wetland habitats.

Trade-offs may be reversible or irreversible. In the latter case, the long-term outcome is a permanent change in the level and mix of ecosystem services that are generated by a certain site or for a particular group of stakeholders. This issue of distribution is key. Trade-offs are inherently and unavoidably to do with equity and the rights of different groups, and with favouring one group's or person's preferences and needs over those of others. There is always an **opportunity cost** (to somebody or something) involved in reaching a trade-off.

Such sources of competition or conflict are often unintended, and do not necessarily arise as the consequence of an explicit choice by decision-makers to prioritise one ecosystem service or development alternative (or its beneficiary group) over others. The concept of externalities has already been described above. They are sometimes difficult to discern, as changes in ecosystem services are frequently separated from the development actions that triggered them - either temporally (e.g. a short-term focus on agricultural production may lead to the longer-term loss of soil quality), spatially (e.g. the construction of a hydro-power scheme has an effect on those living lower down the watershed), sectorally (e.g. the conversion of forest habitat for settlement and construction may also impact on local food security, health status and enterprise development) or socially (e.g. downstream pastoralists may be affected by the loss of floodplain grazing that arises due to water diversion for urban use). Of course these changes may also be positive, when a development action in one place or time generates unexpected ecosystem service benefits for others (for example when new hydrological works on a river lead to the restoration of downstream wetlands, or when small business development reduces commercial exploitation pressures on a nearby forest). The fact however remains that the groups that are affected by changes in the supply of ecosystem services are often not the same as those who benefit from the changes to ecosystems. The trade-off between ecosystem

services is often a trade-off between people or groups of society. Applying an IES approach involves ensuring that these trade-offs, and the groups they impact, are made explicit and factored into the development planning process. Both the opportunity costs and the externalities associated with choosing to pursue a development activity are considered. The IES approach attempts to avoid trade-offs that result in the loss of ecosystem services or impact negatively on society (especially poor and vulnerable groups). Instead it seeks to point to ways of maximising the synergies between development actions and ecosystem service benefits. The intention of integrating ecosystem services into development planning is to level the playing field: to enable decisions to be made on the basis of the best possible information, and to identify where unavoidable consequences may require some form of remediation or mitigation.

OPPORTUNITY COSTS…

are the value to the economy of a good, service or resource in its next best alternative use. They are the benefits that are foregone or diminished by choosing to use land, resources or ecosystem services in a particular way.

Source: Emerton and Howard (2008)

Selected publications:

Burke L., J. Ranganathan, and R. Winterbottom (2015). Revaluing ecosystems: pathways for scaling up the inclusion of ecosystem value in Decision Making. World Resources Institute (WRI), Washington, DC, USA.

Guerry A.D. et al. (2015). Natural capital and ecosystem services informing decisions: From promise to practice. PNAS Hune 16/2015. Volume 112.

Ranganathan J. et al. (2008). Ecosystem services. A guide for decision makers. WRI, Washington DC, USA.

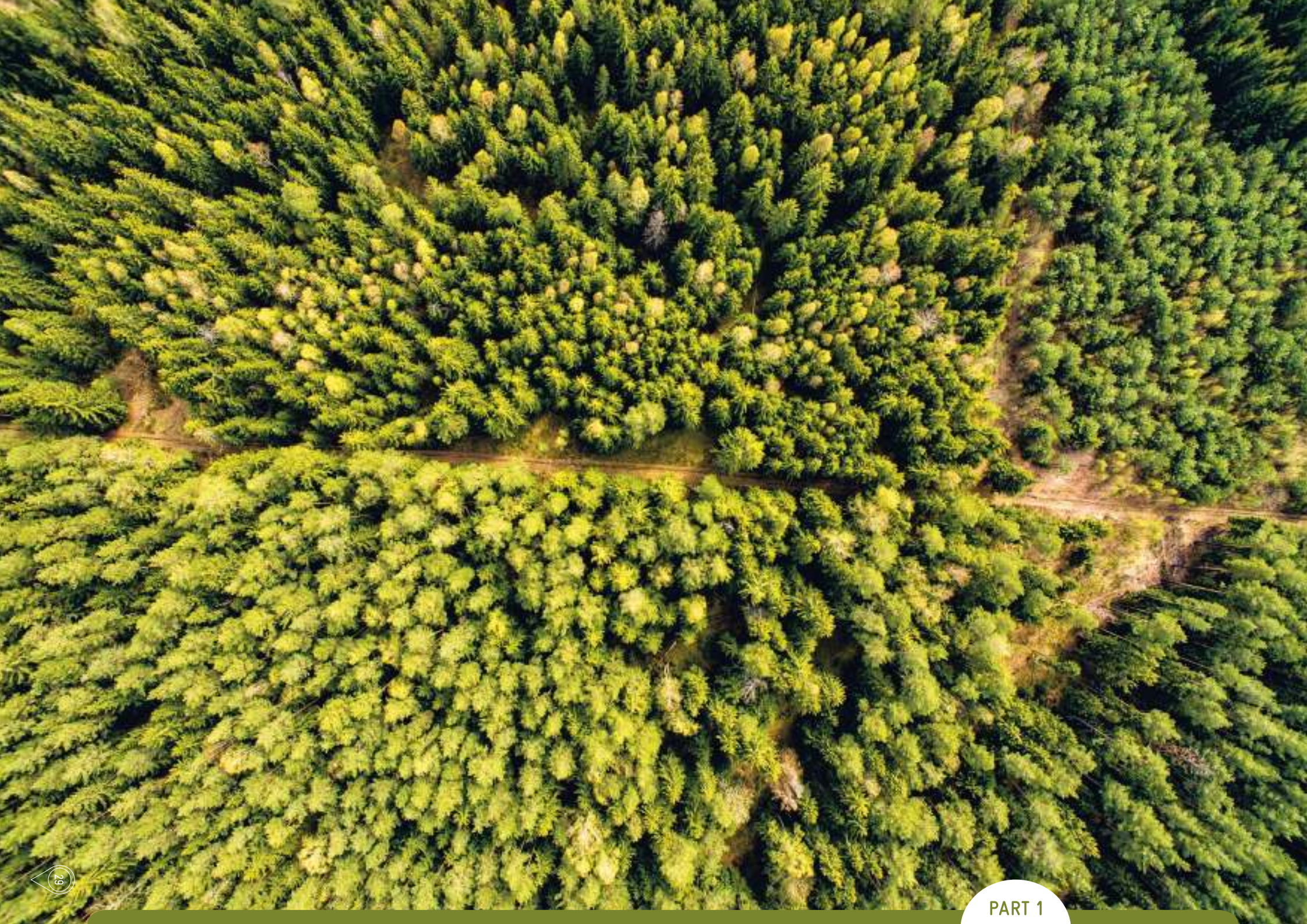
Rincón Ruiz A. (2015). Integrated valuation of biodiversity and ecosystem services: Conceptual and methodological aspects. Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Bogotá, Colombia.

Rode J. and H. Wittmer (2015). Acting on ecosystem service opportunities – Guidelines for identifying, selecting and planning economic instruments to conserve ecosystems and enhance local livelihoods. Helmholtz Centre for Environmental Research GmbH – UFZ, Leipzig, Germany.

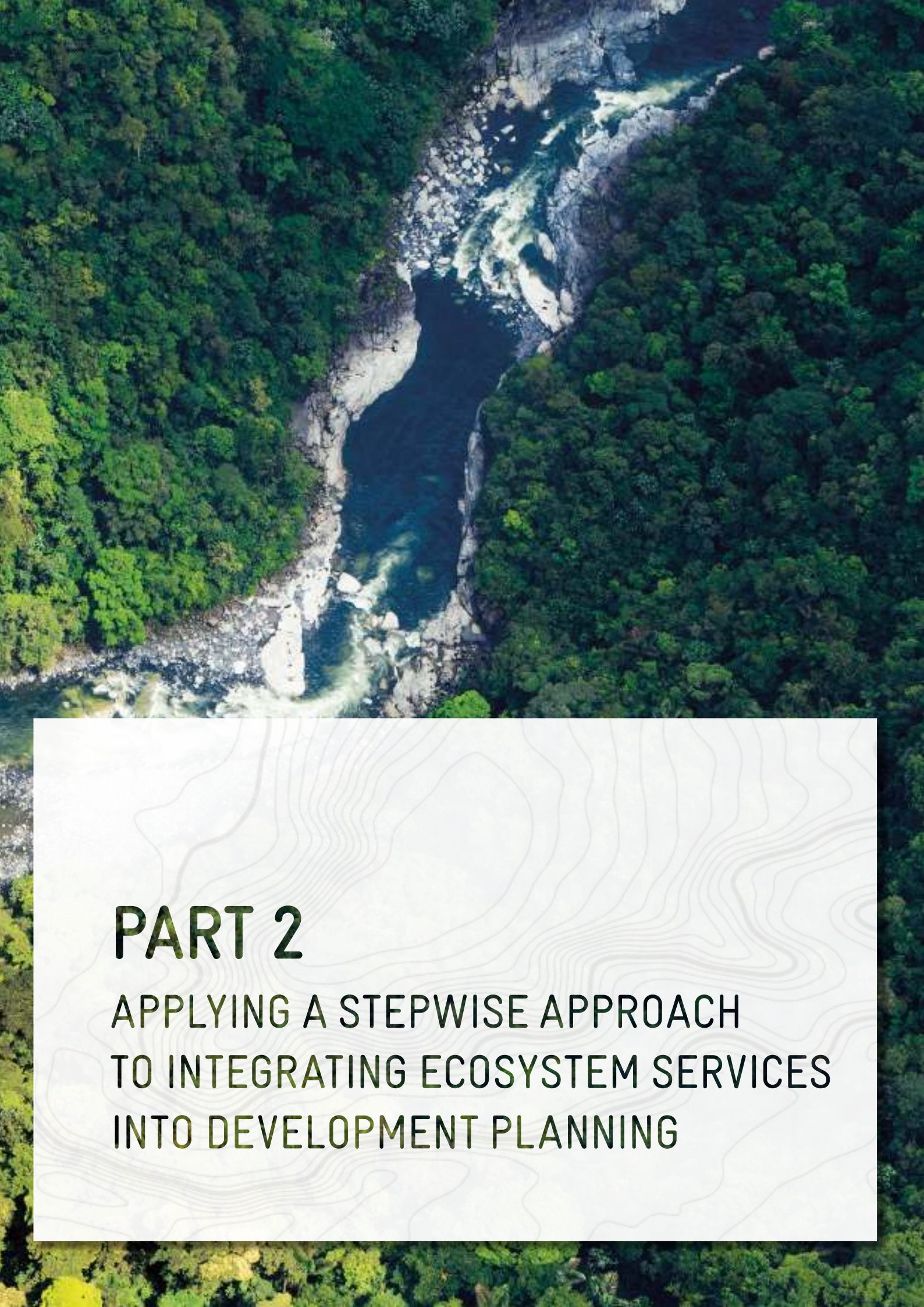
Roe D. (2014). Topic guide: Ecosystem services - Evidence on demand. Department for International Development (DFID), UK.
TEEB for Local and Regional Policy Makers (2010)

Recommended websites:

Biodiversity Information System for Europe: *http://biodiversity.europa.eu*
Common International Classification of Ecosystem Services (CICES): *http://cices.eu/resources*
Ecosystem Services Partnership (ESP): *http://es-partnership.org*
Ecosystem Services Platform: *http://oppla.eu*
Intergovernmental Platform on Biodiversity & Ecosystem Services (IPBES): *http://www.ipbes.net*
The Economics of Ecosystem and Biodiversity (TEEB): *http://www.teebweb.org*
UK Government: Department for Environment, Food & Rural Affairs: *https://www.gov.uk/guidance/ecosystems-services*
ValuES - Integrating Ecosystem Services into Policy, Planning and Practice: *http://www.aboutvalues.net*
World Conservation Monitoring Centre (WCMC): *https://www.unep-wcmc.org*



PART 1



PART 2

APPLYING A STEPWISE APPROACH TO INTEGRATING ECOSYSTEM SERVICES INTO DEVELOPMENT PLANNING

OVERVIEW OF THE STEPS

The stepwise IES approach aims to provide practitioners with a practical and policy-relevant framework for integrating ecosystem services into development planning.

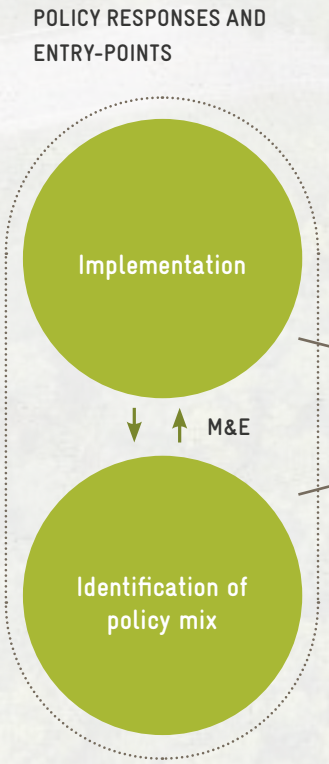
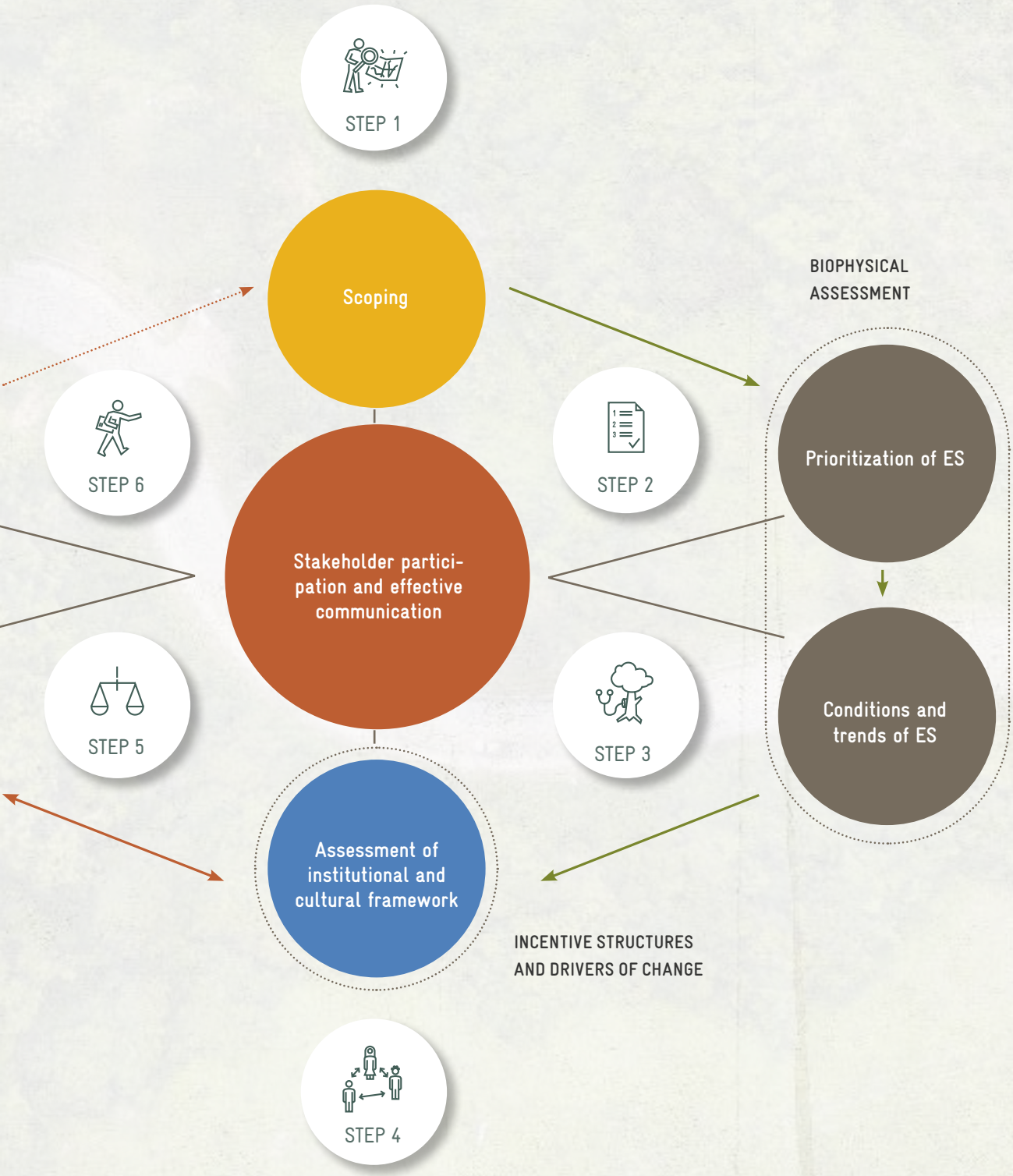


Figure 1.1: Overview of the steps



The table on the following page summarises these six steps, which are then described in detail in the following chapters.

Table 2.1: Summary of the 6 steps

STEP	SUMMARY	EXPECTED OUTCOME	GUIDING QUESTIONS
STEP 1: Defining the scope and setting the stage 	Step 1 involves undertaking the groundwork that is required to get the IES process started. The main tasks are: defining the objective(s), outlining the scope of work and identifying main stakeholders to be involved. At the end of Step 1, the design and next steps in the IES process should be defined, including the division of tasks and responsibilities. The availability of the necessary human and financial resources and other inputs should also be clarified as far as possible.	■ Clear definition of management challenge or issues to be addressed. ■ Documented and agreed objective, scope and expected outcome of the IES process. ■ Documented and agreed work plan, including resource requirements. ■ Stakeholder map and engagement plan. ■ Communications plan.	■ What are the main development and management issues that need to be addressed by the IES process, and for which purpose? ■ Who are the relevant stakeholders and how should they participate in the IES process? ■ What are the milestones and expected outcomes of the IES process? ■ What staff, funds and other inputs are required to carry out the IES exercise? ■ How will key messages be communicated to target groups?
Step 2: Screening and prioritizing ecosystem services 	Step 2 helps prioritize the most relevant ecosystem services that are related with the development plan. At the end of this step priority ecosystem services will have been identified. The main task is to screen the development plan so as to identify risks and opportunities related with the impacts and dependence of different development activities on ecosystem services and the key beneficiaries or affected stakeholders.	■ Matrix showing ecosystem service dependencies and impacts in relation to the development plan. ■ Agreed list of priority ecosystem services. ■ Summary of potential areas of conflict or competition, which may result in trade-offs.	■ How does the development plan (including associated economic activities and livelihoods) depend and impact on ecosystem services? ■ Which stakeholders stand to be affected by the development plan and by changes in ecosystem services? ■ What costs and benefits are associated with these changes and how will they be distributed between different groups? ■ Do potential areas of conflict, competition or synergies emerge? ■ Which are the most important ecosystem services for the development plan and why?
Step 3: Identifying conditions, trends and trade-offs 	Step 3 looks at the cause-and-effect relationships that operate between ecosystem services and the development plan. The status and main trends in the supply and demand for ecosystem services are analysed. Drivers of ecosystem change and key stakeholders are also identified. A particular concern is to identify where there may be synergies and trade-offs between the between different groups, goals or services.	■ Information on ecosystem services conditions and trends. ■ Overview of the main drivers of change, related stakeholders. ■ Analysis of ecosystem services synergies and trade-offs in the context of the development plan. ■ Key messages for different audiences.	■ What information and evidence on ecosystem service conditions and trends exists and what are the main information gaps? ■ What are the current conditions and likely future trends in ecosystem service demand and supply? ■ What are the main drivers of change? ■ What trade-offs might arise between development goals and ecosystem services and how will these affect different stakeholders?

STEP	SUMMARY	EXPECTED OUTCOME	GUIDING QUESTIONS
STEP 4: Appraising the institutional and cultural framework  STEP 4	Step 4 complements the information that has been gathered in Step 3. It appraises institutional, policy, legal and cultural characteristics, and identifies the resulting incentive structures in relation to ecosystem services and the development plan. These factors mediate and influence how people manage, use and impact on ecosystems and their services, and may act as drivers of either positive or negative ecosystem change.	■ List of key institutional, policy, legal and cultural characteristics and the resulting incentive structures (that influence how people manage, use and impact on ecosystems and their services). ■ Identification of underlying causes and drivers of ecosystem degradation. ■ Overview of stakeholders' positions, interest, needs, values and rights. ■ Information on existing and possible areas of conflict or cooperation relating to ecosystem use, management and incentives.	■ Which organisations and institutions govern ecosystems and their services? ■ Who participates in decision-making and in what role? ■ Which policies, regulations and incentives influence ecosystem use and management? Who or what do they target? How are they enforced? ■ Are there conflicts or inconsistencies between different institutional, policy, legal and cultural frameworks and associated incentive systems? ■ Which other needs, interests, values and rights drive ecosystem management choices?
STEP 5: Preparing better decision-making  STEP 5	Step 5 summarises and analyses the information that has been gathered in the previous steps. Based on this information, risks and opportunities for the development plan are investigated. It suggests policy options which can serve to maintain or increase the flow of ecosystem services, and identifies suitable entry-points for guiding or influencing decision-making.	■ Analysis of risks and opportunities associated with the development plan. ■ Shortlist of policy-options and corresponding entry-points into decision-making. ■ Communications messages on policy options.	■ What are the ecosystem service-related risks and opportunities to the development plan? ■ Could economic valuation be useful? If so, how? ■ What are the most feasible policy options and entry points for reducing or avoiding risks and capturing ecosystem service opportunities? ■ How can policy measures, instruments and interventions build on existing experiences?
STEP 6: Implementing change  STEP 6	Step 6 involves developing a strategy to operationalise the policy recommendations generated in step 5. It involves preparing a work plan, as well as a stakeholder engagement and communication strategy for the implementation of concrete measures to integrate ecosystem services into the development plan.	■ Implementation strategy and operational work plan. ■ Communication strategy specifying target audience, key messages and possible champions and allies to encourage and operationalise the required changes.	■ Are the proposed policy options realistic, feasible, acceptable and consistent with the development plan? ■ Are the necessary financial, technical, human resource and institutional capacities in place to deliver the selected policy options? ■ Who will be involved in implementing the policy measures and in what role? ■ How will the impacts of the policy measures be monitored? ■ How will learning be generated, shared and communicated?

