

## Chapter 5

# From ecosystem services assessment to actual change

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Woman bringing sardines to the market in Uvira, DR Congo © L. Janssens de Bisthoven

### RELEVANCE FOR AFRICAN BIOSPHERE RESERVES

- While the concept of ecosystem services, which links biodiversity to human well-being, is well-known, its translation into actual management decisions remains uneven. Information gathered through ecosystem services assessments ideally needs to be used to inform decisions that will impact these services and their management in a positive manner. However, assessment is only a means to an end, and should form part of a whole process designed to **engage stakeholders** throughout, with the final objective of **producing an outcome** that can be synthesized for the sustainable management of biosphere reserves.
- This outcome will only be reached if **changes** (in behaviour, management, governance, etc.) occur as a consequence of the ecosystem services assessment. Key elements that induce changes are **scoping, continuous stakeholder engagement and communication**.
- **Stakeholder engagement** is not only regarded as an essential element in environmental management and decision-making, it is also considered critical in the context of ecosystem services. Stakeholder participation in research can enhance the credibility of information, in relation to the scientific adequacy of technical evidence and arguments. The experiential knowledge brought to the table by stakeholders (local or indigenous knowledge) is likely to lead not only to 'better' information and knowledge about the social and economic importance of ecosystem services, but also to much richer knowledge and **stronger ownership and impact**.
- Communication is not an afterthought. Efforts should be made throughout the process to understand who might have a stake in the area of focus (positively or negatively), and what approach may work best to engage with them. This chapter summarizes **communication methods** best suited for different targets audiences in biosphere reserves, and presents field examples of **stakeholder involvement in research**.

## HOW TO ACHIEVE ACTUAL CHANGE

### Empowering governance

Before local work in biosphere reserves can start, national and regional governance should be in place to create a conducive and empowering environment for environmental legislation, data sharing, cooperation between local authorities, policy integration and coherence, coordination, administrative capacities and consistency and quality of enforcement, coherent and coordinated scientific support and research, and incentives for businesses to develop a green economy.

This means that the national governments (and their sub-national bodies) need to integrate the goals of biodiversity and climate change from multilateral environmental agreements (MEA), such as the Convention on Biological Diversity (post-)Aichi targets,

the Sustainable Development Goals, the Paris agreement on climate change and the African Union's Agenda 2063, into their national strategies and development plans (see **Box 3**). Moreover, governments, through their parliaments, need to adapt the fiscal and jurisdictional environment to be able to adopt and implement those policies as part of a legal and stable framework. This demands sustained mainstreaming efforts across sectors, which requires significant additional capacity-building for civil servants, policy-makers and decision-makers. Moreover, existing scientific and multi-disciplinary talents need to be harnessed and motivated through officially backed networks and forums to implement these policies and plans in order to effectively promote a better understanding of the ecosystem services in biosphere reserves and their utility for poverty alleviation, social and gender equity, and sustainable development.

## HOW CAN ECOSYSTEM SERVICES TOOLS CONTRIBUTE TO BETTER BIOSPHERE RESERVE MANAGEMENT?

If the ecosystem services concept is to support the sustainable management of biosphere reserves, there needs to be a *systematic, robust and credible assessment* of the state and trends of these services (Bagstad et al., 2013). Such an assessment will allow managers to evaluate threats endangering key ecosystem services in biosphere reserves, and to develop *actions* to counter negative trends. It will also help communicate the added value of biosphere reserves to a wide range of stakeholders.

Information gathered through an ecosystem services assessment ideally informs decisions that will impact ecosystem services in a positive way. However, assessment is only a means to an end, and should form part of a whole process designed to engage stakeholders, with the final objective of strengthening the sustainable management of biosphere reserves. Biosphere reserves need to be future proof, in order to achieve *'improved outcomes for ecosystem services and human well-being'*.