GUIDING PRINCIPLES FOR THE PROCESS

1. ENSURING POLICY RELEVANCE

- The IES approach is concerned with addressing development issues in the real world. The process should therefore be guided by agreed policy issues and questions, and closely embedded in a concrete planning or decision-making process.

2. PROCESS ORIENTATION

- Outcomes are important, but the process is also key because it creates ownership for the outcomes.
- Avoid exhaustive assessments, instead build on what already exists in terms of skills, capacities, ongoing initiatives and data/information.
- The IES approach is not a blueprint, and always needs to be adapted to the specific needs and context in which it is being applied.
- Maintain flexibility and manage the process with an adaptive approach.

3. ESTABLISHING STAKEHOLDER PARTNERSHIPS

- Engage stakeholder and interest groups, share responsibility, foster ownership, strengthen local governance and avoid creating parallel structures.

4. BROADENING THE PERSPECTIVE

- IES should be a multi-stakeholder and multidisciplinary endeavour: make sure to respect and incorporate people's different views and perspectives, and whenever possible take local/traditional knowledge into account.
- Working with ecosystem services requires an integrated, transdisciplinary approach which brings together knowledge and expertise from social, natural and political sciences.

5. COMMUNICATING EFFECTIVELY

- Communication is the link between all stakeholders – trust, respect, transparency and openness towards other perspectives and standpoints are essential.
- Listen carefully and adapt technical language to meet the needs, interests and background of your target group. Remember that complex ecosystem services jargon and terminology can be difficult for many people to understand.
- You might want to read this article on the pitfalls of "ecosystem services communication": Ecosystem Services Messaging. Needs Assessment and Initial Messaging Recommendations (2012): *http://www.carangeland.org/images/Ecosystem_Services_Messaging_Needs_Assessment_072512.pdf*

CASE EXAMPLE

The IES approach: Applying IES in La Reserva de la Biosfera Mariposa Monarca, Mexico

La **Reserva de la Biosfera Mariposa Monarca** (RBMM) is glo-bally-renowned as a habitat for the monarch butterfly, which migrates every year between Canada and Mexico. The protected area also provides many other ecosystem services, for example food and medicinal plants, pollination, climate and water regulation, recreation and erosion control. These benefit millions of people at local, regional and national levels.

Nevertheless, the ecological integrity of the RBMM is threatened, putting many of these valuable ecosystem services at risk. A variety of pressures exist, including land use change, deforestation, agricultural conversion and overexploitation of resources such as timber. In addition, the protected area lacks funding, and there is little support for conservation from the main stakeholders that impact and depend on its ecosystem services.

The project **EcoValor México: Valoración de Servicios Ecosistémicos en Areas Naturales Protegidas Federales**, implemented by GIZ in partnership with the **National Commission of Protected Areas** (CONANP) in Mexico, undertook an IES assessment in RBMM, working together with the ValuES project and **Helmholtz Centre for Environmental Research** (UFZ). The aim of the IES was to identify mechanisms for decreasing the development pressures on the protected area, at the same time as protecting the interests of ecosystem service beneficiaries.

The study involved a literature review as well as many workshops, field trips and consultation meetings with different stakeholders. A summary of the findings from the **first five steps** of the IES approach is given below (the **sixth step**, "implementing change", is still under development):

Step 1. Defining the scope of work and setting the stage. The focus of the assessment was on the RBMM, and its main beneficiaries were the approximately 20 million people who live in the surrounding municipalities, as well as the city of Toluca and Mexico City.

Step 2. Screening and prioritizing ecosystem services. The prioritised ecosystem services were waterflow regulation and aquifer recharge, because these were the most affected by deforestation and also benefited the largest human population.

Step 3. Identifying ecosystem service conditions, trends and trade-offs. The baseline was obtained from already-existing studies on the water regulation functions of the RBMM. Agriculture and timber extraction were identified as the main drivers of deforestation, and thus of changes in water regulation services. The affected population comprises the population of the municipalities surrounding the protected area, as well as Toluca and Mexico City.

Step 4. Appraising the institutional and cultural framework. The current impacts of agricultural expansion and timber extraction can be reduced by promoting better conservation practices and investments in the protected area. This requires improved information and coordination efforts. There is also a need to strengthen the monitoring capacity of the protected area, which requires additional financial resources. Addressing the drivers of deforestation can be undertaken with pressure from regional beneficiaries of the water regulation services and the **National Water Commission** (CONAGUA). This will involve information generation and dissemination, advocacy and allocation of improved budgets to conservation activities.

Step 5. Preparing better decision making. Four key recommendations and policy actions were identified: generate information geared at ecosystem service beneficiaries about the importance of the role of the protected area, so as to increase their participation and support for conservation; inform farmers and timber harvesters about the importance of ecosystem services to their activities, in order to promote better practices and investment for conservation; encourage the development of an new financing mechanism to generate additional funding for protected area conservation efforts. And undertake an ecosystem valuation exercise to generate specific evidence of the protected area to water supplies. As an initial step, a stakeholder workshop was convened to discuss and analyse options for the development of the new financing mechanism.

STEP 1: DEFINING THE SCOPE OF WORK AND SETTING THE STAGE

Step 1 involves undertaking the groundwork that is required to get the IES process started. The main tasks are: defining the objective(s), outlining the scope of work and identifying main stakeholders to be involved. At the end of Step 1, the design and next steps in the IES process should be defined, including the division of tasks and responsibilities. The availability of the necessary human and financial resources and other inputs should also be clarified as far as possible.

Rationale for this step, objectives and expected outcomes

The first step of the IES approach is a preparatory one. It defines the objectives and scope of the assessment. This includes considering its sectoral and geographical focus, the planning or decision-making process and audience that it seeks to inform or influence, the main issues or management challenges to be addressed, and the key stakeholders to be involved. **Step 1** also involves organising administrative and logistical aspects such as staffing, funding, workplan and timeline. By the end of **Step 1**, there should be a clear plan for how the work will proceed, which has been discussed and agreed with key stakeholders.

Objectives

The main objective of Step 1 is to design the IES process properly, especially its aim, scope and the expected outcomes, to build a shared understanding of why and how the assessment is being carried out, and to agree upon key issues with relevant stakeholders.

Expected outcomes

- Clear definition of management challenge or issues to be addressed.
- Documented and agreed objective, scope and expected outcomes of the IES process.
- Documented and agreed work plan, including resource requirements.
- Stakeholder map and engagement plan.
- Communications plan.

How to do this step

It is very important from the start to be clear about the purpose and envisaged outcome of the IES approach. It is important to have an idea of the development process or decision-making context in which IES is being used, as well as the key decision-makers and stakeholders that it seeks to engage and influence.

POLICY AND RESEARCH QUESTIONS (SEE ALSO STEP 3)

Make sure to make a clear distinction between:

a) the policy issues and related management challenges (the policy question) to be addressed by your initiative; and

b) the aim of a possible study (that might be necessary) to obtain better information on ecosystem services conditions and trends and the underlying causes related to ecosystem management (the research questions, which are basically sub-sets of policy questions).

Recommended reading: Increasing the Policy Impact of Ecosystem Service Assessments and Valuations - Insights from Practice. UFZ and GIZ. 2016. *http://www.aboutvalues.net/data/about_values/increasing_impact_of_es_assessments.pdf*

This is necessary in order to align it with the intended use (and users) of its results, and to ensure that it is fit to purpose.
The initial decision about the scope and boundaries of work in the particular planning process that is to be assessed in the IES exercise will usually be made by the leaders of that process. This will typically be done with the assistance of technical experts and advisors. As elaborated further below, in some cases broader consultation (for example with affected stakeholders or with non-governmental organisations and local communities) will be undertaken. This should be encouraged, so as to incorporate as many different views and perspectives as possible, and to reach a better understanding of the context in which the IES exercise (and the planning process it is addressing) is taking place.
Step 1 will broadly define the key development and ecosystem service issues that need to be examined in more detail in the IES exercise. If the process starts to become very technical, make sure to reconnect the discussion to the relevant policy issues that should be changed or improved. Do not forget to involve key actors from the beginning, all of whom should be fully informed and should understand the need for change. This is necessary if they are to take ownership of the process later on. Effective communication from the start is a key factor for a successful IES exercise.

During this step, the most important elements to consider, discuss and clarify are the purpose, scale and inputs of the process, as well as its intended outcome. Several tools can assist in deciding on these parameters, such as internal meetings and brainstorming sessions, problem tree analysis and mind-mapping. Relevant background literature and data should be collated and reviewed to inform the framing and diagnosis of the issues to be addressed.

Identifying the stakeholders who are impacted by or who affect ecosystem services is an important part of the scoping. It is necessary to clarify, very early in the process, which groups, individuals and agencies should be involved in the IES process, and how they should be involved. Stakeholders may include, for example, community members, local administrators and leaders, businesses, producer or consumer groups, government line agencies, NGOs and scientific experts.

Possible criteria for prioritising stakeholders include looking at who manages, regulates, depends and impacts on ecosystem services in the context of the development plan that is being considered, who has a high level of power and influence and who has expertise on the issue. While some of these groups may be immediately obvious (for example the farmers that are involved in an agricultural improvement project, or the industries that pollute a particular river), others may exert a less clear - but equally important - influence. Examples include off-site producers and consumers, the Ministry of Finance, or local opinion- leaders. It is important to trace through the chains of cause and effect that link ecosystem services and development processes, including the ways in which decisions are made and enforced.

DIFFERENT TYPES OF STAKEHOLDER ENGAGEMENT:

- Informing stakeholders: Disseminate information to those who might be impacted or have an interest in the outcome of the policy, plan or project.
- Learning from stakeholders: Understand and consider views, interests and concerns of different actors to develop options and evaluate potential impacts.
- Working for stakeholders: Develop a shared approach to decision making among stakeholders. The process is deliberative, involving group assessments of an issue and potential responses.

Source: DEFRA (2011)

The essence of the IES approach is that it is participatory. Once the main stakeholders have been identified, they should be brought into the planning process as soon as possible. This will be an important factor in the subsequent quality of the assessment. Stakeholder consultation will help to refine and focus the objectives and scope to reflect the realities of the on-the-ground situation, and will enable new perspectives and knowledge to be built into the design of the assessment. It is also a critical step in leveraging buy-in and acceptance from those involved, including the groups who may ultimately be responsible for implementing the recommendations that come out of the IES assessment.
A common understanding of the management challenges among stakeholders can contribute towards creating alliances and fostering solutions. In practical terms, it helps to ensure that key participants support the IES process, and fosters a sense of buy-in, interest and understanding.

There are various tools that can be used to help in identifying and engaging stakeholders. Having agreed the broad boundaries and scope of work, stakeholder mapping can be used to assist in identifying additional groups that need to be brought into the process. Face-to-face meetings with core stakeholders can also help. You could for example start with organising a small workshop to present the IES approach, inviting representatives of different organisations. Forming a new task force or working group to guide the process, or mandating an existing one to do so, is also a good option.

At this stage, a stakeholder engagement and communication plan should be drawn up, covering every stage of the IES process from the design stage to the implementation of its recommendations. In addition to who should be involved, one thing to think about is how they should be engaged.
Communication is a fundamental –and continuous– element of the whole IES process. You should identify target groups and formulate key messages as soon as the basic scope and stakeholders for the process have been determined.

RECOMMENDATIONS:

- Be prepared to refine the scope as the work proceeds. The issues that you eventually identify may only be relevant to part of the geographic area, or concern a larger one. Over time, it may prove useful to reduce or expand the focus, or to engage new stakeholders.
- Keep in mind that the broader the approach is, the more resources you will need! Try to keep the assessment as targeted as possible.
- Do not forget that the involvement of key stakeholders is essential, from the start - both to identify the full range of ecosystem dependencies and impacts, and to address them successfully.

BASIC PRINCIPLES FOR EFFECTIVE COMMUNICATION

POWERFUL:
A powerful message is one that raises strong emotions, or fosters deep reflection.

LASTING:
A lasting message sticks with the audience long after the message has been delivered, such as a catchy song or easily remembered phrase.

ACTIONABLE:
An actionable message is one that clearly describes what actions are required, such as a 50-meter riparian buffer zone.

SURPRISING:
A surprising message is one that creates pleasant tension in the recipients mind, such as a surprising comparison, an interesting fact or a new perspective.

TARGETED:
A targeted message is aimed directly at a particular audience.

INTERESTING:
An interesting message is one that has strong visual or auditory appeal.

CLEAR:
A clear message states exactly what the key issues are, focusing precisely on the specific points, including, for instance the problems caused by undervaluation of ecosystem services, the urgency of addressing trade-offs, the importance of changing the situation, and potential means of changing the situation.

Source: GIZ (2016).

The following matrix *(→ Figure 2.2)* can help to summarise the stakeholder information relevant for steering the IES process.

Figure 2.2: Key stakeholder matrix

Source: Durham et al. (2014)

It is important to remember that interest and influence can change over time and the impact of such change should be considered during the whole IES process. It is often useful to include a range of attributes when categorising stakeholders, for example how they depend, impact on or manage ecosystem services, and how these roles, responsibilities and relationships may overlap, reinforce or even contradict each other. For example, in many cases the users of ecosystem services are also the managers of the land and resources which generate these services – and their actions may even be contributing to ecosystem degradation and loss. It is worth giving thought to the importance of establishing relationships and networks of cooperation between stakeholders, and to identify who might be involved in these, and how they might work. Political support, in particular, may be required to move the IES process forward and, eventually, to implement its recommendations. The groundwork done in **Step 1** can establish a solid basis for facilitating change in the future.

One way of categorising stakeholders is to apply criteria such as interest and influence to divide them into:

Key players: need to be actively solicited and engaged as a core part of the process, because they have high interest and influence over a particular phenomenon.

Context setters: are highly influential, but have little interest. Because of this they may be a significant risk, and should be monitored and managed.

Subjects: have high interest but low influence, but they may become influential by forming alliances with other stakeholders.

Crowd: have little interest in or influence over desired outcomes.

Source: Reef M.S. et al. (2009)

How stakeholders are categorised will also provide important information about the best ways of engaging and communicating with them throughout the IES process. It is important to remember that interest and influence can change over time, and the impact of such change should be considered during the whole IES process.

Resource needs and suitable methods & tools for the scoping:

- Political buy-in.
- A core team and financial resources to get the process started.
- Facilities to organise and moderate meetings, stakeholder workshops.
- Map of the area.
- Stakeholder overview.
- Clear statement of the policy or management issue to be addressed, decision or planning process to be informed or influenced, and target audience.

You can find a great deal of methods and tools for designing and steering multi-stakeholder processes on the Internet, including specific ones for stakeholder management. Some examples:

CBD (2007). Communication, Education and Public Awareness (CEPA). Toolkit: *https://www.cbd.int/cepa/toolkit/2008/doc/CBD-Toolkit-Complete.pdf*

DEFRA (2011). Participatory and deliberative techniques to embed an ecosystem services approach into decision-making. An introductory guide.

GTZ (2007). Multi-stakeholder management: Tools for stakeholder analysis: 10 building blocks for designing participatory systems of cooperation: *http://www.fsnnetwork.org/sites/default/files/en-svmp-instrumente-akteuersanalyse.pdf*

ODI Planning Tools - Stakeholder Analysis: *https://www.odi.org/publications/5257-stakeholder-analysis*

Reef, M. et al (2009). Who´s and why? A typology of stakeholder's analysis methods for natural resource management. Journal of environmental management.

Wageningen University´s Centre for Development Innovation: Knowledge co-creation portal. Multi-stakeholder partnerships: *http://www.mspguide.org/tools-and-methods*

Case example

Step 1: Preparing national guidelines for ecosystem service assessments in Jordan

Jordan is predominately a desert country with a growing population. There are heavy pressures on land and resources, which are affecting the availability of key ecosystem services such as water, pasture, food and raw materials. External factors such as ongoing climate change and desertification processes and the influx of a large population of war refugees from surrounding countries have exacerbated these stresses. Recognising the importance of biodiversity and ecosystem services, the Ministry of Environment is in the process of designing national guidelines for ecosystem services assessments and valuations. Under the leadership of the Ministry, a broad array of civil society organisations, academic institutions, government agencies and international experts got together in early 2016 to identify the scope of these national guidelines **(Step 1)**. Workshop participants agreed that the guidelines should provide a road-map for integrating ecosystem services into key policy instruments (in particular land use planning, environmental impact assessment and strategic environmental assessment) and for designing, monitoring and reporting indicators **(Step 5)**. The guidelines will provide an ecosystem services assessment methodology **(Step 3)**, which enables practitioners to consider different stakeholders' values and priorities regarding ecosystem services. The guidelines will be in accordance with the Jordanian environmental regulatory framework **(Steps 4 and 5)**.

STEP 2: SCREENING AND PRIORITISING ECOSYSTEM SERVICES

At the end of Step 2 priority ecosystem services will have been identified. The main task is to screen the development plan so as to identify key ecosystem services risks and opportunities.

Rationale for this step, objectives and expected outcomes

Having defined the scope and boundaries of work, identified the decision-making targets and agreed on the process that will be followed, the second step involves examining how the development plan depends and impacts on ecosystem services. The most important ecosystem services for economic and livelihood activities will be identified. This prioritisation and narrowing-in on topics and issues is important, because it helps to reduce the complexity (and hence time and cost) of the assessment. It also ensures that the results that are generated are relevant and applicable to the decision-making process (and decision-makers) that they seek to influence or inform. In most cases it will be impossible (and also unnecessary) to consider each and every ecosystem service.

Objectives

The main objective of **Step 2** is to analyse how the development plan depends and impacts on ecosystem services. This forms the basis for prioritising ecosystem services and focussing the scope of the assessment.

Expected outcomes

- Matrix showing ecosystem service dependencies and impacts in relation to the development plan.
- Agreed list of priority ecosystem services.
- Summary of potential areas of conflict or competition, which may result in trade-offs.

How to do this step

A scoping exercise should be carried out to establish which ecosystem services are linked to achieving the development plan. This can usually be done as a desk exercise. In those cases where there is no existing plan, the scoping should focus on the most important livelihood sources or production activities for the site, sector, company or group being assessed. → *Annex 1* provides a comprehensive checklist of ecosystem services which can be used during this scoping exercise. Then, key dependencies and impacts should be identified, using the following definitions (adapted from OECD 2008):

- The development plan **depends on ecosystem services** if the service is an input, or somehow enables, enhances or regulates the conditions necessary for a successful outcome. If the ecosystem is degraded, and the service declines, the development goals may be compromised or fail altogether. If the ecosystem is conserved, or the service improves, the development outcomes can be sustained or even improved. For example, a coastal development plan may depend on mangrove storm protection services. A certain quality and area of mangroves must be maintained in order not to jeopardise coastal development.

- The development plan **impacts on ecosystem services** if the actions associated with it alter the quantity or quality of a service. For example, the coastal development plan may also involve infrastructure development which will lead to the loss of natural habitats, shoreline erosion and worsened water quality. Its impact might however also be positive. For example, introducing cheap and accessible energy sources for rural fishing households may reduce fuelwood consumption, improve the quality of mangroves, and secure important fish breeding and productivity services.

A simple matrix can assist in identifying ecosystem service dependencies and impacts (→ *Table 2.2)*. Each row corresponds to an ecosystem service, and each column relates to a key development goal or activity. A score should be assigned to each cell according to dependence/impact (0 = no relevance, 1= minor relevance, 2= moderate to major relevance). This provides a way of prioritising the most important ecosystem services.

Those rows with the highest aggregate score show the ecosystem services, which display the highest dependencies or impacts in relation to the development initiative, and should be prioritised in further steps of the IES process. In addition, the highest aggregate score of the columns provide you with the information on development issues and stakeholders that most dependent and/or are having the major impact on ecosystem services.

Table 2.2: Matrix for identifying impacts and dependencies

Ecosystem services	Development objective/measure/activity						Ohter economic activities and elements of human well-being				Sum of scores
	X		Y		Z		x		y		
	D	I	D	I	D	I	D	I	D	I	
Insert all ecosystem services here											
Sum of scores											

D The objective/measure/activity depends on the respective ecosystem services
I The objective/measure/activity impacts on the respective ecosystem services
2 Moderate to major relevance
1 Minor relevance
0 Not relevant

Most of the information required can be gathered through a combination of literature review, data analysis and expert/stakeholder consultations. Even though only a very rapid scoping of ecosystem services is taking place at this stage *(a detailed review will be carried out in Step 3*), it should be noted that a large body of information and opinions typically lies behind the matrix that you will construct. It is important to keep notes on why particular scores were assigned, what kinds of ecosystem dependencies and impacts were identified and whom they were thought to affect. This information will feed into further steps of the assessment which look at the prioritised ecosystem services in more detail.

It is also useful to bear in mind that the ranking of ecosystem service dependencies and impacts is not a 'scientific' one. It aims to reflect stakeholders' perceptions and preferences. Remember that this means that the matrix will only reflect the opinions of those stakeholders that have been involved in the scoping exercise. *For this reason, it is desirable to be as inclusive as possible in your consultations, and to make sure that the opinions and perceptions of different stakeholders are well-balanced.* There is also likely to be a high level of uncertainty in some areas, due to a lack of data and knowledge about ecosystem processes, interactions and causality. While every effort should be made to gather the most

accurate and up-to-date data (within the time and resources available), it should be recognised that, inevitably, there will be many gaps and imperfections in the evidence base for the matrix.

When assigning the scores, *distributional concerns should always be considered*. You should take into account the fact that some parts of society depend heavily on ecosystem services, and may have few other options or sources of fall-back if these services are degraded or lost. *There may in addition be other, political, social or developmental reasons why special attention should be paid to particular groups or effects. Where impacts and dependencies disproportionately affect women, indigenous peoples or the rural poor, for example, they might need to be accorded a relatively higher weight.* Conversely, where dependencies are associated with illegal or unsustainable practices, or if alternatives are readily available and affordable to the affected stakeholders, a relatively lower weight may be allocated. Based on the screening, a priority list of ecosystem services should emerge in relation to the *dependencies and impacts* of the development plan. The scoring will also highlight potential areas of conflict, competition or synergy, which may result in trade-offs (these will be looked at in detail in **Step 3**). *While the number of ecosystem services that are of major importance to a given development plan will of course depend on the specific context, as well as on the scope and the complexity of the plan, it is desirable to come up with a "shortlist" of no more than five or six ecosystem services for more detailed review and assessment.* A larger number of priority ecosystem services will add to the complexity, time and resource demands of the subsequent assessment, and may run the risk of generating results which are neither concrete nor specific to the issues or questions being considered.

Resource needs and suitable methods & tools for the scoping:

- Facilities to organize expert and stakeholder meetings and workshops, a moderator.
- An existing development plan or information on a planned measure.
- Information on economic activities and livelihoods relating to the site, sector, group or company under consideration.
- Basic biophysical information about the area.
- Information on ecosystem services (if available).

You can find additional resources and tools to prioritise ecosystem services in the publications and websites below.

The „Guide to Corporate Ecosystem Valuation - A framework for improving corporate decision-making (WBCSD, PWC; ERM, IUCN 2011) provides a matrix for identifying the links between business sectors and ecosystem service values:
http://www.wbcsd.org/work-program/ecosystems/cev.aspx

Ash N., H. Blanco, C. Brown, K. Garcia, T. Henrichs, N. Lucas, C. Ruadseep-Heane, R.D. Simpson, R. Scholes, T. Tomich, B. Vira, and M. Zurek (eds) (2010). Ecosystems and human well-being: A manual for assessment practitioners. Island Press, Washington, DC. USA.
http://www.unep-wcmc.org/resources-and-data/ecosystems-and-human-wellbeing--a-manual-for-assessment-practitioners

OpenNESS – Operationalisation of Natural Capital and Ecosystem Services. OpenNESS aims to translate the concepts of Natural Capital (NC) and Ecosystem Services (ES) into operational frameworks: *http://www.openness-project.eu/*

ValuES - Integrating Ecosystem Services into Policy, Planning and Practice. Methods navigator:
http://www.aboutvalues.net/method_navigator/

WRI has published a step-by-step method „Weaving Ecosystem Services into Impact Assessment (2013), the technical appendix contains several tools and furthermore you can directly download spread sheets for prioritizing impacts and dependencies:
http://www.wri.org/publication/weaving-ecosystem-services-into-impact-assessment

Case example

Step 2: Screening and prioritising ecosystem services in Cozumel protected areas, Mexico

Protected areas are often accorded little attention, and a low priority, in economic decision-making processes, especially in the sectors that depend and impact most on ecosystem services. An IES approach was used by **Mexico's National Commission of Protected Natural Areas** (CONANP), in partnership with the **GIZ** and **Conservation Strategy Fund** (CSF) under the umbrella of bilateral project **EcoValor México: Valoración de Servicios Ecosistémicos en Areas Naturales Protegidas Federales**. The aim was to demonstrate the economic contribution of ecosystem services to local, national and sectoral development processes, so as to make the case for PAs as well as to generate information about policy actions and instruments that could be used to address key conservation threats and management issues. One of the sites in which the IES approach was applied was **Cozumel Reefs National Park** and C**ozumel Island Flora and Fauna Protection Area**, which together form a conservation landscape and seascape located about 20 km off the east coast of the Yucatán Peninsula. In Cozumel, lack of information about the economic and social benefits that the area generates has kept it from being valued as a key contributor to human wellbeing and development at both local and regional levels. This situation has created challenges for natural resource management, as well as for promoting well-planned and sustainable coastal development in a context characterized by mass tourism. Additionally, the Park has limited resources for management, which makes it difficult to adequately address threats.

Priority management issues and associated ecosystem services were identified during an intensive two-day workshops. The workshop brought together PA managers and other local resource managers, users and experts. Discussions focused on the main conservation priorities, threats and opportunities as well as the most important ecosystem services provided by the PAs. After identifying these focal areas and issues, stakeholder maps were produced to trace the dependencies and impacts of various different groups and sectors on the PAs and their ecosystem services.

The main conservation management and development planning issue was the threats posed to coral reefs, mangroves and other natural habitats and species by unsustainable tourism and coastal infrastructure development. The key concern became to generate information that could be used to better align policies and practices in these sectors with ecosystem services, and improve public budget allocations to PA conservation activities. Three sets of ecosystem services were prioritised for further assessment and communication: recreational and leisure activities, protection against storms and flooding, and other benefits provided by mangroves and coral reefs (such as nutrient cycling, support to fisheries productivity and carbon sequestration). This information on ecosystem service dependencies and impacts **(Step 2)** provided the basic information required to understand and articulate the main PA-sectoral economic linkages, and to identify the key ecological and economic indicators and target audience for the ecosystem assessment and valuation exercises which followed **(Steps 3 and 4)**. It also established a foundation for ensuring that the ecosystem service assessment process was focused on identifying collaborative solutions to the key conservation management issues and development priorities in the region **(Steps 5 and 6)**.

STEP 3: IDENTIFYING ECOSYSTEM SERVICE CONDITIONS, TRENDS AND TRADE-OFFS

Step 3 looks at the cause-and-effect relationships that operate between ecosystem services and the development plan. The status and main trends in the supply and demand for ecosystem services are analysed. Drivers of ecosystem change and key stakeholders are also identified. A particular concern is to identify where there may be synergies and trade-offs between the different groups, goals or services.

Rationale for this step, objectives and expected outcomes

Step 2 will have identified the ways in which the development plan and its key stakeholders depend and impact on ecosystem services. It will also have prioritised the most important ecosystem services. **Step 3** now investigates these linkages in more detail. It examines their biophysical basis in terms of conditions and trends in ecosystem services provision and use, and also looks at the drivers and underlying causes of change. The information generated will form a key input into identifying concrete policy responses, later on in the IES process. It can also be used as a baseline against which to measure future changes in development and ecosystem service indicators during the course of the implementation of the development plan and associated policy measures. Last but not least, the results are an important input for communication activities as they are the starting point for formulating key messages about the links between ecosystem services and development activities.

Objectives

The main objective of **Step 3** is to develop a clear understanding of the current status, past and future trends in ecosystem service demand and supply. That includes information about how and by whom ecosystems are being managed and used. A key issue is to examine the factors that may be leading to ecosystem service degradation – or may, with intervention, be harnessed to maintain and improve ecosystem services.

Expected outcomes

- Information on ecosystem services conditions and trends.
- Overview of the main drivers of change and related stakeholders.
- Analysis of ecosystem services synergies and trade-offs in the context of the development plan.
- Key messages for different audiences.

How to do this step

First, it is necessary to describe the present condition of the ecosystem services that have been prioritised during **Step 2***, and of the ecosystem that is generating them (1).* A basic description of the natural and human-modified ecosystems that lie within the boundaries of the development plan should be given, including information about their area, type, management and status. These should then be related to the prioritised ecosystem services. Evidence should be presented which explains the biophysical relationships that result in the provision of ecosystem services from a given ecosystem: that a particular forest, for example, is serving to protect against erosion or maintain downstream water flow, or that a specific habitat is hosting important pollinator species. → *Annex 2 / Table 4.1* gives some suggestions about the ecosystem service measures and indicators that can be used.

A clear statement should be made about the current status of the *supply* of ecosystem services: what quality and quantity of benefits are being generated. It is also necessary to look at the *demand* side: who is benefiting from the ecosystem service and in which ways. How many urban dwellers, for example, rely on water sources which are protected by a natural forest, or what kinds of crops are being pollinated by wild insects? Then the *impacts* of the development plan should be assessed: how its activities would impact on the supply of ecosystem services. How does a hydropower dam affect downstream flooding, for example, or what are the impacts of wetland conversion on fisheries breeding and productivity?

After collecting this baseline information, it is necessary to *review trends in the demand and supply of ecosystem services (2).* This would usually include past trends as well as likely future developments. It might, for example, track changes in forest cover, document the spread of agriculture and abstraction of water for irrigation, and show how shifts in demography and consumption patterns have affected the demand for land and natural resources.

It is also important to examine how the groups that use and manage ecosystem services are changing, and how use and management patterns are being transformed. For example, is ongoing urbanisation leading to a much larger number of beneficiaries depending on water quality and water flow services, and at the same time resulting in a sharp rise in the demand for food and construction materials? Are shifting lifestyles, aspirations and earning power reducing the demand for fuelwood, wild foods and traditional medicines? Trend analysis also involves assessing how human activities and other forces are affecting the status of ecosystems and their ability to generate services. Is afforestation and sustainable farming improving the capacity of a watershed forest to protect downstream water supplies, for example, or are there signs that the expansion of housing and other infrastructure may encroach into a wetland area that is important for flood attenuation?

This leads to an *analysis of the drivers of ecosystem service change (3).* Conclusions will be drawn about why ecosystem changes have occurred or will arise in the future. The question of who is responsible for these changes, and *who has been impacted or will be affected by them (4)* will also be addressed. This will highlight the groups and activities that are responsible for maintaining (or degrading) ecosystem services, and the motivations or underlying forces that cause them to behave in a certain way.

Having collected these four types of information, the data can then be synthesised and recorded in a form that can be used in subsequent steps of the IES process. → *Table 2.3 (on page 52)* provides a format for doing this. Each row refers to an ecosystem service, which is in turn linked to the specific site or ecosystem that generates it. The columns then record the current condition of the ecosystem service and likely future trends in demand and supply, and summarise what the direct drivers and underlying causes of change are in the scenarios of future development and who or what is responsible for them.

RECOMMENDATIONS:

- There are a number of challenges in assessing the supply of ecosystem services in relation with their characteristics (for example how they flow over time and space, and whether there are any incompatibilities between different types of uses).
  Please consult → *Annex 3.*
- Consult at least one expert per priority ecosystem service.
- Consider hosting a meeting in which a number of people with specialised knowledge, experience or interests in the ecosystem services under scrutiny share information and react to each other's perspectives.
- Consult local experts.
- It is important to be explicit about the assumptions made about links between ecosystem status, the provision of ecosystem services and human wellbeing. Every effort should be made to build a good evidence base regarding causality, sustainability, thresholds and uncertainty. Assumptions should be explicitly stated.
- Remember that the IES approach is not intended to be a detailed academic or research exercise. It is a planning tool, geared towards generating practical and policy-relevant decision-support information.

Table 2.3: Matrix for recording ecosystem services conditions, trends, drivers of change & stakeholders

Ecosystem service	Ecosystem(s) that generate(s) the service	Current condition of ecosystem service ++ *very good* + *good* - *bad* -- *very bad*	Trends (going up, stable or going down) ↗ → ↘		Drivers of change and underlying causes	Stakeholders and actions (related to the drivers of change) and/or other motivations
			Supply	Demand		

Based on the information on ecosystem service conditions, trends and drivers, it will be possible to identify where trade-offs may occur. → *Annex 3* gives examples of ecosystem service trade-offs which can be used to guide this analysis. Assessing trade-offs will help you identify the stakeholders that will likely win or lose if the quality or quantity of ecosystem services changes.

Resource needs and suitable methods & tools

- The type of biophysical data to be collected will of course depend on the ecosystem services that are being assessed. Land cover and land use data are the most common input for ecosystem assessments. Other information might for example include natural resource production and consumption statistics (e.g. timber, fuelwood or fisheries); agricultural areas, yields and farm budgets; hydrological models of water supply and consumption; projections of flood and drought incidence, severity and impact zones; information about biological diversity, species populations and trends.

- Additionally, it will almost always be necessary to source basic information about the stakeholders that manage ecosystems or influence ecosystem management. This typically includes data on social and institutional organisation, diversity and differentiation, population and demography, livelihoods and income, socioeconomic differences among various groups.

- Both biophysical and socioeconomic information can usually be obtained in many different forms and from many different sources, such as maps, surveys, inventories, geographic information systems, databases, official statistics and technical papers. They may be held in government records, 'grey literature' produced by projects and researchers, academic journals and papers, libraries, online databases and so on. Expert advice and stakeholder consultation also provide a rich source of information, especially where documented data are scarce.

- It is usually necessary to allocate resources to conduct a study or a literature review. Although in most cases primary data collection is not necessary, and secondary sources will suffice, some form of additional consultation or field study may be required to fill the gaps in available information.

- Expertise on how to process and interpret both biophysical and socioeconomic data is vital. It is relatively easy to collect information – but much harder to make sense of what it means and how it relates to the policy issue or decision-making process that is under consideration.

In recent years the number of tools and methods for assessing ecosystem services has risen steeply. → *Annex 4* summarises some of the most commonly used methods. The following publications and websites provide orientation and guidance *(see next page).*

In the ValuES - Integrating Ecosystem Services into Policy, Planning and Practice website *http://www.aboutvalues.net* you can find the following useful information.

- Methods navigator
- ValuES Publication on Increasing the Policy Impact of Ecosystem Service Assessments and Valuations - Insights from Practice
- ValuES Synthesis Report of ES Assessments
- ValuES Report: Indicators for Managing Ecosystem Services - Options & Examples

IPBES – Catalogue of Assessments on Biodiversity and Ecosystem Services:
http://catalog.ipbes.net

Sub-Global Assessment Network (SGAN):
http://ecosystemassessments.net

Mapping and Assessment of Ecosystems and their Services (MAES) (2013). An analytical framework for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020. Discussion paper:
http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/pdf/MAESWorkingPaper2013.pdf

Haines-Young R.H. and M.B. Potschin (2009). Methodologies for defining and assessing ecosystem services. Final Report, JNCC:
http://www.nottingham.ac.uk/cem/pdf/JNCC_Review_Final_051109.pdf

Ash N. et al. (2011). Ecosystem and human well-being: A manual for assessment practitioners. WCMC/UNEP.
http://www.unep-wcmc.org/resources-and-data/ecosystems-and-human-wellbeing--a-manual-for-assessment-practitioners

Elmqvist T. et al. (2011). Managing trade-offs in ecosystem services. Environment and Development. Paper 4:
http://www.bioecon-network.org/pages/UNEP_publications/04%20Managing%20Trade-offs.pdf

WCMC (2014). Measuring ecosystem services: Guidance to develop ecosystem services indicators.

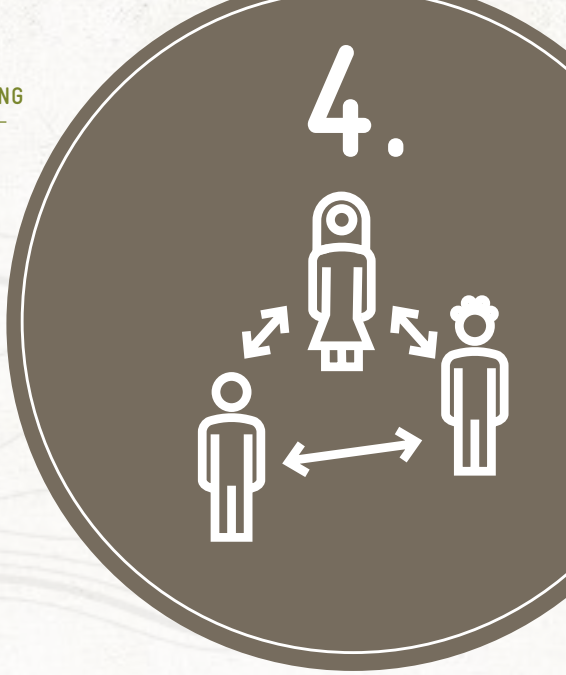
Case example

Step 3: Mapping ecosystem services for land use planning in Duque de Caxias, Brazil

In recent years the municipality of Duque de Caxias has been experiencing clean water scarcity, intense urban heat waves, and severe floods and landslides. The municipality lies within the state of Rio de Janeiro and borders the metropolitan area of the city of Rio de Janeiro. It has an area of approximately 470 km² and nearly 900.000 inhabitants. The municipality´s Department of Urban Planning mapped key ecosystem services with the ultimate aim of updating the city´s land use zoning within urban and rural landscapes. The IES approach was used as the basis of this study to ensure a proper integration of ecosystem services into policy.

In mid-2015, order to define the scope of the study **(Step 1)**, the Department hosted a workshop with several other city´s Departments –Environment, Risk Management, Health, Tourism, Culture and Education- where the concept of ecosystem services was introduced and the studies objective was set: design ecosystem-based measures to secure the sustained provision of ecosystem services for the municipality´s population and their productive activities. With the help of an online questionnaire, the meeting´s participants then prioritized the nine most important ecosystem services (**Step 2:** *Screening and Prioritizing)*. After this, experts in-charge of steering the initiative assessed ecosystem services conditions, trends and trade-offs **(Step 3)** via 27 interviews with local citizens, experts and decision-makers. The result was the creation of nine thematic maps where each ecosystem service´s supply and demand was represented for different kinds of land uses and land cover. The appraisal of the cultural and institutional framework **(Step 4)** was an integral part of the entire process, as it was crucial to reflect local perceptions of ES values, expected tendencies and perceived supply and demand patterns. These maps will help the Department of Urban Planning to develop a new land use plan, manage land use conflicts, and discuss different scenarios for resilient and sustainable urban development **(Steps 5 and 6).** Ultimately, the goal is to enhance productive activities while preserving key natural capital.

STEP 4: APPRAISING THE INSTITUTIONAL AND CULTURAL FRAMEWORK



Step 4 complements the information that has been gathered in Step 3. It appraises institutional, policy, legal and cultural characteristics, and identifies the resulting incentive structures regarding ecosystem services and the development plan. These factors mediate and influence how people manage, use and impact on ecosystems and their services, and may act as drivers of either positive or negative ecosystem change.

Rationale for this step, objectives and expected outcomes

Ecosystem **governance** is almost always a complex issue. Ecosystems are rarely subject to one form of management or regulation that is clearly enforced and understood by everyone. More commonly, a variety of formal and informal, "modern" and *traditional*, private and collective systems coexist. Many ecosystem services also have at least some of the characteristics of *public goods*, meaning that people cannot necessarily assert unambiguous ownership rights over them, or be excluded from using or benefiting from them. These circumstances and characteristics set the context and rules within which ecosystems are managed and used (and which drive people to degrade or conserve them). Understanding them is therefore fundamental to identifying policy responses that can address the identified drivers of ecosystem change, during the next stage of the IES process **(Steps 5 and 6)**.

Objectives

The main objectives of **Step 4** are to understand how different stakeholders' interests, rights and values determine the way in which they depend or impact on ecosystem services. The aim is to identify the factors that shape people's behaviour and actions. The extent to which institutional, policy, legal and cultural characteristics encourage or discourage ecosystem conservation and sustainable management is of particular concern. It is also important to consider the way in which people's different interests, rights and values may stimulate conflict or cooperation in ecosystem use and management.

Expected outcomes

- List of key institutional, policy, legal and cultural characteristics and the resulting incentive structures (that influence how people manage, use and impact on ecosystems and their services).
- Identification of underlying causes and drivers of ecosystem degradation.
- Overview of stakeholders' positions, interest, needs, values and rights.
- Information on existing and possible areas of conflict or cooperation relating to ecosystem use, management and incentives.
- Understanding of underlying incentives and disincentives (rules, laws, prices, rights and so on) associated with the drivers of change analysed in **Step 3** *(→ Table 2.4 which highlights the last two columns of →* *Table 2.3 from Step 3 (page 52):*

GOVERNANCE…

…is the body of rules, enforcement mechanisms and corresponding interactive processes that shape people's behaviour (Huppert, Svendsen & Vermillion 2003)

- Governance is about social interactions, decisions, and how we make and enforce them.
- It is about the exercise of authority and about being in charge.
- It deals with who is responsible, how they wield their power, and how they are held accountable.
- It relates to decision-makers at all levels: government ministers, managers, business people, property owners, farmers and consumers.

Source: UNDP, WB and WRI (2004)

Table 2.4: Step 4 links underlying causes of ecosystem change to stakeholder actions and motivations

Ecosystem service	Ecosystem(s) that generate(s) the service	Current condition of ecosystem service	Trends (going up, stable or going down)	Drivers of change and underlying causes	Stakeholders and actions (related to the drivers of change) and/or other motivations

How to do this step

A good starting point in evaluating institutional, policy, legal and cultural characteristics is to conduct a review of existing literature, including official records (such as laws, regulations, policies, agreements, etc.). Official sources will, however, usually focus on formal regimes. They will typically present only limited information about actual ecosystem governance arrangements. For this reason, it is important to search for anthropological, sociological and political economy studies which present a more in-depth (and often more realistic) description of a given situation.

Equally, if not more, important, will be the perceptions and insights of ecosystem managers and users themselves. It is important to note that this information is often not documented. It may include traditional knowledge and oral history. Learning about these aspects will require face-to-face interviews and discussions, and often involves some kind of stakeholder analysis. These methods are an important means of obtaining information about the de facto situation on the ground, in terms of the principles and rules that actually govern ecosystem access, ownership, management and use, as well as the extent to which de jure institutions, laws and policies are effective.

Much of the most valuable information in **Step 4** will therefore be based on achieving an understanding of *qualitative aspects of institutions, organisations and actors*, and will consider stakeholders' relative power, positions, interests, needs, rights and values. This will also assist in learning more about distributional issues. Many different stakeholders typically depend and impact on ecosystem services. They will have varying – and possibly even conflicting – needs and interests, and may not all share equal influence and power. **Step 4** should seek to identify major sources of inequity, as well as tracking how different groups participate in and are affected by decision-making processes. Stakeholder maps and other visual tools can be useful for assessing the main groups that need to be considered in the process. This can also help to identify the groups and individuals that are excluded from institutional, policy and regulatory

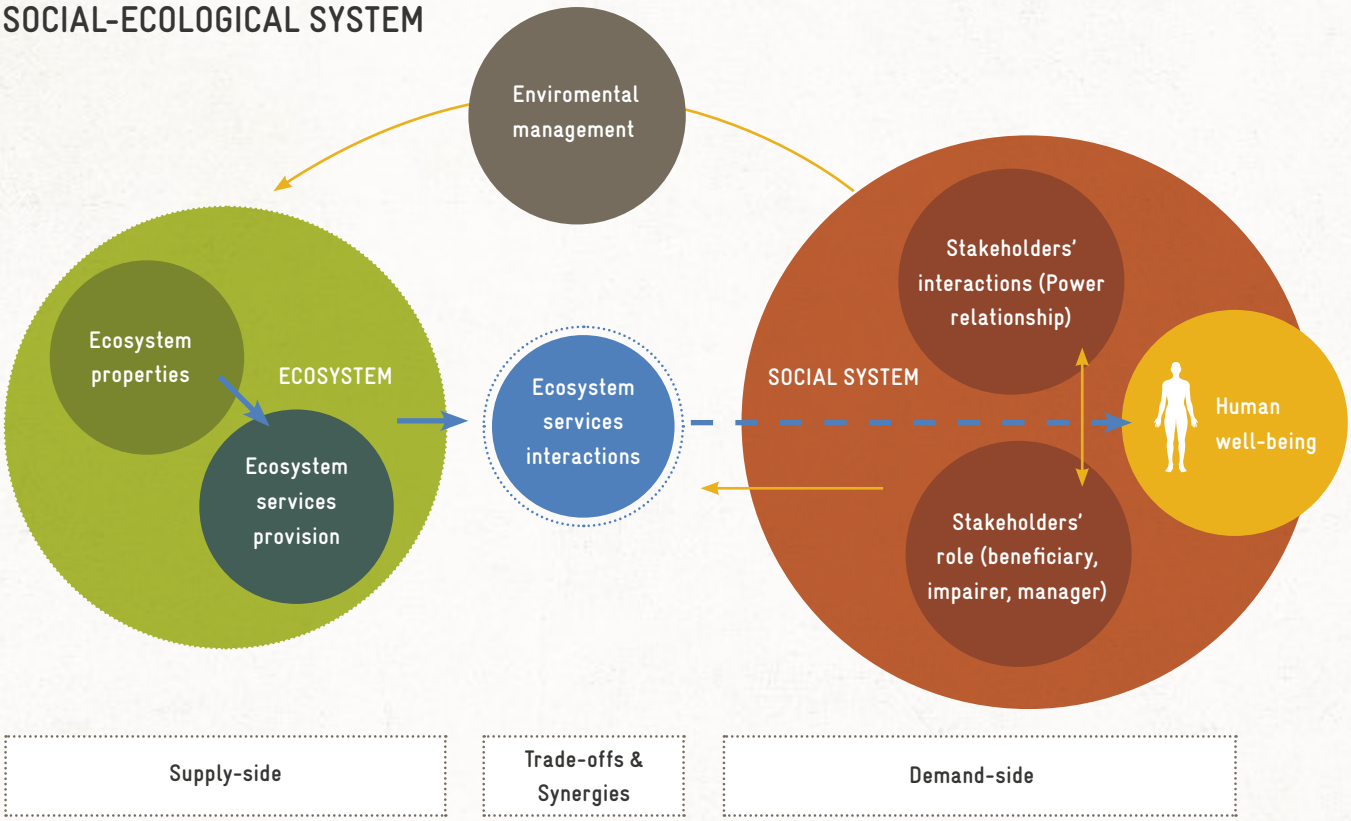
RECOMMENDATIONS:

- Your analysis should encompass how institutions, policies, regulations and cultural norms function in practice, in terms of governance and equity.
- Institutional, policy, legal and cultural frameworks include both customary and government authorities and laws, as well as formal and informal institutions, rules, practices and belief systems.
- A wide range of incentives should be considered, including de facto and de jure rights, markets, prices, taxes and subsidies that relate to ecosystem services, and the lands and resources that generate them.
- Try to work out the difference between what is on paper, and what is actually going on.
- Think about things like elite capture, inequities, control of decision-making by particular groups, corruption, etc. In other words, the real-world factors that modify and influence how decision-making works.
- Even if the assessment process cannot go into too much detail- it needs to identify and highlight some key factors.
- Link the information you obtain with the drivers of change identified in **Step 3** so as to complete the whole picture.

arrangements. This is an important exercise. Failing to identify these groups could mean marginalising still further some of the poorest and most vulnerable sectors of society. → *Figure 2.3* displays the links between the social and the ecological systems within the ecosystem services framework.

It emphasizes the power relationships that permeate stakeholder interactions and ultimately affect the demand of ecosystem services.

Figure 2.3: Stakeholder relationships and ecosystem services



Conceptual framework of the interactions along the flow of ecosystem services from the supply-side to the demand-side and human well-being. Blue arrows represent the flow of ecosystem services. Yellow arrows denote interactions within or from the social system.

Source: Felipe-Lucía M. et al. (2015).

The TEEB Initiative explains the interconnection of ecosystem services and the flow of benefits as public, collective or private as follows:

> You should be aware that ecosystem services are interconnected and that most of the time they are a mix of private, public and collective benefits. (...) In some countries, water flowing from a forest spring is considered private, but what of the enjoyment hikers experience when they stop for a rest by the river? What about the ground water recharge capacity further down in the valley? What about regional climate regulation due to the forest's evapotranspiration? (...) The focus on ecosystem services permits to clarify who has what right to nature. It is also important to realise who is dependent on which ecosystem services and who have formal and informal rights. Supporting, regulating and cultural services are less visible and tangible and therefore have mainly the character of public or common service and de facto occur mostly an open access situation, where is difficult to control the way people access, use and impact them. However, public and collective services play a significant role by contributing to human well-being and society's welfare. Trees in cities improve temperature regulation and reduce air pollution. This benefits everyone. If an ecosystem service is not recognized as a public benefit ('greenbelts', for example), there is a risk that it will deteriorate (TEEB for Local and Regional Policy Makers 2010).

Social, economic, policy, institutional and governance conditions also influence people's behaviour, because they shape the opportunities and constraints that they face as they go about their day-to-day business. An overview of these different kinds of **incentives** can help to identify the factors that are most influential in determining how people are encouraged, enabled, empowered or even required (or not) to use and manage ecosystem services.

The following incentives tend to exert the most important influences on ecosystem management and use (adapted from Emerton 2000 and GTZ 2004):

1. Market-oriented incentives are measures that have an impact on market actions and opportunities - generally transferred by way of prices and markets. Examples are user charges, eco-labelling and payments for ecosystem services.

2. Fiscal incentives are measures that seek to change or influence the prices that people pay or receive for goods and services, or raise public revenues. They operate through public budget transfers. Examples are taxes, subsidies and low-interest credit.

3. Regulatory incentives are measures that regulate and stipulate legal conditions, codes of social interaction (who may do what under which conditions). Examples are laws, environmental standards and access restriction.

   - Property rights are a special category of regulatory instrments, which allocate rights to own, use or manage biodiversity, ecosystems, land, resources or other assets and services. Examples are ownership, management, access, usufruct and sale rights, or arrangement such as leases, concessions, licences, permits and franchises.

   - Cultural and social norms operate through setting and sanctioning generally-accepted standards or codes of behaviour and conduct, and are generally enforced through social and peer control rather than through formal regulations. Examples include religious edicts, patterns of *acceptable* behaviour, taboos and restrictions.

4. Cooperation includes measures that motivate changes in resource management by involving interest groups in the decision-making and governance process. Examples are roundtables or alliances.

5. Information-related incentives are measures such as those that make external effects visible and in so doing, provide information about the actual benefits and costs of certain management techniques. Examples are audits, labelling and certification and information and measuring systems. It is important to bear in mind that the nature and effectiveness of incentives depend on a number of factors, including:

   - Features of the ecosystem services: Is it possible to control access to an ecosystem service and exclude others, and is there any rivalry in consumption?

   - Characteristics of the stakeholders: What are their positions, rights, interests, values and needs?

   - Structure of land and resource governance: Who owns or has rights to use, manage, benefit, trade in or otherwise exploit/control ecosystems and the services they generate?

   - Nature of rules or social coordination among stakeholders: How do rules work? Are they legitimate? How are they enforced, and what kind of incentives do they create?

INCENTIVES...

are factors that motivate human behaviour. They can be positive and foster certain behaviour, but they can also act as disincentives and deter people from doing something. Incentives can be material (e.g. financial or to do with gaining additional products or benefits), but are often also non-material (e.g. cultural, informational, moral or acquiring improved knowledge, status or satisfation).

→ *Annexes 3 and 5* provide more information about these topics. Please also consult the manual "Natural Resources and Governance: Incentives for Sustainable Resource Use" (GTZ 2004): *http://agriwaterpedia.info/wiki/File:GIZ,Fischer,A.,-Petersen,L.,Huppert,W.(2004)_Natural_Resources_and_Governance_Incentives_for_Sustainable_Resource_Use.pdf*

→ *Table 2.5 on page 60* provides a simple framework for recording the results of the stakeholder analysis and appraisal of institutional and cultural frameworks that will have been carried out in **Step 4**. Presenting information in this summary form offers a very useful way of checking at a glance how different governance factors and conditions serve to encourage or discourage ecosystem service dependencies and impacts for different groups.

Table 2.5: Matrix for recording stakeholder analysis results

Stakeholder	Why do they act the way they do		Level of power	Level of influence	Relationships among stakeholdersa	
	Position	Interests/ needs	High (H), medium (M) or low (L)	High (H), medium (M) or low (L)	Possible alliances	Possible conflicts

Resource needs and suitable methods & tools

- Data and information on stakeholders and institutions that directly or indirectly influence ecosystem management.
- Data and information on the legal and cultural characteristics of ecosystem management.
- Expertise in social sciences and institutional analysis.

The following websites and publications provide additional orientation:

Method profile on identification of stakeholders in the ValuES Methods Inventory:
http://www.aboutvalues.net/method_navigator/

Bromley W. (1992). Making the commons work: Theory, practise and policy. Institute for Contemporary Studies Press. San Francisco, California:
http://library.uniteddiversity.coop/Cooperatives/Multi-Stakeholder_Co-ops/Making_the_Commons_Work-Theory_Practice_and_Policy.pdf

BiodivERsA Stakeholder Engagement Toolkit (2013): http://www.biodiversa.org/702

DEFRA (2011). Participatory and deliberative techniques to embed an ecosystems approach into decision making: An introductory guide.

Felipe-Lucía M. et al. (2015). Ecosystem services flows: why stakeholders' power relationships matters:
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0132232

GTZ (2007). Multi-stakeholder management: Tools for stakeholder analysis:
10 building blocks for designing participatory systems of cooperation:
http://www.fsnnetwork.org/sites/default/files/en-svmp-instrumente-akteuersanalyse.pdf

Hanna S. and M. Munasinghe (1995). Property rights and the environment - Social and ecological issues.
The Beijer international Institute of Ecological Economics and the World Bank:
http://elibrary.worldbank.org/doi/abs/10.1596/0-8213-3415-8

Mayers J. (2005). Stakeholder power analysis, IIED:
http://www.policy-powertools.org/Tools/Understanding/docs/stakeholder_power_tool_english.pdf

OpenNESS Project: Operalisation of Natural Capital and Ecosystem Services:
http://www.openness-project.eu/library/reference-book/sp-stakeholder-involvement

Ostrom E. (1999). Self-government and forest resources. Occasional Paper No 20.
Center for International Forestry research. CIFOR. Sindangbarang, Bogor.

Schmeer K. (1999). Stakeholder analysis guidelines. Policy Toolkit for Strengthening Health Sector Reform,
Abt Associates, Inc., Bethesda, MD, USA: http://www.who.int/workforcealliance/knowledge/toolkit/33.pdf

Case example

Step 4: Appraising the cultural and institutional framework in Taï National Park, Côte d'Ivoire

Ivory Coast's Taï National Park (TNP) covers an area of 536.000 ha. TNP is recognized as a UNESCO world heritage site, as a biosphere reserve. It is the largest remaining intact primary rain forest in West Africa, a region that has witnessed rapid deforestation over the past decades. PNT is exceptionally well conserved due to effective management and donor involvement for more than 20 years. But the funding model is not sufficient anymore. This is why the **national Protected Area Agency** (OIPR), together with its partners and the **German International Cooperation** (GIZ), decided to adopt an ecosystem services perspective for supporting Ivorian fundraising efforts.

Three workshops were conducted where different stakeholders were represented, including local and regional government, national level ministries, the agricultural sector, national and international company interests, NGOs and academia. The first three IES-steps were used to create a common understanding for the ecosystem services the TNP Park provides to Cote d'Ivoire in general and the South-west region in particular. Scenarios were developed that contrasted the likely consequences of insufficient funding to a situation where park management would be adequately equipped and funded. Ecosystem services that were particularly important for economic activities at both local and national levels were identified.

The **fourth step** of IES was then used to identify target audiences for the results of an ecosystem services assessment launched through the process. Different stakeholders were identified in workshops. It was decided that the study results should be used to target two groups in order to raise awareness for additional support to the Tai Park's financial situation. These two groups were the national government and the private sector. The reason for this is that it was envisaged that these two groups would be the primary target of efforts to mobilise additional funding for conservation, due to their special dependence on the services of the National Park. The government has both a mandate and a strong motivation to ensure that Taï's economically valuable services are maintained for public interest and national development reasons. Meanwhile, the cacao sector (which dominates agricultural production around the National Park, and at regional and national levels) depends heavily on the pollination and microclimatic regulation services provided by natural forest. The stakeholder analysis helped to target the ecosystem service assessment and develop communication materials that fit the target audience.

STEP 5: PREPARING BETTER DECISION-MAKING

Step 5 summarises and analyses the information that has been gathered in the previous steps. Based on this information, risks and opportunities for the development plan are investigated. It suggests policy options which can serve to maintain or increase the flow of ecosystem services, and identifies suitable entry-points for guiding or influencing decision-making.

Rationale for this step, objectives and expected outcomes

Steps 1-4 of the assessment process will have provided information about the linkages between the development plan and ecosystem services, and described how different stakeholders stand to gain or lose as a result of ecosystem change. They will also have described the main causes or drivers of ecosystem degradation and loss, and the frameworks and incentives that govern how ecosystems are used and managed.

On the basis of this understanding, **Step 5** now involves establishing the main risks and opportunities that ecosystem services pose to the development initiative or plan. It identifies policy options to manage these risks, capture these opportunities and address the drivers of ecosystem change. **Step 5** also recommends suitable entry-points for guiding, changing or otherwise influencing decision-making processes.

Objectives

The main objective of **Step 5** is to come up with practical, workable policy measures and instruments that can serve to ensure that the risks that development activities pose to ecosystem services are avoided or mitigated, and the development opportunities that ecosystem services offer are captured.

Expected outcomes

- Analysis of risks and opportunities associated with the development plan.
- Shortlist of policy-options and corresponding entry-points into decision-making.
- Communications messages on policy options.

How to do this step

The first stage of preparing for better decision-making is *to bring together all the information that has been collected in* **steps 1-4** *(1).* Start by reviewing the impacts and dependencies of the development plan on ecosystem services, take a look again at trade-offs and reconsider the institutional, policy, legal and cultural frameworks and incentives. Make sure that you have a clear logic chain which links together information on these different topics into a coherent *story* about the development plan and the ecosystem services you are concerned with. At this point, some gap-filling may be required, if data is missing or incomplete, or if you realise that key opinions or stakeholders have not had a chance to input properly into the process.

Next, use this information to *identify the development risks and opportunities that arise from ecosystem services (2).* While doing this, also think about any positive or negative trade-offs that may result from the effect of the development plan on ecosystem services, and consider who or what might be affected by these. Remember that trade-offs may involve

- monetary gains or losses (such as changes in physical expenditures or profits) and other economic benefits or costs (for example changes in crop yields, fisheries productivity, health or nutritional status), and

- changes in people's non-material circumstances (for instance greater empowerment for women, alienation of indigenous groups' cultural heritage, better inclusion of the poor in decision-making processes).

Decide if the development plan needs to be revised, so as to minimise, avoid or mitigate these risks or capture these opportunities. At this stage, you may want to consider whether there is a need to carry out *economic and or social/cultural valuation (3).*

As described in Part I of these guidelines, the concept of value is multi-dimensional – and so valuation may take many different forms. For example, economic valuation can provide information on both the monetary and non-monetary costs and benefits associated with the development plan and ecosystem services in terms of on economic indicators such as income, production, employment or the incidence of poverty. A social or cultural valuation will consider the value of ecosystem services according to what different groups perceive to be important in terms of their own preferences, principles, belief systems and world-views.

The main reasons for using valuation are

- to provide additional evidence and arguments to convince decision-makers of the need to modify the development plan or to utilise policy instruments,
- to represent the interests of particular groups, or consequences for them, which might not otherwise be taken into account, and
- to generate any additional (quantified) data that may be needed for designing, planning or evaluating policy instruments, or to compare policy options.

It should, however, be emphasised that valuation is not always required, or necessarily useful, in all cases. If you do decide that some kind of valuation exercise is needed, its purpose, target group and focus should be clearly elaborated. A great deal of guidance already exists on how to conduct the economic valuation of ecosystem services, and there is a growing (although still small) literature on non-monetary, social and cultural valuation. → *Annex 4* gives further details of these. *The ValuES website provides useful background information and a methods navigator as well as case studies: http://www.aboutvalues.net*

The "Preliminary guide regarding diverse conceptualization of multiple values of nature and its benefits, including biodiversity and ecosystem functions and services" developed by IPBES also offers a key resource.
→ *http://www.ipbes.net/sites/default/files/downloads/IPBES-4-INF-13_EN.pdf*

Additionally, you can find a summary for practitioners of the IPBES multiple values guide on the ValuES website:

→ *http://www.aboutvalues.net/data/ipbes/ipbes_values_of_nature_en.pdf*

On the basis of the risks and opportunities identified (and, if a valuation exercise has been carried out, information on values), it will now be possible to *define what needs to change in order to reduce the negative ecosystem impacts* of the development plan and maximise its positive synergies *(4)*. Think again about the main stakeholder groups that are affected by or drive changes in ecosystem services, and go back to the main causes of ecosystem degradation. Try to figure out how it might be necessary to change stakeholders' behaviour and actions so as to maintain the flow of ecosystem services, or better capture the opportunities associated with them. Remember to refer back to the development goals and outcomes that the plan you are assessing aims to achieve.
The changes you seek to set in place should always contribute towards these goals.

The process of preparing better decision-making concludes with the *appraisal of policy options and* ***entry points*** *into decision-making processes (5).* A detailed list of policy options for integrating

ENTRY POINTS…

refer to windows of opportunity to guide, influence or change decision–making. They may occur at any level of governance, and are situations or processes that help gain the interest of policy makers, important stakeholders or the broader public for the importance of ecosystem services. For example, they may relate to:

- Fulfilling already-agreed goals, prior commitments or the needs of stakeholders.
- Supporting or furthering the positions, interests and needs of decision makers.
- Addressing issues that mobilize public opinion, civil society or businesses.
- Resolving conflicts over ecosystem services.
- Making explicit *untouchable* societal values and beliefs.
- Empowering social movements or new players in a political context.

ecosystem services is provided in the → *Annex 6*, including some real-world examples. Some key points to bear in mind include:

- Analyse which instruments or policy changes could be used to minimise, avoid or mitigate risks and capture opportunities for ecosystem services or development outcomes.
- Review the range of policy options that are available to you, and choose those that will most effectively sustain the capacity of ecosystem services to meet people's needs.
- Choose measures and instruments, wherever possible, that have already been proven to be effective in relation to ecosystem services and development impacts, and to the institutional and cultural setting in which you are working. Make use of any windows of opportunity that are associated with public opinion, political and social conditions or market developments.
- Develop new policy tools and instruments, if appropriate in some cases, so as to fill key gaps in existing frameworks. For example, there may be needs and possibilities to develop novel markets, tax incentives, benefit-sharing arrangements or governance structures. Think about the feasibility of these changes.
- Pay particular attention to distributional and equity issues: take into account the needs of the poor and vulnerable groups when you identify and select potential policy options and instruments.

However, most often, making relatively small changes to existing policies (including overcoming existing distortions and failures) can leverage substantial improvements in the way in which markets, laws and institutions work in relation to ecosystem services. In almost all instances a mix of policy instruments is required, which target different issues and stakeholder groups and work together to achieve a given set of objectives or desired outcomes.

While some of these aspects will require technical review and analysis, much of the information required to prioritise policy options and entry points into decision-making can be generated through stakeholder dialogue. It is particularly important to involve the target groups that are or will be affected by the development plan and the proposed policy instruments, and those who are responsible for making the decisions that will enable the selected instruments to be delivered.

→ *Table 2.6* provides a framework for summarising and recording policy options and entry points.

Once a list of possible policy options and entry points into decision-making has been developed, it is possible to assess their viability and feasibility. This shows their *fit* with the local conditions and context in which they are expected to operate, and with the development initiative under consideration. They can then be *prioritised into a shortlist for actual implementation (6).* This is considered further in **Step 6**.

Table 2.6: Matrix for identifying policy options and entry points into decision-making processes

Development goal or measure	Related risks and opportunities	What do we want to change? Drivers to tackle	New/different policy option(s)	Entry points into decision-making (including possible alliances with key stakeholders)

Resource needs and suitable methods & tools

- Facilities to organise meetings and/or a stakeholder workshop, a moderator.
- Expertise in the field of political science, public policy and associated disciplines.
- Agreed list of criteria for selecting policy-options.
- Optional: Expertise in economic and or social/cultural valuation of ecosystem services.

The following publications and websites provide orientation and guidance:

ValuES - Integrating Ecosystem Services into Policy, Planning and Practice

- Methods navigator
  http://www.aboutvalues.net/method_navigator/

- Increasing the policy impact of ecosystem service assessments and valuations - Insights from practice (2016):
  http://www.aboutvalues.net/data/about_values/increasing_impact_of_es_assessments.pdf

Rode J. et al. (2015). Capturing ecosystem services opportunities: A practice oriented framework for selecting economic instruments in order to enhance biodiversity and human livelihoods. UFZ Policy papers:
https://www.ufz.de/export/data/global/65816_DP_03_2015_RodeEtal_ESOpportunities.pdf

IPBES (2015):

- Work on policy support tools and methodologies:
  http://www.ipbes.net/sites/default/files/downloads/IPBES-4-12_EN.pdf

- Diverse conceptualization of multiple values of nature and its benefits, including biodiversity and ecosystem functions and services (preliminary guide).
  http://www.ipbes.net/sites/default/files/downloads/IPBES-4-INF-13_EN.pdf

Case example

Step 5: Economic valuation of Cat Tien National Park, Viet Nam

The study on the economic value of **Cat Tien National Park** (CTNP) was carried out in 2013. The overall goal was to generate information to assist the Department of Nature Conservation to justify protected areas as an economically beneficial use of public lands, resources and funds. The specific objective was to strengthen the economic case for conserving nature in the Cat Tien landscape, at the same time as providing an opportunity to develop, test and apply practical and policy-relevant methods for ecosystem valuation that can be adapted and used in other protected areas in Viet Nam.

The study followed **four iterative steps**, each aiming to answer a specific question. The **first step** –identifying and describing ecosystem services– asked: what types of services do CTNP's biodiversity and ecosystems generate? The **second step** –assessing ecosystem service-economic linkages– asked: how are these ecosystem services linked to economic production, consumption and wellbeing? **The third step** ¬–estimating ecosystem values and beneficiaries– asked: how much are ecosystem benefits worth, and to which sectors and stakeholders? The **fourth step** – demonstrating the economic consequences of ecosystem change – asked: what are the economic benefits of conservation and economic costs of ecosystem degradation?

The study valued five categories of ecosystem services that were considered to be of the greatest importance in economic and human wellbeing terms in and around CTNP: wood and non-wood forest products, water flow and quality regulation, carbon sequestration, pollination and seed dispersal, nature-based tourism, recreation and education. One or more valuation method was applied to each, selected according to what was most feasible and appropriate in technical terms, within the scope and resources available to the study and –most importantly– according to the availability of data for valuation. These included market price, surrogate market price, stated preference, cost-based methods, production function and benefit transfer techniques.

A second feature of the study's methodology was that it was dynamic. Coming up with a single, snapshot figure of "the economic value of CTNP" had little meaning. The National Park has value because it serves to secure, protect and sustain important biodiversity and ecosystem services that would otherwise be degraded and lost. It is therefore the impact of changes in the flow of ecosystem services over time which has meaning for conservation and development policy, planning and management. In order to generate these figures, the study first assessed the baseline: it identified the ecosystem services that are currently being generated in the CTNP landscape, and estimated their economic value. It then modelled the changes in land use and land cover that would occur over the next 25 years if the CTNP landscape were to revert to an unprotected status. The difference represents the economic value-added and/or costs avoided that are associated with maintaining Cat Tien as a National Park into the future. Incremental annual values (value added/cost avoided as compared to the baseline) were calculated for each ecosystem service, and for the National Park and buffer zone as a whole.

The study found that CTNP's ecosystem services generated economic goods and services worth VND 1,091 billion (US$ 51.6 million) in 2012. The direct income generated from the utilisation of forest land and resources accounted for only around 6% of this value. By far the largest share (almost two thirds) came from the regulating and supporting services that help other sectors to avoid costs and damages (through the protection of settlements, farms, infrastructure and other production processes, as well as via the mitigation of global climate change). Just over a quarter of the total is accounted for by the value added by ecosystem services to production in other sectors, most notably agriculture and tourism. The decline in ecosystem values that would occur under an "unprotected landscape" scenario makes it clear that maintaining the conservation status of CTNP implies considerable economic value-added and costs avoided. The cumulative losses and ecosystem values foregone if biodiversity and ecosystems were not protected via CTNP is estimated to be more than VND 2,255 billion (US$ 107 million) over the next twenty five years.

STEP 6: IMPLEMENTING CHANGE

Step 6 involves developing a strategy to operationalise the policy recommendations generated in step 5. It involves preparing a work plan, as well as a stakeholder engagement and communication strategy for the implementation of concrete measures to integrate ecosystem services into the development plan.

Rationale for this step, objectives and expected outcomes

Having identified policy responses which will assist in managing ecosystem service dependencies and impacts and capture ecosystem opportunities, the **final step** in the IES assessment process is to set up an implementation strategy. This lays out the process, guiding principles and intended outcomes for the policy measures. An operational work plan is developed which sets out tasks, timelines, responsibilities and stakeholder involvement, and shows the financial resources and other inputs that are needed for successful delivery. A plan is also formulated to ensure effective communication and stakeholder engagement. By the end of **Step 6**, you should be ready to commence implementation of the selected policy options.

Objectives

The main objective of **Step 6** is to take the final decisions to enable the implementation of concrete measures to integrate ecosystem services into the development plan under consideration.

Expected outcomes

- Implementation strategy and operational work plan.
- Communication and stakeholder engagement strategy specifying target audience, key messages and possible champions and allies to encourage and operationalise the required changes.

How to do this step

First of all, it is helpful to review the policy measures and entry points that were identified in **Step 5**, so as to be sure that that they are consistent with the objectives of the development plan, and will be acceptable and implementable within the local context. Each policy measure on the shortlist should be appraised to check that it is realistic, achievable and acceptable. Note that this may require comparing the selected instruments and their operational requirements against existing laws and policies, institutional mandates and capacities and resource availability. Sometimes it is also necessary to carry out some kind of more structured feasibility study or cost-benefit analysis before proceeding further. Formal appraisal or approval procedures may even be required, especially if the measure is to be implemented by government.

In almost all cases an extensive process of stakeholder consultation is required. If the selected policy measures and instruments are not acceptable to those concerned, or if decision-makers do not buy into them, then they will stand little chance of success in practice. This is the case even if they have been positively appraised in terms of technical, legal or financial feasibility. Once the final selection of policy measures has been made, an implementation strategy and work plan can be developed. A wide variety of guidance is available on formulating strategies and developing work plans. The details of these processes need not be repeated in this guide. Some key points to include, and bear in mind, are:

- Stakeholder involvement and responsibilities: Establish who needs (or wants) to be involved in implementing the policy measures, and in what way. A stakeholder engagement strategy should be developed. It is also important to have a clear and agreed allocation of responsibilities, specifying who is accountable and in charge of delivering what and when.
- Outreach: Communication, education and public awareness are all vital to the successful integration of ecosystem services into public and private decision-making, so as to transfer information to stakeholders and the general public. The communi-

cations strategy should also contain an active plan for learning from others and for sharing lessons and experiences. Consider who may be the partners in communication and how communication strategies promoting the value of ecosystem services can be delivered.

- Resourcing: Identification of the financial, material, human resource and institutional needs to deliver the selected policy measures will be an integral part of the operational work plan. In many cases, these resources may not immediately be available, or will only be partially available. The work plan may need to allow for the generation of additional resources through activities such as training and capacity-building, the development of new financial mechanisms, a fundraising strategy or plans for organisational change.

- Timing: Choosing the right time to set up a policy instrument can be important. Key circumstances that can help or hinder in this process include: political stability, elections, the timing of the financial year, new government policies and strategies or re-organisation of government departments and institutions. Look for windows of opportunity. The time taken to initiate or revise a development plan and policy instruments should not be underestimated, especially when they depend on participatory processes. At the same time, it is essential that policy measures can be realised in a timely manner. If they take too long to get off the ground, and if environmental, political, legal, social or economic conditions have changed over the intervening period, they may become redundant.

- Adaptive management and learning: It is almost inevitable that adjustments will need to be made in the scope, target and means of delivery of the policy instruments.
  The necessary learning processes, feedback loops and adaptive approaches should be built into the implementation process.

- Monitoring: It will be necessary to track the impacts and effectiveness of the policy measures against agreed targets and indicators. Performance indicators should be "SMART": specific, measurable, achievable, relevant and time-bound. Monitoring should be built into the work plan.

- Information needs and knowledge gaps: The IES approach is a rapid assessment tool. It will not, in most cases, be based on long and detailed primary data collection, or provide a large body of documented material. Knowledge gaps may well remain, which may need to be filled during the course of policy implementation. Information collection and dissemination should form a part of the strategy and operational plan.

RECOMMENDATIONS:

- Political, institutional and community support must be secured to implement policy options successfully and sustainably.
- Find opportunities to build on initiatives that are already under way.
- Consider best practices from other regions and countries.
- Creating a network of partner agencies and interest groups can be a way to strengthen the implementation of the workplan.
- The identified measures and instruments need to be properly resourced and funded. Ideally this should be a part of the overall development plan, but in some cases it may be necessary to secure additional funds or to work through partnerships with others or as part of other initiatives that are already underway.

Table 2.7: Matrix simple work plan

Objective (why)	Activities (what)	Time frame (until when)	Stakeholders/ responsibilities (who)	Challenges	Possibilities to overcome such challenges

Expected outcomes

- Buy-in from decision-makers and key stakeholder.
- Facilities to organize meetings and/or a stakeholder workshop, a moderator.
- Basic planning skills.
- Political buy-in from key decision-makers for the selected policy measures and instruments.
- Financial resources and human capacities to implement the work plan.

The following publications and websites provide orientation and guidance:

Tools4dev. Practical tools for international development:
http://www.tools4dev.org/resources/policy-implementation-matrix-template/

Wageningen UR's Centre for Development Innovation. Knowledge co-creation portal. Multi-stakeholder partnerships:
http://www.mspguide.org/tools-and-methods

Case example

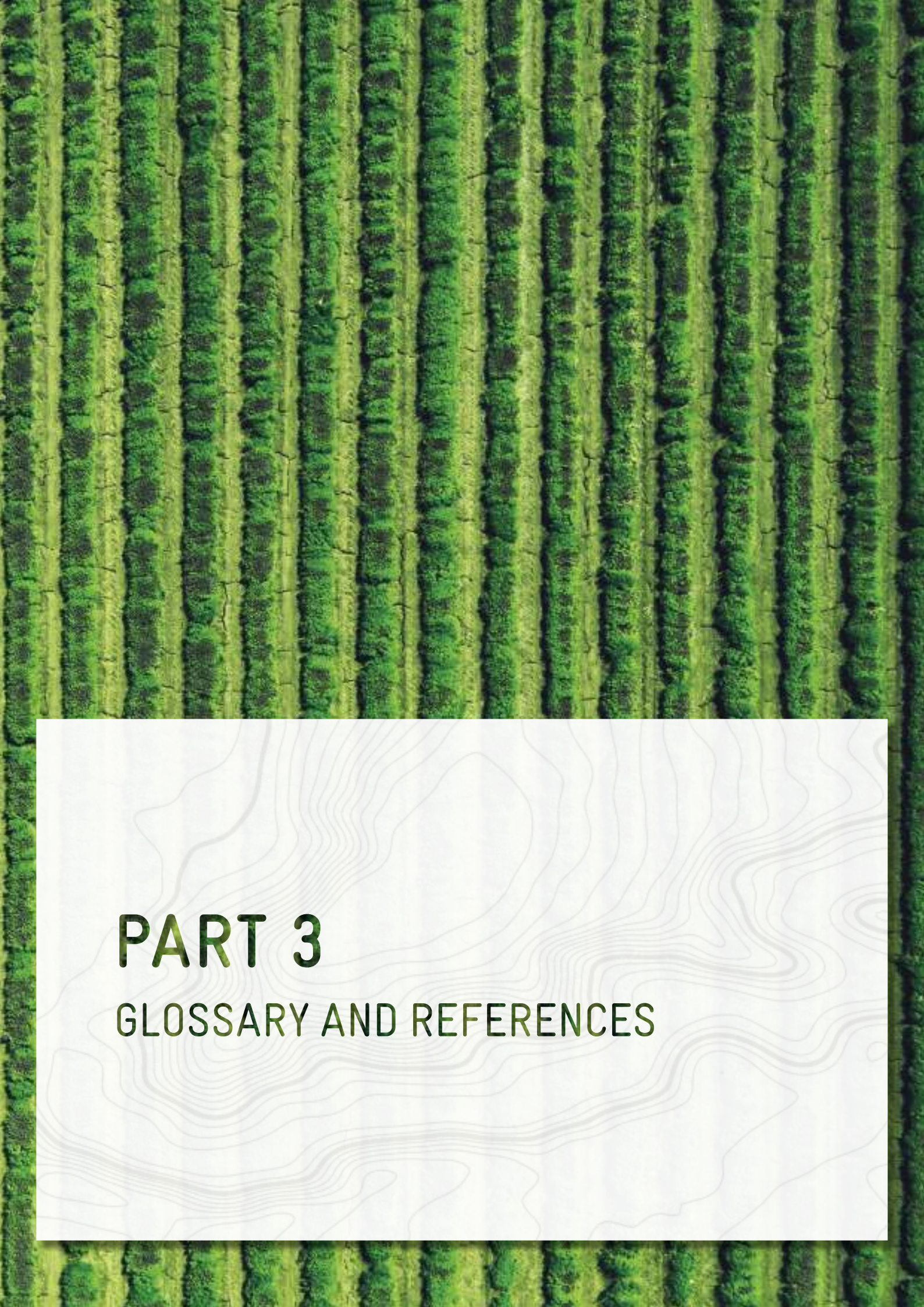
Step 6: Strengthening the management of Pozo Azul, Colombia

The **Regional Environmental Authority of the Norte de Santander province in Northeast Colombia** faced a challenge concerning a popular local natural tourism destination, Pozo Azul. It is a natural area featuring tropical dry forests, waterfalls and clear water ponds. It is threatened due to the inexistence of a visitor management plan. At the same time agriculture and livestock production in the surrounding area are diverting water away from Pozo Azul's waterfalls and ponds. This is threatening the area´s prime touristic appeal.

After several meetings with experts from the region and local inhabitants, the Regional Environmental Authority decided to focus on strengthening the area´s infrastructure as a local tourism destination, thereby focusing on recreational and water provision services of the site. This would involve a number of activities such as improving access paths, regulating visitor numbers, establishing entrance fees and introducing signposting and other tourist facilities. A strategy was also developed to manage water-related conflicts. This corresponds to **Steps 1 and 2** of the IES process. With the support from **German Development Cooperation** (GIZ), the Regional Environmental Authority commissioned an assessment study to understand local ecosystem service dynamics and establish the area´s visitor carrying capacity. An economic valuation study was also undertaken to determine visitors´ willingness to pay to visit the attraction as input to decide on entrance fees **(Steps 3 and 5)**.

The study identified opportunities to strengthen the management of Pozo Azul as a tourism attraction, while at the same time establishing the area as an **Integrated Management District** (a sustainable land use category under Colombian law). This would also position Pozo Azul at the centre of regional discussions concerning the need to conserve tropical dry forests **(Step 5)**.

Since the identification of this policy measures, several multi-stakeholder meetings have been convened to discuss Pozo Azul´s future, drum up support and discuss ways to strengthen its management **(Step 4).** The meetings have involved large mining corporations with interests in the region, local farmers, and district authorities, among others. The implementation of Pozo Azul´s tourism management plan is now underway **(Step 6)**.



PART 3

GLOSSARY AND REFERENCES

GLOSSARY

ACCESS AND BENEFIT SHARING (ABS)	The ABS principle of the Convention on Biological Diversity (CBD) aims at ensuring a fair and equitable sharing of the benefits arising from the use of genetic resources. This means that, where genetic resources are used for scientific or commercial purposes, the country of origin is to be compensated (GIZ 2012).
ADAPTIVE MANAGEMENT	A process of iterative planning, implementing, and modifying strategies for managing resources in the face of uncertainty and change. Adaptive management involves adjusting approaches in response to observations of their effect and changes in the system brought on by resulting feedback effects and other variables.
AGROBIODIVERSITY	The diversity of plants, insects, and soil biota found in cultivated systems. Alien species: Species introduced outside its normal distribution (UK National Ecosystem Assessment 2011).
BIODIVERSITY	Means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD, Article 2).
CERTIFICATION	Certification of ecological and socially responsible management places businesses apart from their competitors and can allow them to realise added value. A well-known example is the certification of forest enterprises based on the standards of the Forest Stewardship Council (FSC). Certified wood products enter higher-grade markets.
COMMAND AND CONTROL POLICY	Refers to environmental policy that relies on regulation (permission, prohibition, standard setting and enforcement) as opposed to financial incentives, that is, economic instruments of cost internalisation (OECD 2008).
DEVELOPMENT	Development refers to actions that aim to improve human well-being. It encompasses social, economic, and environmental issues, such as economic growth, poverty reduction, infrastructure expansion, energy independence, and adaptation to climate change (WRI 2008). Development planning is seen here as the process of preparing and carrying out a project that seeks to improve the living conditions in a community, region or nation. Development p lanning comprises strategic and measurable goals that have to be met within a certain time period. The planning process always requires the involvement of stakeholders. The development plan makes reference to all actions that are part of the planning process (projects, policy instruments, activities).
DIRECT-USE VALUE (OF ECOSYSTEMS):	A rate used to determine the present value of future benefits, for instance a foreseen cash flow or the flow of benefits to society from a standing forest throughout time (TEEB 2010). The basic underlying idea is that we value something that we may have in the future less than something that we can have right now. The practice of discounting applies first and foremost to an individual deciding how to allocate scarce resources at a particular point in time. In general, an individual would prefer to have something now, rather than in the future, though with some exceptions (the value of anticipation, for example). Discount rates are expressed as percentages and represent the proportion of the value that each individual is prepared to forego every year until the benefit is received. For example, a 5% discount rate implies that the present value of something that you expect to receive in 10 years' time is only about one tenth as valuable in present terms. The discount rate reflects not only our preference of having something today but also the risk involved of not receiving the foreseen benefit in the future.
DRIVER	Any natural or human-induced factor that directly or indirectly causes a change in an ecosystem (UK Ecosystem Assessment 2011).

DRIVER, DIRECT	A driver that unequivocally influences ecosystem processes and can therefore be identified and measured to differing degrees of accuracy (UK Ecosystem Assessment 2011). Land clearing, fishing and urban growth are examples of direct drivers.
DRIVER, INDIRECT	Also known as causes of change, an indirect driver is a factor, which causes something else to change and therefore has influence on direct drivers. Market prices, consumer preferences, taxes are examples of indirect drivers, since they generate incentives to act in a certain way. For instance, higher fish prices may be an incentive to fish more, while fuel subsidies may also be an incentive to overfish since the cost of fishing remains depressed
ECOLOGICAL INFRASTRUCTURE	A concept referring to both services by natural ecosystems (e.g. storm protection by mangroves and coral reefs or water purification by forests and wetlands) and to nature within man-made ecosystems (e.g. microclimate regulation by urban parks) (TEEB 2010).
ECOSYSTEM APPROACH	A strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use of nature´s benefits to society. An ecosystem approach is based on the application of appropriate scientific methods focused on levels of biological organisation, which encompass the essential structure, processes, functions, and interactions among organisms and their environment. It recognises that humans, with their cultural diversity, are an integral component of many ecosystems (UK Ecosystem Assessment 2011).
ECOSYSTEM ASSESSMENT	A social process through which the findings of science concerning the causes of ecosystem change, their consequences for human well-being, and management and policy options are brought to bear on the needs of decision-makers (UK Ecosystem Assessment 2011).
ECOSYSTEM BASED ADAPTATION (EBA)	The use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change. As one of the possible elements of an overall adaptation strategy, ecosystem-based adaptation uses the sustainable management, conservation, and restoration of ecosystems to provide services that enable people to adapt to the impacts of climate change (CBD, IUCN 2010).
ECOSYSTEM	A community of plants, animals and smaller organisms that live, feed, reproduce and interact in the same area or environment (IUCN 2010). It is a dynamic complex of animals, plants and microorganisms and their non-living environment interacting as a functional unit, and depending on one another. If one part is damaged it can have an impact on the whole system. Humans are an integral part of ecosystems. Ecosystems can be terrestrial or marine, inland or coastal, rural or urban. They can also vary in scale from global to local. Examples of ecosystems include forests, the open oceans, coasts, inland water bodies, wetlands, drylands, desert, cultivated lands (also known as agroecosystems). Ecosystems interact among each other. Ecosystem conditions are very dynamic and in flux.
ECOSYSTEM DEGRADATION	An ecosystem´s persistent reduction in the capacity to provide ecosystem services (MA, 2005).
ECOSYSTEM RESTORATION:	The process of assisting the recovery of an ecosystem that has been degraded damaged or destroyed (SER Primer 2004).
ECOSYSTEM SERVICES	The benefits people obtain from nature. These services come from natural (e.g. tropical forests) and modified ecosystems (e.g. agriculture). While there is no single agreed method of categorising all ecosystem services, the Millennium Ecosystem Assessment (MEA) framework of provisioning, regulating, supporting and cultural services is widely accepted and seen as a useful starting point.

EMISSIONS CERTIFICATES	An example for trade with emissions certificates with regard to emergent and developing countries is the Clean Development Mechanism (CDM). CDM enables private or government investors to implement projects for emissions reductions in developing countries and get credit for the reductions for their obligations laid down in the Kyoto Protocol of the UN Framework Convention on Climate Change in industrialised countries. Units consist of certified emissions reductions (CERS) in metric tonnes of CO_2 equivalents (tCO_2e).
ENDEMIC	Restricted to a particular area. Used to describe a species or organism that is confined to a particular geographical region, such as a lake, an island or a mountain (IUCN 2010). When referring to a species as endemic, it is important to state the area. For instance, the axolotl salamander (Ambystoma mexicanum) is endemic to the lake of Xochimilco in Mexico City.
ENVIRONMENTAL AND CONSERVATION FUNDS	Financing mechanisms that foster sustainable and effective management as well as the protection of ecosystems and our environment. There are at least two main areas of application for environmental and conservation funds: i) Financing environmental protection measures and environment-related projects. This includes environmentally-sound investments in urban-industrial areas in an effort to improve companies' or the state's business activities (e.g. energy, water and wastewater services) and to improve the quality of life in cities and industrial centres. ii) Financing conservation measures, especially the long-term financing of operating costs for protected areas within the context of conservation area management, but also financing other measures such as efforts to combat desertification (GTZ 2004).
EXISTENCE VALUE	The value that individuals place on knowing that a resource exists, even if they never use that resource (also sometimes known as conservation value or passive use value) (TEEB 2010).
EXTERNALITIES	A consequence of an action that affects someone other than the agent undertaking that action and for which the agent is neither compensated nor penalized through the markets. Externalities can be positive or negative (TEEB 2010).
EXTERNAL BENEFITS OR POSITIVE EXTERNALITIES	Are side effects from production and consumption activities that benefit other people. An example of a positive externality would be when somebody takes care of his or her garden and his or her neighbour can benefit from the nice view or the song of birds, without having to pay or work for receiving that benefit.
EXTERNAL COSTS OR NEGATIVE EXTERNALITIES	Are external or side effects that damage other people from production and consumption activities. An example of negative externalities would be the side effects of production processes such as pollution (noise, fumes and vibration) endured by people living next to a quarry.
GLOBAL CHANGE	A generic term to describe global scale changes in systems, including the climate system, ecosystems, and social-ecological systems.
GOVERNANCE	Governance is the body of rules, enforcement mechanisms and corresponding interactive processes that coordinate people's behaviour (Huppert, Svendsen and Vermillion 2003). Governance is not only what a central government or a dictator would do; it happens in large and small groups and at different scales, from local to global. Consequently, governance is formed whenever people need to interact with others to establish, say, standards and rules for using a natural resource (GTZ 2004).
GOVERNANCE OF ECOSYSTEMS	The process of regulating human behaviour according to shared ecosystem objectives (TEEB 2010).
HABITAT CHANGE	Change in the local environmental conditions in which a particular organism lives (IUCN 2010). Habitat change may be gradual or sudden. Gradual change can occur due to, for instance, slight modifications in average seasonal temperatures or precipitation. More sudden habitat changes may be driven by humans, such as land clearings or pollution, or due to extreme events, such as droughts, fires, hurricanes, mudslides and volcanic eruptions.
HABITAT	The place or type of site where an organism or population naturally occurs (IUCN 2010).

HUMAN WELL-BEING	A context and situation dependent state of being, comprising, among other things, access to basic material for a good life, freedom of choice, health, good social relations, security, peace of mind, a clean and healthy environment and spiritual experience (TEEB 2010).
INCENTIVES	Factors that motivate human behaviour. They can be positive and foster certain behaviour, but they can also act as disincentives and deter people from doing something they would otherwise do. Incentives can be material or monetary, but also non-material or non-monetary. Reputation and appreciation are examples of non-material incentives. We assume that people act under bounded rationality, which means that they always try to increase their individual utility, restricted by their actual opportunities and capabilities. In many cases, people cannot maximise their utility since they have access to a limited amount of information, or because their willingness to make an effort and spend time on a particular decision is low. But at large, people strive for an increased overall individual utility (GTZ 2004).
INDIRECT-USE VALUE (OF ECOSYSTEMS)	The benefits derived from the goods and services provided by an ecosystem that are used indirectly by an economic agent. For example, the purification of water by soil filtration (TEEB 2010).
INSTITUTIONS	Formal and informal rules (North 1990) including the corresponding measures of enforcing them. Institutions can guide human behaviour and reduce uncertainty (Furubotn and Richter 1998). They can take various shapes and forms -meeting your colleagues for lunch every day at a particular time, established procedures of conflict resolution in a school class, the right of way in traffic, agreements on the use of a particular grazing area- all these guidelines of human behaviour can be considered institutions (GTZ 2004).
LANDSCAPE	An area of land that contains a mosaic of ecosystems, including human-dominated ecosystems. The term cultural landscape is often used when referring to landscapes containing significant human populations or in which there has been significant human influence on the land (UK Ecosystem Assessment 2011).
LAND USE	The human use of a piece of land for a certain purpose (such as irrigated agriculture, recreation and housing) (UK Ecosystem Assessment 2011). Note that the term is not synonymous with land cover. The latter refers to the physical material at the earth´s surface (grass, asphalt, trees, water, etc.).
MARKET-BASED INSTRUMENTS	Mechanisms that create a market for ecosystem services in order to improve the efficiency in the way the service is used. The term is used for mechanisms that create new markets, but also for responses such as taxes, subsidies or regulations that affect existing markets (UK Ecosystem Assessment 2011).
MARKET FAILURE:	A situation in which the allocation of goods and services is inefficient and there are other outcomes that make at least one person better-off. In the realm of ecosystem services, a market failure could be the inability of a market to capture the correct values associated with a specific ecosystem service (UK Ecosystem Assessment 2011).
NATURAL CAPITAL	Natural capital is the extension of the economic notion of capital (physical and human means of production) to environmental goods and services. Capital is a stock of resources that yields a flow of goods or services into the future. Natural capital is thus the stock of natural ecosystems that yields a flow of valuable ecosystem services into the future. For example, stocks of trees or fisheries provide a flow of new trees or fish. Natural capital may also provide services such as waste recycling, water catchment and erosion control. Since the flow ecosystem services improves if the ecosystem is functional, the structure and diversity of the system are important components of natural capital.

NATURAL RESOURCES	Those parts of nature that have an economic or cultural value to people. In an economic sense, man-made capital and labour are also resources. However, they are not of a ‚natural' origin. Some natural resources require the use of man-made capital and/or labour in order to transform them and make them accessible and useful (GTZ 2004). In this manual, however, we focus on the flows of benefits and costs from using those resources, rather than on the stocks of resources themselves.
NON-USE VALUE	Benefits which do not arise from direct or indirect use but rather from not using the resource (TEEB 2010). For instance, knowing that a rare species of monkey is in the wild, even though you might never see them
OPPORTUNITY COST	Refers to the value of the next-best alternative. It is the cost incurred by not enjoying the next-best alternative to the alternative chosen. Foregone benefits of not using forested land in a different way, say, as farm land, is the opportunity cost of having a standing forest. It is a central element when analysing management decisions that result in trade-offs between different qualities and quantities of ecosystem services.
PAYMENTS FOR ECOSYSTEM SERVICES (PES)	Payments for ecosystem services are policy instruments that aim to bring about sustainable land use through direct incentives. The core concept of PES is that those who provide ecosystem services should be compensated for doing so and that those who benefit from the services should pay for their provision. One of the most common examples in this regard is in the realm of water provision. Upstream caretakers of forested areas should be compensated by downstream communities that benefit from the high-quality water flowing from the conserved forest. The amount of compensation should be an approximation of the opportunity cost of forest caretakers for leaving the forest intact rather than using it in some other way, such as clearing it to free up the land for farming.
POLICY-MAKER	A person with power to influence or determine policies and practices at an international, national, regional or local level (UK Ecosystem Assessment 2011).
POLICY/POLICIES	A policy is a statement of intent by a group of people. It encompasses the ideas, principles and plans of what to do in a particular situation to reach a certain outcome. Different development sectors, such as industry, agriculture, the environment, energy, education and health, might have their own policies at any scale (national, regional or local). In such cases we speak of sector policies. Sector policies usually look into the current situation and prescribe necessary steps and tasks to achieve goals to improve or change the current state of affairs. The classical policy cycle begins by defining a problem or issue, setting an agenda to solve it, designing and implementing the policy, raising awareness about the policy and evaluating outcomes to, in-turn improve policies. In reality, however, the policy cycle is not necessarily linear and policy unfolding can be a highly complex endeavour.
POLITICS	Refers to the procedures and processes that unfold as a result of and during exchanges -usually debate or dialogue- between people or groups of people with the aim of negotiating outcomes, resolving differences or trying to reach any kind of agreement. This exchange eventually results in making decisions to implement actions. The notion of power is central to politics, as it is also about gaining influence to turn a given situation to a party´s own favour or improving someone´s status. Negotiations hardly ever occur in a level playing field; power asymmetries among different actors are the norm. Politics occurs at all levels, from the local household level to the global arena.
PRECAUTIONARY PRINCIPLE	The management concept stating that in cases "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation," as defined in the Rio Declaration (UK Ecosystem Assessment 2011).

PRIVATE GOODS	Goods that yield benefits to people and are characterised by high levels of rivalry and excludability. Rivalry means that one person's consumption of the good reduces the quantity available to others. Excludability means that the producer can restrict use of the product and only make it available to those he/she chooses or are willing to pay for it and excluding those outside of the set criteria.
PROPERTY RIGHTS	Refers to how a given resource or good is used and owned. Property rights confer the right to use the good, to earn income from it, to transfer it to others and to claim your rights over the good. Many argue that establishing clear property rights might be a way of reducing degradation by internalizing externalities (see a description of the term above) and relying on the incentives that owning a resource conveys, such as land, to protect and nurture it.
PUBLIC GOODS	Goods that yield benefits to people and are characterised by high levels of rivalry and excludability. Rivalry means that one person's consumption of the good reduces the quantity available to others. Excludability means that the producer can restrict use of the product and only make it available to those he/she chooses or are willing to pay for it and excluding those outside of the set criteria.
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PUBLIC GOODS	A good or service in which the benefit received by any one party does not diminish the availability of the benefits to others, and where access to the good cannot be restricted (TEEB 2010).
RESILIENCE (OF ECOSYSTEMS)	The level of disturbance that an ecosystem can undergo without crossing a threshold to a situation with different structure or functions. Resilience depends on ecological dynamics as well as the organisational and institutional capacity to understand, manage, and respond to these processes (UK Ecosystem Assessment 2011).
SPECIES	An interbreeding group of organisms that is reproductively isolated from all other organisms, although there are many partial exceptions to this rule in particular taxa. Operationally, the term species is a generally agreed fundamental taxonomic unit, based on morphological or genetic similarity. Once a new species has been described and accepted it receives a unique scientific name (UK Ecosystem Assessment 2011).
SPECIES DIVERSITY	Biodiversity at the species level, often combining aspects of species richness, their relative abundance and their dissimilarity (UK Ecosystem Assessment 2011).
SPECIES RICHNESS	The number of species within a given sample, community or area (UK Ecosystem Assessment 2011).
SUSTAINABILITY	A system's ability to remain diverse and productive through time. The term originated in the field of ecology but has spread worldwide as the guiding principle of sustainable development. In this context, sustainability refers to the endurance of biological, political, cultural and economic systems and their interactions through time. The concept of sustainable development was popularized by the World Commission on Environment and Development (also known as the Brundtland Commission) with the publication of the Commission's report titled Our Common Future in 1987. Sustainable development has not lost its usefulness as a guiding principle for development and the concept is now enshrined in the UN's Sustainable Development Goals (SDGs) as part of its Agenda 2030 for Sustainable Development published in 2015. The SDG cover a broad range of development issues, including poverty, hunger, health, gender equality, economic growth, education, climate change, environment, water, sanitation, energy and social justice.

THRESHOLD/TIPPING POINT	A point or level at which ecosystems change, sometimes irreversibly, to a significantly different state, seriously affecting their capacity to deliver certain ecosystem services (TEEB 2010).
TOTAL ECONOMIC VALUE (TEV)	A framework for estimating the value of a good or service, or a bundle of goods and services, considering various constituents of value, including direct use value, indirect use value, non-use value, option value and bequest value.
TRADE-OFF	A choice that involves losing a given quantity of a certain quality of an ecosystem service in return for gaining another service. In other words, it describes an exchange where you give up one thing in order to get something else that you also desire.
TRADITIONAL KNOWLEDGE	The knowledge, innovations and practices of indigenous and local communities around the world that are deeply grounded in history and experience. Traditional knowledge is dynamic and adapts to cultural and environmental change. It incorporates other forms of knowledge and viewpoints. Traditional knowledge is often used as a synonym for indigenous knowledge, local knowledge or traditional ecological knowledge.
TRANSACTION COSTS	Refers to a cost incurred in making any economic trade. The resources spent for the creation, maintenance and functioning of institutions can be understood as transaction costs (Furubotn and Richter 1998).
USE VALUE	The value that is derived from using or having the potential to use a resource. This is the net sum of direct use values, indirect use values and option values (TEEB 2010).
VALUATION, ECONOMIC	The process of estimating a value and expressing it in monetary terms for a particular good or service in a certain context (TEEB 2010).
WILLINGNESS-TO-PAY (WTP):	An estimate of people´s preparedness to pay in exchange for a certain service for which there is normally no market price, for example, the WTP for the protection of an endangered species (TEEB 2010).

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PART 4

ANNEXES

ANNEX 1:
ECOSYSTEM SERVICES AND THEIR SYMBOLS
(ADAPTED FROM MEA 2005 AND TEEB 2010)

1) Provisioning Services are ecosystem services that describe the material outputs from ecosystems. They include food, water, raw materials and other resources.

	Food	Ecosystems provide the conditions for growing food – in wild habitats and in managed agro-ecosystems.
	Raw materials	Ecosystems provide a great diversity of materials for construction and fuel.
	Fresh water	Ecosystems provide good quality surface and groundwater.
	Medicinal resources	Many plants are used as traditional medicines and as input for the pharmaceutical industry.

2) Regulating Services are the services that ecosystems provide by acting as regulators. For instance, regulating the quality of air and soil or by providing flood and disease control.

	Local climate and air quality regulation	Trees provide shade and remove pollutants from the atmosphere. Forests influence rainfall.
	Carbon sequestration and storage	As trees and plants grow, they remove carbon dioxide from the atmosphere and effectively lock it away in their tissues.
	Moderation of extreme events	Ecosystems and living organisms create buffers against natural hazards such as floods, storms, and landslides.
	Waste-water treatment	Micro-organisms in soil and water decompose human and animal waste, as well as many pollutants.

	Erosion prevention and maintenance of soil fertility	Soil erosion is a key factor in the process of land degradation and desertification.
	Pollination	Some 87 out of the 115 leading global food crops depend on animal pollination, including important cash crops such as cocoa and coffee.
	Biological control	Ecosystems are important for regulating pests and vector borne diseases.

3) Habitat or Supporting Services underpin almost all other services. Ecosystems provide living spaces for plants or animals; they also maintain a diversity of different breeds of plants and animals.

	Habitats for species	Habitats provide everything that an individual plant or animal needs to survive. For instance, migratory species need habitats along their migrating routes.
	Maintenance of genetic diversity	Genetic diversity distinguishes different breeds or races, providing the basis for locally well-adapted cultivars and a gene pool for further developing commercial crops and livestock.

4) Cultural Services include the non-material benefits people obtain from contact with ecosystems. They include aesthetic, spiritual and psychological benefits.

	Recreation and mental and physical health	Natural landscapes and urban green spaces play a role in maintaining mental and physical health.
	Tourism	Nature tourism provides considerable economic benefits and is a vital source of income for many countries.
	Aesthetic appreciation and inspiration for culture, art and design	Language, knowledge and appreciation of the natural environment have been intertwined throughout human history.
	Spiritual experience and sense of place	Nature is a common element of all major religions; natural landscapes also help form local identity and sense of belonging.

ANNEX 2: MEASURES AND INDICATORS OF BIODIVERSITY AND ECOSYSTEM SERVICES

General principles and recommendations

- Indicators measure a state, quantity or process derived from observation and monitoring.
- Indicators use purpose- and audience-specific measurements or values to communicate a message.
- Metric: a set of measurements or data that underpin each indicator (e.g. a certain value).
- An index combines a number of measurements to increase the sensitivity, reliability and ease of communication.
- Ecosystem services indicators communicate conditions, trends and causes (drivers) to policy makers.
- Construction of indicators should be considered as a social process.
- Indicators serve a special purpose by measuring and communicating the relative value of an ecosystem service in a particular (political) context.
- Consider the needs of stakeholders to evaluate and measure the impact of measures or policies.
- In order to increase the efficiency of communicating results (and promoting change), indicators should be understandable, relevant and legitimate.

Table 4.1: Overview measures of biodiversity and ecosystem services

CATEGORY	EXAMPLES
MEASURES OF DIVERSITY	Species diversity, richness and endemism Beta (turnover of species), phylogenetic, genetic, functional diversity
MEASURES OF QUANTITY	Extent and geographic distribution of species and ecosystems Abundance/population size Biomass/net primary production
MEASURES OF CONDITIONS	Threatened species/ecosystems Red List Index (RLI) Ecosystem connectivity and fragmentation (fractal dimension, core area index, connectivity, patch cohesion)
MEASURES OF PRESSURES	Land cover change Climate change Pollution and eutrophication (nutrient level assessment) Human footprint indicators (e.g. human appropriate net primary productivity, HANPP, Living Planet Index (LPI), ecological debt Levels of use (harvesting abstraction Alien invasive species
MEASURES OF PROVISIONING SERVICES	Timber, fuel, fibre livestock and fisheries production Wild animal's products Harvested medicinal plants Water yield and regulation Biological infrastructure Need for nature based recreation
MEASURES OF REGULATING SERVICES	Carbon sequestration, water flows regulation and production, natural hazard regulation, waste assimilation, erosion regulation, soil protection, disease regulation, pollination, pest control
MEASURES OF CULTURAL SERVICES	Recreational use, tourism numbers or income, spiritual values, aesthetic values

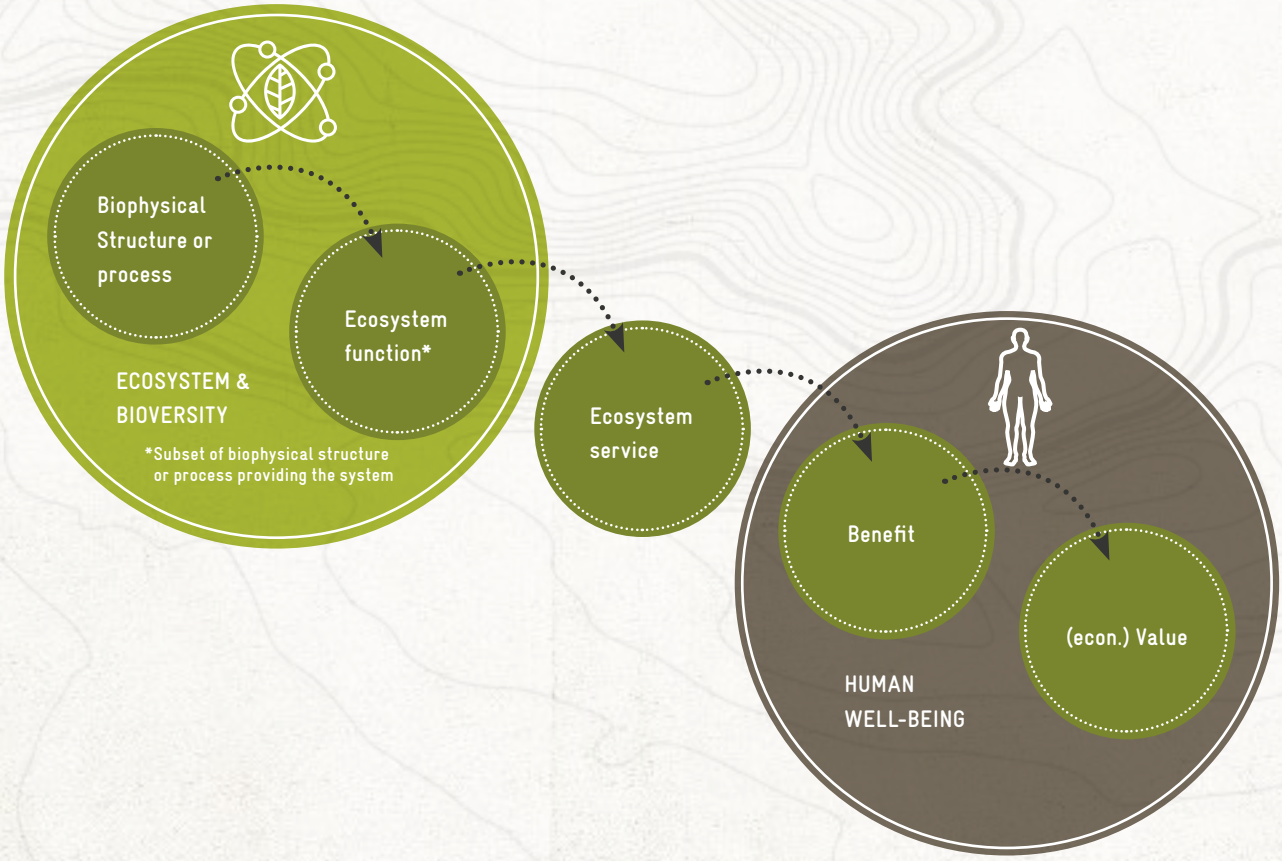
Source: TEEB Foundation 2010

ANNEX 3: CHARACTERISTICS OF ECOSYSTEM SERVICES AND RESULTING CHALLENGES

A tiered approach to assessing ecosystem services

Assessing ecosystem services can be understood as a tiered approach, wherein the first task involves understanding the key ecosystem structures and processes and functions to be able to identify those functions that are useful to society or, in other words, the ecosystem services. We move on to understand the supply of the ecosystem service, which can be expressed in physical or any other measurable units which are meaningful for generating a common understanding of what is being assessed (e.g. cubic meters of water, number of species, tons of carbon sequestered). When looking at the benefits that ecosystem services provide to society, we look at the social demand of a service and how the service is valued by different groups of people. When contrasting demand and supply, we can gage whether there is a balance or whether degradation can be attributed to an excess demand or any other form of impact. → *Figure 4.1* presents a simple framework for understanding the main links between ecosystems, ecosystem services and human well-being. Despite its simplicity, it provides a very useful conceptualization of the links between the different assessment dimensions.

Figure 4.1: Framework for linking ecosystems to human wellbeing



Source: Adapted from Haines-Young/Potschin (2010), de Groot (2010)

Main characteristics of ecosystem services: Spatial and temporal dynamics

When assessing the condition and trends of ecosystem services a clear understanding of *scale, spatial pattern, and timing of service flows* can lead to more effective environmental policies and management interventions. **Ecosystem services are not homogenous across landscapes or seascapes, nor are they static phenomena. They are heterogeneous in space and evolve through time.**

Key spatial and temporal dynamics of ecosystem services:

- Ecosystem services experience a *change* from a point of production to a point of use in three ways: 1) Biophysical processes change across a landscape, 2) benefits and beneficiaries change across a landscape, 3) costs of provision change across a landscape.
- Spatial and temporal variation of energy flow determines location and productivity of ecosystems (e.g., temperature and precipitation greatly influence abundance and distribution of biodiversity in a given landscape).
- Provision and delivery of services from ecosystems is a function of spatial configuration of ecosystems (e.g., type of vegetation and its location influences water provision, nutrient transport and some cultural services).
- "Ecosystem services do not always decline or improve in a linear and predictable manner. They may naturally go through cycles of collapse and renewal." (WRI 2008).
- The spatial configuration of land cover in a region affects ecological patterns and processes. For example, changes in the structure of the landscape can alter nutrient transport and transformation, species persistence and biodiversity and nurture invasive species.
- In many cases impacts due to changes in ecosystems (e.g. deforestation) are highly site-specific, and the intensity of the impact (e.g. floods) will depend on the receiving end (e.g. size/location of community along flood-plain).
- Societal preferences and needs change over time, which may change the way society values and uses ecosystem services.

A challenge when making management decisions is the "spatial mismatch" regarding the area where the ecosystem service is produced and the area that benefits from it.
The → *following figure 4.2* shows possible spatial relationships between service production areas (P) and service benefit areas (B).

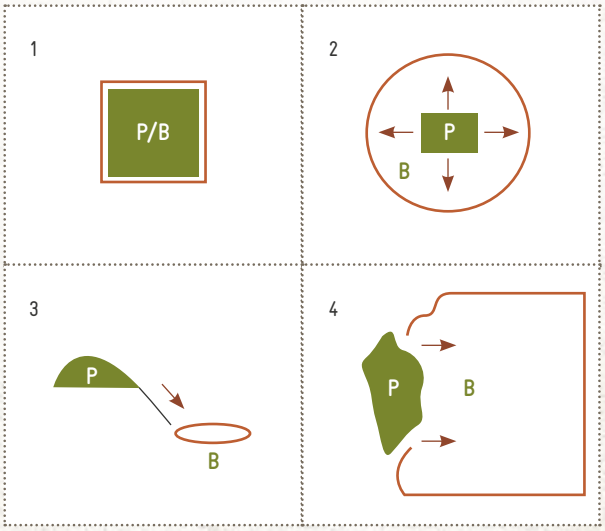
Figure 4.2: Spatial mismatch between service production and service benefit areas

In panel 1, both the service provision and benefit occur at the same location (e.g. soil formation, provision of raw materials).

In panel 2, the service is provided in various directions and benefits the surrounding landscape (e.g. pollination, carbon sequestration). Panels 3 and 4 demonstrate services that have specific directional benefits.

In panel 3, down slope areas benefit from services provided in uphill areas, for example water regulation services provided by forested slopes.

In panel 4, the service provision unit could be coastal wetlands providing storm and flood protection.



Source: Fisher et al. (2009)

Rivalry and excludability

There are two basic characteristics that shape people's capability to access and enjoy benefits from any given ecosystem service; these are 1) excludability or the feasibility to control access to a service and 2) rivalry in consumption or "subtractability". The feasibility of exclusion depends not only on the physical attributes of a service, but also on situational factors such as the location. For instance, it is much easier to control access to a mango tree in my yard than to a mango tree that grows far away from my house. These attributes can be modified through changes such as location, availability of new financial resources, introduction of new rules and development of enforcement mechanisms. The more public the access and enjoyment of a service is, the harder it is to establish regulatory mechanisms to govern their use.

→ *Figure 4.3* presents a matrix that organizes several goods and services according to the level of excludability and rivalry in consumption.

Figure 4.3: Rivalry and excludability

Many goods or services can shift from one category to another based on their use and regulation!

Source: GTZ (2004)

Trade-offs and synergies

Ecosystem service trade-offs arise from management choices made by humans, which can change the type, magnitude, and relative mix of services provided by ecosystems. Trade-offs occur when the provision of one ES is reduced as a consequence of increased use of another ES. In some cases, a trade-off may be an explicit choice; but in others, trade-offs arise without premeditation or even awareness that they are taking place. These unintentional trade-offs happen when we are ignorant of the interactions among ecosystem services (e.g., Tilman et al. 2002, Ricketts et al. 2004), when our knowledge of how they work is incorrect or incomplete (Walker et al. 2002), or when the ecosystem services involved have no explicit markets. But even when a decision is the result of an explicit, informed choice, the decision may have negative implications. For example, adverse impacts may arise as a consequence of the scale mismatch between the intent of a particular management decision, the expected outcome, and the long-term or broad spatial scale of the decisions (van Jaarsveld et al. 2005). Ecosystem feedbacks and food web dynamics can also lead to unexpected consequences (Logiudice et al. 2003). As either the temporal or spatial scale increases, trade-offs become more uncertain and difficult to manage— even with adequate knowledge. As human societies continue to transform ecosystems to obtain greater provision of specific services, we will undoubtedly diminish some to increase others (Foley et al. 2005). A simple way of classifying trade-offs is according to whether management choices actually increase the overall provision of services or more of one service may reduce the availability of another ES:

1) **Synergies, or positive co-variation (more of one means more of another)**

   Example: Maintaining soil quality may promote primary production, enhance carbon storage, help regulate water flows and improve most provisioning services (most notably food).

2) **Trade-offs, or negative co-variation (more of one means less of another).**

   Example: Extensive crop production may reduce soil quality, biological control, air quality regulation and water regulation.

Negative and positive co-variations in overall service provision vary along a continuum with some management choices actually promoting a greater service mix (synergy) while others favouring one service over others (negative co-variation) to the point where any additional unit of a given service decreases other services proportionately. Trade-offs can occur between services (e.g. provisioning services vs. regulating services), in a given time horizon (e.g. present vs. future generations) and in space (e.g. upstream vs. downstream). By highlighting the relative impacts of trade-offs on the current and future supply of ecosystem services, we can focus on a critical element for making better decisions about managing trade-offs themselves namely, understanding who are the winners and losers or, in other words, who are those who will gain from a given service mix change and who will lose. → *Table 4.1 on page 96* provides examples of ecosystem service trade-offs.

Table 4.2 Examples of ecosystem service trade-offs

DECISION	GOAL	EXAMPLE WINNERS	ECOSYSTEM SERVICES DECREASED	EXAMPLE LOSERS
INCREASING ONE SERVICE AT THE EXPENSE OF OTHER SERVICES				
Draining wetlands for farming	Increase crops, livestock	Farmers, consumers	Natural hazard regulation, water filtration and treatment	Local communities including farmers and some downstream users of freshwater
Increasing fertilizer application	Increase crops	Farmers, consumers	Fisheries, recreation (as a result of dead zones created by excessive nutrients)	Fisheries industry, coastal communities, tourism operators
Converting forest to agriculture	Increase timber (temporarily), crops, livestock, and biofuels	Logging companies, farmers, consumers	Climate and water regulation, erosion control, timber, cultural services	Local communities, global community (from climate change), local cultures
CONVERTING ECOSYSTEMS AND THEIR SERVICES INTO BUILT ASSETS				
Coastal development	ncrease capital assets, create jobs	Local economy, government, developers	Natural hazard regulation, fisheries (as a result of removal of mangrove forests or wetlands)	Coastal communities, fisheries industry (local and foreign), increased risks to coastal businesses
Residential development replacing forests, agriculture or wetlands	Increase capital assets, create jobs	Local economy, government, developers, home buyers	Ecosystem services associated with removed ecosystems	Local communities, original property owners and downstream communities
COMPETITION AMONG DIFFERENT USERS FOR LIMITED SERVICES				
Increased production of biofuel	Reduce dependency on foreign energy	Energy consumers, farmers, government	Use of crops for biofuels instead of food	Consumers (rising food prices), livestock industry
Increased water use in upstream communities	Develop upstream areas	Upstream communities, industries	Water downstream	Downstream communities, industries
MAINTAINING A BALANCED SERVICE MIX OR PROMOTING OVERALL SERVICE INCREASE				
Introducing agro ecological practices	Increase crops, promote crop resilience	Farmers, consumers	ES mix may increase: food, fodder, raw materials, pollination, erosion control	Suppliers of agro-chemicals, farmers (more effort required)
Restoring urban green spaces	Increase city dweller access to green spaces	Urban dwellers, visitors	ES mix increases: habitats, recreation, aesthetic appreciation, health, raw materials, pollination, food	Grey infrastructure developers, settlements being impaired by new zoning

Source: Adapted from WRI (2008)

PART 4

ANNEX 4: OVERVIEW OF METHODS FOR ASSESSING ECOSYSTEM SERVICES

Please refer to the ValuES Methods Inventory *www.aboutvalues.net/method_navigator/* for a comprehensive list of many different assessment and valuations methods and tools.

Table 4.3: Common economic valuation methods

APPROACH	METHOD	ELEMENT OF TEV CAPTURED	APPLICATION	BENEFITS	LIMITATIONS
Market price (marketed goods, trace impact of change in ecosystem services on produced goods)	Market values	Direct and indirect uses	Money paid for ecosystem goods and services that are traded in commercial markets, e.g., timber, fish.	Market data readily available and robust.	Limited to those ecosystem services for which a market exists.
	Change in productivity (production function)	Indirect use	Value is inferred by considering the changes in quality and quantity of a marketed good that results from an ecosystem change (e.g., increases in fisheries income resulting from improvements in mangrove habitats).	Market data readily available and robust.	Data-intensive and data on changes in services and the impact on production often missing.
Revealed preference (uses market based information to infer a non-marketed value)	Travel cost	Direct and indirect uses	It assumes that the value of a site is reflected in how much people are willing to pay to travel to the site. Costs considered are travel expenditures, entrance fees and the value of time.	Based on observed behaviour.	Generally limited to recreational benefits. Difficulties arise when considering multiple destination trips.
	Hedonic price	Direct and indirect uses	Value of environmental amenities (air quality, scenic beauty, cultural benefits, etc.) that affect prices of marketed goods (e.g., the higher market value of waterfront property, or houses next to green spaces).	Based on market data, so relatively robust figures.	Very data-intensive and limited mainly to services related to property.

APPROACH	METHOD	ELEMENT OF TEV CAPTURED	APPLICATION	BENEFITS	LIMITATIONS
Cost based	Avoided damage costs	Direct and indirect uses	Value is based on the costs of actions taken to avoid damages if a specific ecosystem service did not exist (e.g., the costs to protect a property from flooding).	Market data readily available and robust.	Can potentially overestimate actual value.
	Replacement/ substitute costs		Value is based on the cost of replacing the ecosystem service (function) or providing substitutes (e.g., previously clean water that now has to be purified in a plant)		
	Costs of Illness human capital		Health costs (morbidity and mortality) due to changes in ecosystem services (e.g. air or water pollution).		
Stated preference	Contingent valuation	Use and non-use	Involves directly asking people how much they would be willing to pay to prevent loss of, or enhance, an ecosystem service (e.g. willingness to pay to keep a local forest intact).	Able to capture use and non-use values.	Bias in responses, resource-intensive method, hypothetical nature of the market.
	Choice modelling	Use and non-use	People chose from a "menu" of options with differing levels of ecosystem services and differing costs. Menus might be derived from policy options where a set of possible actions might result in different impacts on ecosystems.		
Transfer of values	Benefits transfer (not a valuation method in itself)	All	Transferring a value from studies already completed in another location or context and adjusting them to local conditions (e.g. estimating the value of a forest using the calculated economic value of a forest somewhere else but of a similar size and type).	Can reduce the need for primary valuation studies and provide information swiftly.	Degree of accuracy of the valuation might not be sufficient for making a decision.

The choice of valuation method generally depends on the type of service, availability of resources, time and data for the study as well as its purpose. Some of the commonly used valuation methods to quantify or estimate the different value components of the TEV are shown in the following figure. Direct use values tend to be the easiest to account for, because they are often part of formal markets. Non-use values are particularly challenging; they are the most difficult to measure quantitatively and have the greatest uncertainty attached to them.

Source: IUCN, WB, TNC 2004, adapted

Table 4.4: Cultural and social assessment methods

APPROACH	METHOD	APPLICATION	ADVANTAGES	DISADVANTAGES
Ethnographical Methods (Process of observing and working towards understanding the world from the perspective of the people under consideration.) and	Action Research	Based on a learning-by-doing approach. A researcher is actively participating in community processes over a given period of time in order to gain insights into community practices and beliefs.	Implementable in almost any setting at relatively low costs. Data collection spread over larger time frames allows for better capturing the entire spectrum of people's values and beliefs.	May be time consuming and may require to involve many people. Not representative of *society* or *culture* as a whole. Possible bias through misinterpretation of actions or missing information. People may act or express themselves differently when being observed.
	Participant observation	Can be used to derive values by looking at people's behaviours and consumption patterns.		
	Daily Note Taking	A researcher delegates the task of keeping daily notes and records of actions to community members over a period of time. Analysing these data sets will help to better understand the perspectives of community members.		
	Writing of a descriptive monologue	A researcher delegates the task of writing a short monologue about a specific topic or specific cultural interaction to community members.		
	Questionnaires	Asking people directly how important they think ecosystem services are by means of a questionnaire.		
	Interviews	A single person or a group of people is interviewed about their values, beliefs and preferences concerning ES through the use of either closed- or open-ended questions.		
	Key Informant Interviews	A person with in-depth knowledge about a community in question (e.g. a community leader) is interviewed in order to deepen the understanding of, how a community consumes resources or deals with governance issues, and can give recommendations.		

Ethnoecological Methods (Process of understanding how people conceptualize, value, and use their local environments.)	Cultural Consensus Analysis	Based on the theory that some beliefs and values are cultural. The method is applied by asking different individuals a series of questions to which they have to provide a specific answer. If there is a sufficiently high level of agreement amongst the responses, that can be seen as a common cultural belief or value.	Implementable in almost any setting at relatively low costs.	Hypothetical situation, i.e. based on people's stories and perceptions.
	Cultural Domain Analysis	People indicate how they think different items or products fit together in categories. Through the analysis of matrices a researcher can then derive how a group of people judge and value different items or products.	Survey results can be compared and be used for statistical analysis.	Several biases possible referring to the design of the questionnaire or interview (e.g. response bias, strategic bias, design bias).
	Social Network Analysis	Social structures are investigated by visualizing *networks* (i.e. institutions, actors, ES) in a graph and then linked to each other through *ties* (i.e. relationships, interactions). This can help to visualize how a society or community interacts with these *networks* and values them.	Values and preferences derived directly from (different) societal actors. Can capture different aspects of values, beliefs and preferences.	May require expert input. Getting a large and representative sample size may be time consuming. Can be *"incomplete"* or not representative of an entire culture or society.
	Stakeholder Analysis	Stakeholders are all those people affected by a project/policy/study/decision, or who have an important influence on its outcome. Stakeholder provides essential information on the economic, social and political context of a project or study area. Stakeholder analysis is an important first step in many ecosystem service assessments. It helps to identify and understand stakeholders: how they are affected by ecosystem services, how they influence them, and their role in (public) decision making. Stakeholder analysis allows fine-tuning of the assessment design. It also provides vital information for effectively and meaningfully engaging stakeholders in the assessment process itself. Stakeholder involvement in assessments has to be considered according to their rights, their interests, their knowledge, as well as any strategic goals pursued by the assessment.	Includes the perceptions of most relevant stakeholders if done thoroughly and ensuring representation of all involved parties.	

Table 4.3: Cultural and social assessment methods

APPROACH	METHOD	APPLICATION	ADVANTAGES	DISADVANTAGES
Geographic Methods (Identify and map ES relevant information spatially.)	GIS and Remote Sensing	Geo-Information Systems (GIS) analyse and represent spatial and geographical data in an integrated way. Many different data types can be inputted in a GIS, including ecosystem areas, ES flows, boundaries, socio-economic variables, societal preferences in specific areas, among others.	Involvement of relevant stakeholders in the design ensures public acceptance, legitimacy and relevance of the results. Easy to understand due to visual output. Promotes ownership amongst a community or group of stakeholders. Visual output that can be used to influence decision-making processes.	Can be expensive and time consuming. Modelling: Essentially depends on the availability of relevant data in the right format, quantity and quality, as well as the quality of the model itself. Can be *incomplete* or not representative of an entire society or culture. Difference in opinions can be difficult to reflect in a *final output*. May not capture complexity of the situation.
	Participatory Mapping and Modelling	Involvement of stakeholders in the design and content of analytical models or maps that represent ES, benefit flows, beneficiaries and trade-offs under different spatial and temporal conditions.		
	Protected Area Benefits Assessment Tool – PABAT	The Protected Areas Benefits Assessment Tool (PA-BAT) helps to identify the different types of benefits provided by Protected Areas (PA). The tool identifies who benefits and by how much. It also provides information regarding the degree to which particular benefits are linked to protection strategies. Stakeholder involvement and input helps achieve a high quality assessment. The PA-BAT aims to assess legal resource use and the benefits that potentially accrue from that use. The assessment may also identify neglected ecosystem services. If the assessment is repeated over time, changes in quality or quantity of either supply or demand of ecosystem services can be monitored. The tool needs to be adapted to site-specific circumstances. It is possible to apply the tool to areas under no form of protection.		
	TESSA Toolkit	The TESSA-toolkit focuses on a site-scale-level, such as a wetland, using information gathered locally. The toolkit can help assess climate regulation, flood protection, water provision, water quality improvement, harvested wild and cultivated goods and nature-based recreation. The toolkit is accessible to non-experts and practitioners on the ground, as it provides a *user manual* with a workbook structure. TESSA is relatively low cost to apply compared to many other methods. It delivers scientifically robust results, often based on field measurements, rather than scenarios. Guidance on how to pull together data from individual ecosystem services into an ecosystem service overview is also provided.		

	Participatory Rural Appraisal	Participatory Rural Appraisal (PRA) offers various tools for practitioners, government officials and community members to jointly analyse a local situation and plan projects/programmes/activities that are sensitive to local context. PRA is highly relevant for small-scale ecosystem service appraisals. PRA tools can be applied to examine the locally perceived state, the demand and the use of ecosystem services. PRA is not a fixed combination of methods, rather an evolving set of tools, which are marked by their relative simplicity, adaptability and low-tech/low-cost character. Typically, they comprise qualitative field research methods stemming from social anthropology and sociology, such as ranking exercises, transect walks, participatory mapping, trend analyses and seasonal calendars. In PRA, facilitators seek to support community members to undertake their own analysis and identify their own plans for action. Extensive mentoring, training and practical assistance may be necessary as preparatory work for PRA facilitation team to ensure that the PRA process leads to the desired results.	High flexibility, questions can be adapted to specific local conditions or information needs. Provides insights into the overall value of ecosystem services at a specific site.	Can require extensive knowledge and expertise. Difficult to assess all ecosystem services spatially.
Historical Methods (Reveal how and why values of nature and its benefits have formed and changed over time.)	Archival Work	Reading of original archival records to gain a better understanding of a society or culture. It is generally more difficult than internet research, as the identification of relevant documents and archives can be time consuming.	Large amount of information availability. Allows exploring past and present tendencies and preferences.	Results may not be representative of *society* or *culture* as a whole, but rather of individual stakeholder groups or organizations. May be time consuming.
	Document Analysis or Problem-Oriented Discourse Field Analysis	Screening of relevant existing literature to identify values and beliefs of different actor groups on specific topics in regards to ES. Problem-oriented discourse field analysis can further be used to identify actors' knowledge and potential conflicts. Academic literature, grey literature and social media can be examined.		
	Media Analysis	Media (newspaper, TV channels) and social media outputs are analysed over a period of time in order to capture the perceived value and beliefs of society on ecosystem services.		

Table 4.3: Cultural and social assessment methods

APPROACH	METHOD	APPLICATION	ADVANTAGES	DISADVANTAGES
Narrative Methods (Descriptive methods which capture the importance of nature and its benefits to people through stories, verbal or visual summaries.)	Storytelling (Oral History)	Participants are asked to share stories about past experiences. The group then reflects upon the presented information to discuss societal values and beliefs related to these experiences.	Based primarily on opinions of relevant stakeholders and general public. Allows for weighing and judging different options. Can help in decision-making processes. Ensures public acceptance and local / regional relevancy of results. Allows exploring different scenarios and their implications.	The way information is presented may cause a bias in responses. Difficult to present all information and capture complexity correctly. Can be time consuming. Results can be highly influenced by individuals with a stronger voice. Due to complexity of ecosystems, it is difficult to create comprehensive and realistic scenarios for the future in terms of ES supply and demand.
	Participatory Scenario Analysis	Two or more different future scenarios are presented to participants. The group then reflects upon the presented information and discusses which scenario would be preferable under which conditions.		
	Scenario Development and Scenario Planning	Some scenario development approaches are developed for the assessment and/or management of ecosystem services, while others are easily adapted to reflect ecosystem services issues. Scenario approaches range from highly exploratory to decision-oriented and from intuitive to analytical. They vary in the degree of complexity. Different contexts require different scenario approaches. All approaches involve a common set of steps for scenario development. This process includes: selecting a scenario approach, developing storylines based on available data, identifying uncertainties and drivers of change, and discussing scenario outcomes. Scenario planning is an effective tool to analyse future prospects of changes in ecosystem service provisioning and trade-offs. However, a scenario cannot forecast the future. Rather, it reflects different possibilities of what the future could look like.		
	Focus Groups	Deliberative group setting in which information is exchanged between group members, and the group then discusses in an iterative process until a consensus is reached. Deliberative group sessions help in expressing shared values instead of individual values. Usually done in a small group of people (4-8) and facilitated by an instructor or mediator.		

			Can help create awareness.	
	Citizen's Juries	A number of experts and relevant stakeholders present information to a group of citizens who then respond by giving a recommendation or *verdict*.		
	Deliberative Multi-Criteria Analysis	Techniques that involve groups of stakeholders designing formal criteria against which to judge the non-monetary (and sometimes monetary) costs and benefits of different management options as the basis for highlighting the value of ecosystem services.		
Preference Methods (Analyse perceptions, knowledge and values associated with nature's benefits.)	Freelisting	Community members are asked independently to list items that they think belong to a certain category or list which items they prefer most of a given category. Based on the most common answers, a researcher can derive a certain extent of societal preferences and values in regards to the topic in question.	Helps to gauge society's preferences and can be used to develop new products or strategies. Can capture all aspects of values, beliefs and preferences. Results can be compared and be used for statistical analysis.	Design may require expert input. Getting a large sample size may be time consuming. Several biases possible referring to the design of the method (e.g. response bias, strategic bias, design bias). Often suffers from a lack of information regarding method adaptation and complexity of results, such as explanations of why a scenario is preferred or why people act the way they do.
	Paired Comparisons or Triad Tests	In order to gain knowledge about the values of different items or products, a researcher can arrange these items or products into multiple sets of two. A respondent can now indicate his preference out of all possible paired combinations. The item that has been chosen most is the most preferred. In triad tests, respondents choose a "best", "middle" and "worst" item from all possible combinations of three items.		
	Pile Sorting	Participants divide items or products into a number of value-categories based on their perceived value.		
	Delphi Survey and Value Compass	Set of techniques that revolve around a group of participants (often experts) that discuss an issue at hand iteratively until a consensus is reached. The group ranks different values and then discusses the degree to which these values are important in a specific community.		
	Rankings	In ranking exercises, two or more products or entities are presented to an individual or a group of people who can then choose which of the options are preferred to others or if some of them have an identical value.		

ANNEX 5: FURTHER INFORMATION ON STAKEHOLDER ASSESSMENT AND INCENTIVES

Influences of the social system

Ecosystem services contribute to human well-being. The relation between ecosystem services and society is not linear. Multiple stakeholder depend and impact ecosystem services differently. The social system drives environmental management, establishing the management and use options and conditioning desirable ecosystem functions to ensure the provision of certain –preferred- ecosystem services. Stakeholders themselves interact in many different ways. These interactions are usually modulated by formal power asymmetries (e.g., property rights, access or legal permissions), informal power asymmetries (e.g., social leadership, gender inequity) or hidden power imbalances (e.g., social pressure promoting self-censorship). In various stakeholder exchanges, be them formal negotiations or casual discussion, stakeholder needs and interests are reflected in the positions they assume.

The Iceberg model (→ *Figure 4.4*) helps explain the connections between positions, interests and needs.

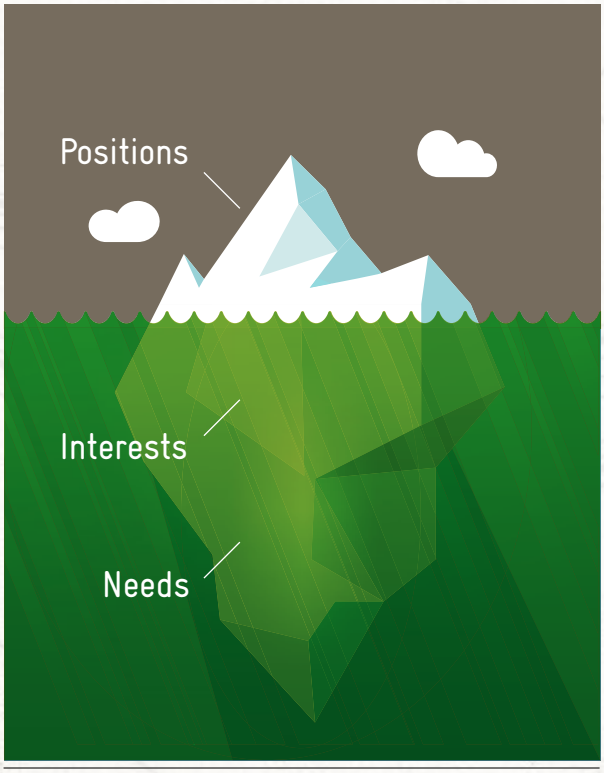
The Iceberg Model

- Positions are what people say to protect their interests and needs (which lie beneath), and to get what they want. There may be no obvious connection between the position and the underlying interests and needs. Positions are always negotiable. Example: fishermen objecting to an offshore windfarm.

- Interests are things that people move towards because they enhance the quality of life and are desirable. There is some room for negotiation about how an interest is met. Example: To continue fishing in fishing grounds.

- Needs are things that people try to fulfil, because non-fulfilment of a need causes anxiety. Needs are non-negotiable, although the means of meeting a need can be negotiated. Example: to earn a living; community survival; security for children

Figure 4.4: Iceberg model



Source:
http://www.scotland.gov.uk/Publications/2010/03/30180908/14

Stakeholders play different roles in the management and use of ecosystem services. They can manage ecosystem services (i.e., co-producing or impacting them) or be recipients of ecosystem service benefits (i.e., using them but also being excluded from access). Stakeholders' interactions affect the role of individual stakeholders in the system, which in turn perpetuates power relationships. → *Annex 4* contains several research and assessment methods to explore stakeholder perspectives, motivations, positions, interests and needs.

Incentives

Incentives for ecosystem management depend on the characteristics of the actors (institutions, organizations and local people).

It is important to know which are the characteristics of groups that are relevant for the conditions and trends of ecosystem services, thinking how such characteristics might influence user behaviour. This could be based in the history of the groups, their pattern of social interaction (e.g. conflicts among them), social factors such as ethnicity, economic factors like livelihood strategies and cultural factors such as beliefs.

Positions are related to interests and these ones are connected to the different kind of needs of the different actors. Such needs could be either material (such as income) or social (like prestige).

ANNEX 6: OVERVIEW OF POLICY INSTRUMENTS AND MEASURES FOR INTEGRATING ECOSYSTEM SERVICES

→ *Table 4.4* provides an overview of different alternatives to integrate ecosystem services into policy. Options are organized according to types of policy instruments, namely national and sub-national policy planning, economic and fiscal incentives and governance issues.

Table 4.5: Policy options for integrating ecosystem services

POLICY OPTION	HOW IT WORKS	DESIGN AND IMPLEMENTATION CONSIDERATIONS	EXAMPLES OF EXPERIENCE
NATIONAL AND SUB-NATIONAL POLICIES			
Mainstream ecosystem services into economic and development planning.	Addresses indirect drivers of ecosystem change over the longer term by including ecosystem services in poverty reduction strategies, national economic and development plans, or country assistance strategies.	Overcoming separate agency mandates, integrating different skills and perspectives, aligning with other policies such as financial and economic incentives.	Tanzania's 2005 National Strategy for Growth and Reduction of Poverty explicitly recognizes many of the drivers of ecosystem service degradation as impediments to poverty reduction. The strategy sets goals to address these drivers, establishes a set of poverty-environment indicators, and includes 15 environmental targets (Assey et al 2007).

POLICY OPTION	HOW IT WORKS	DESIGN AND IMPLEMENTATION CONSIDERATIONS	EXAMPLES OF EXPERIENCE
Include investments in ecosystem services in government budgeting.	Makes the crucial link between policies focused on ecosystem services and providing funds to carry them out.	Improving ability to value and integrate ecosystem services in cost-benefit analysis and identifying specific investments to sustain them.	UK Treasury drew on the Millennium Ecosystem Assessment in preparing its Comprehensive Spending Review of government funding. Notes that Assessment is relevant to achieving sustainable growth, employment, security and equity, and that Treasury will aim to release resources to meet environmental challenges (UK House of Commons Environmental Audit Committee 2007).
Establish protected areas.	Helps protect ecosystems and their associated services from drivers of over exploitation and conversion.	Incorporating goal of sustaining ecosystem services into site selection, linking biodiversity conservation and sustaining ecosystem service goals Including local communities, taking a landscape approach that recognizes drivers of change outside the protected area, and ensuring financial sustainability.	In 1986, St. Lucia designated marine reserves with the involvement of local people and businesses, leading to regeneration of mangrove forests (WRI et al 2000:176-77).In 1993, Austria established 20-year contracts with all forest owners requiring them to protect the land. Financial compensation was offered to owners who lost income (Hackl and Rohrich 2001)
ECONOMIC AND FISCAL INCENTIVES			
Use tax deductions and credits to encourage investment in and purchase of ecosystem services.	Provides economic incentive to manage ecosystems in ways that sustain services.	Avoiding equity problems or protecting one service at the expense of others.	U.S. law gives landowners tax deductions for donating conservation easements, which restrict use of the property to protect associated resources (House 2006).
Establish fees for use of resources or services.	Reduces waste of resource.	Avoiding equity issues, where those with lower incomes are less able to pay and balancing number of users.	In Colombia, Cauca Valley water associations voluntarily agreed to increase user fees paid to the local utility in exchange for improved watershed management. The associations aim to improve stream flow for the benefit of agricultural producers (FAO 2002).
Use taxes or other public funds to pay for the maintenance of regulating and cultural services.	Creates economic incentive to supply services that do not normally have a market value.	Maintaining one service at the expense of others, avoiding creating equity issues such as loss of harvest rights or ineligibility because of lack of tenure. Depending on still emerging market infrastructure such as quantification, verification and montoring tools. Informing public about use of funds to provide accountability.	The UK Nitrate Sensitive Areas (NSA) Scheme uses direct government payments to compensate farmers for adopting management practices that reduced leaching of nitrates into groundwater (IUCN 2007). A Costa Rican fund mainly from fuel tax revenues pays forest owners for watershed protection (Perrot-MaTtre and Davis 2001). Belize charges foreign tourists a conservation fee, which funds a trust dedicated to the sustainable management and conservation of protected areas (Conservation Finance Alliance 2003).

POLICY OPTION	HOW IT WORKS	DESIGN AND IMPLEMENTATION CONSIDERATIONS	EXAMPLES OF EXPERIENCE
Reduce perverse subsidies.	Removes incentive for intensive production of provisioning services at expense of other services.	Overcoming vested interests in maintaining subsidies, creating mechanisms to transfer reduction in subsidies to payments for maintenance of regulating and cultural services.	As a result of eutrophication of waterways and threats to drinking water supply, many Asian countries have reduced fertilizer subsidies, including Pakistan (from US $178 million to US $2 million per year), Bangladesh (US $56 million to US $0), and the Philippines (US $48 million to US $0) (Myers 1998).
Set limits and establish trading systems for use of ecosystems and their services.	Achieves more cost-effective improvements in ecosystem services than conventional regulatory approaches.	Ensuring limit is stringent enough to provide an incentive to participate Allocating permits or credits in cases of unclear property rights. Keeping transaction costs manageable, especially for non-point sources.	In 1980, New Jersey established Tradable Pinelands Development Credits to limit development in environmentally sensitive areas and allow prospective developers to trade for development rights on available land (Landell-Miles and Porras 2002). In 1999, Australia established a Water Transpiration Credits Scheme, to reduce river salinity (Brand 2005). Under its National Water Initiative, Australia sets limits on water use in the Murray Darling Basin and, as of January 2007, the basin states are able to buy and sell permanent water entitlements (Parliament of Australia 2006).
Fund valuation of ecosystem services and research into improving valuation methods.	Increases societal awareness of the value of ecosystem services and strengthens cost-benefit analysis for public decisions.	Dealing with techniques for valuing ecosystem services that are still in their infancy. Discrediting ecosystem service approach by overestimating values.	A study found Canada's Mackenzie Watershed's 17 ecosystem services worth nearly US $450 billion undisturbed, offering new perspective of economic benefits and costs of proposed gas pipeline (Canadian Parks and Wilderness Society 2007). A study found that on a single Costa Rican farm natural pollination by insects increased coffee yields 20 percent on plots that lay within a kilometre of natural forest, service worth approximately US $60,000 (Rickets et al 2004).
Use procurement policies to focus demand on products and services that conserve ecosystem services.	Creates incentives for suppliers to adopt approaches that are ecosystem friendly.	Avoiding high transaction costs of demonstrating responsible behaviour Implementing cost- effective monitoring and verification systems.	UK Government timber procurement policy stipulates timber must come from legal and sustainable sources (CPET 2007).
Support wetland banking schemes.	Provides way of maintaining overall services provided by wetlands by requiring substitution by developers.	Ensuring that substituted wetlands are of equal value to those destroyed Ensuring equity for local populations who lose services.	Wetland banking schemes in California allow developers who destroy wetlands to offset the environmental damage by paying to protect a sensitive wetland in another location (Office of Policy, Economics, and Innovation and Office of Water 2005).

POLICY OPTION	HOW IT WORKS	DESIGN AND IMPLEMENTATION CONSIDERATIONS	EXAMPLES OF EXPERIENCE
Include ecosystem services in sector policies and strategic environmental assessments (SEA).	Goes beyond addressing impacts of economic development to look at dependence on services. Broadens scale of analysis.	Dealing with limited experience of public sector using Ecosystem Services Approach in decision processes and limited information on ecosystem services.	South Africa's Working for Water Program combines social development goals of job creation and poverty relief, and agricultural goals of increasing productivity of cleared lands, as well as ecosystem rehabilitation goals of eradicating alien species and restoring stream flows (Department of Water Affairs and Forestry 2007).
Set targets to encourage use of renewable energy.	Provides incentive to replace fossil fuels with renewable sources.	Using land to produce renewable energy sources such as biofuels can lead to soil erosion and degradation of ecosystem services such as water quality.	Under the UK Renewable Transport Fuel Obligation, transport fuel suppliers must ensure a proportion of their fuel sales is from renewable sources, as of 2008 (Commons 2007).
Require ecosystem management best practices in granting licenses or concessions.	Creates incentives for managing ecosystems in ways that sustain ecosystem services.	Defining and enforcing best practice standards.	Cameroon's 1996 Forest Code calls for all commercial logging to be regulated under designated forest concessions. This legislation establishes rules for concession allocation, local distribution of forest revenues, as well as requirements for submitting and gaining approval for forest management plans (WRI 2007).
Use zoning or easements to keep land available for priority ecosystem services.	Provides way to maintain priority ecosystem services.	Needing legal framework in place and fair political process to apply zoning.	Some flood plains are zoned for uses such as recreation or agriculture rather than housing or commerce. Easements can be used to keep land available for cultural and regulating ecosystem services.
Use physical structures or technology to substitute for ecosystem services.	Provides a substitute for degraded ecosystem services that may mimic natural design.	Building structures such as sea walls to substitute for ecosystem services such as coastal protection often simply shifts the problem, distributing costs and benefits unfairly, fostering false confidence, and providing only a single benefit rather than multiple benefits of ecosystem service.	Seattle's street edge projects mimic natural ecosystems, reducing storm water runoff by 99 %. Roof gardens also reduce runoff (Seattle Public Utilities 2007). Dikes and levees substitute for coastal protection. Sea walls avoid coastal erosion.
Use regulating ecosystem services such as natural hazard protection or water filtration instead of built structures.	Usually provides co-benefits such as carbon storage and recreation.	Procuring time and funds for negotiations and continued maintenance. Dealing with limited knowledge about ecosystem service flows, especially for regulating and cultural ecosystem services.	New York City protected its watershed instead of building a filtration plant (US EPA 2007b). Reforestation and conservation of mangroves in coastal areas affected by the 2004 tsunami can help prevent future damage (UNEP-WCMC 2006).

POLICY OPTION	HOW IT WORKS	DESIGN AND IMPLEMENTATION CONSIDERATIONS	EXAMPLES OF EXPERIENCE
Establish certification schemes that encourage best management practices.	Provides those growing or harvesting timber, fish, or crops a way to learn about best management practices and to demonstrate use of the practices.	Ensuring development of transparent, scientifically valid standards and their adoption. Paying transaction costs that may limit participation Informing consumers.	U.S. Department of Agriculture provides farms with organic certification (USDA 2006). Forest Stewardship Council provides certification for sustainable timber harvesting practices (US FSC 2006). In the Pacific U.S. states, "Salmon-safe" certifies farms and urban land that practice fish-friendly management (IUCN 2007).
Introduce education or extension programs on good practices.	Provides knowledge to those maintaining ecosystem services.	Providing economic incentives for participation.	U.S. National Conservation Buffer Initiative educates farmers to control pollution by using filter strips and other measures such as wind barriers (USDA NRCS 2007).
Develop and encourage use of products and methods that reduce dependence and impact on ecosystem services.	Reduces degradation of ecosystem services by avoiding harmful substances or using services more efficiently.	Evaluating potential negative trade-off, such as organic agriculture potentially requiring use of more land, which could lead to further habitat conversion.	Drip irrigation in Israel allows for more efficient use of water for agriculture (Sandler 2005). Rainwater harvesting practices increase the supply of drinking water in parts of India (CSE India 2004). Organic agriculture reduces negative impacts on soil and water by avoiding agrochemicals.
GOVERNANCE			
Clarify or strengthen local community rights to use and manage ecosystem services.	Ensures involvement of stakeholders who may depend on ecosystem services for their immediate livelihood and well-being.	Identifying who represents the community, clarifying the role of traditional authorities, ensuring that women and the poor are included.	Vietnam's 1994 Land Law allows organizations, households, and individuals to manage forests for long-term purposes. Some one million families living in upland areas have managed five million hectares of forest. This decentralization has resulted in an increase in protected forests as well as an increase in the benefits the people gain from the forests' services (FAO 2000).
Develop and use private and public sector indicators for ecosystem services.	Provides information about the state of ecosystem services and shows where practices need to be changed.	Obtaining funding to develop ecosystem indicators and continued funding to disseminate and use data on regular basis.	The European Union makes indicators on natural resource management publicly available online (Eurostat 2006). Silicon Valley Environmental Partnership provides indicators and tracks local trends to foster more informed decision making (Silicon Valley Environmental Partnership 2007). Global Reporting Initiative standards for corporate sustainability reports require companies to report on water and natural resource use (GRI 2007).

POLICY OPTION	HOW IT WORKS	DESIGN AND IMPLEMENTATION CONSIDERATIONS	EXAMPLES OF EXPERIENCE
Establish processes to work across levels of government, from local to national.	Shifts focus to boundaries of ecosystem services rather than boundaries of government jurisdictions, uses complementary authorities, skills, and resources of different levels of government.	Requiring transaction costs and time for building partnerships.	In Samoa, 40 local communities work with national agencies to co-manage fisheries. National government provides legal authority, research, market information, credit, and transport. Local communities have clear rights and authority to manage local fishery under a management plan (WRI et al 2005:93).
Ensure public access to information and participation.	Allows the public to hold public and private actors accountable for their actions in relation to ecosystem services.	Requiring investment in building the capacity of individuals, civil society, and government to produce, analyse, disseminate, and use information and to engage effectively in decision making.	Evaluation of Brazilian ecological tax system recommends making amounts transferred public so local governments can be held accountable for their use (WWF 2003).

Source: WRI (2008)

Options for policy intervention should be weighed according to the criteria listed below.

- Political viability: To what extent will the measures be supported by high-level decision-makers and politicians? Are they consistent with, and do they support, key development goals and political agendas?
- Public and ethic acceptability: Have the people who will be affected by the measures indicated their support, and are they in harmony with broader social and cultural norms?
- Legal authority: are the measures enabled, and supported, by law? Do they contravene any informal or customary arrangements?
- Economic viability: Is there a net benefit to deploying the measures for society at large or for the groups involved? If there remain uncaptured benefits or uncompensated costs, can transfer mechanisms be deployed to balance these?
- Equity and fairness: Will any group be made disproportionately better or worse off by the measures, particularly poorer or more vulnerable sectors of the community? If so, can redistributive mechanisms built in where needed?
- Financial viability, sustainability and cost-effectiveness: Will there be sufficient funds committed, or generated, in order to cover the costs of the measures over the long-term? Are they the most cost-effective means of reaching a particular outcome?
- Effectiveness and reach: Do the measures have a high chance of success, and of reaching the largest possible number of target participants/beneficiaries?
- Urgency: Which measures address the highest priority needs and desired outcomes?
- Institutional capacity and sustainability: Is there the organisational set-up and institutional capacity to deliver the measures, and to monitor and enforce them over the long-term?
- Ease of implementation: Are the measures realistic to implement in the given time frame, resource budget and skill-set?

NOTES

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VALUES

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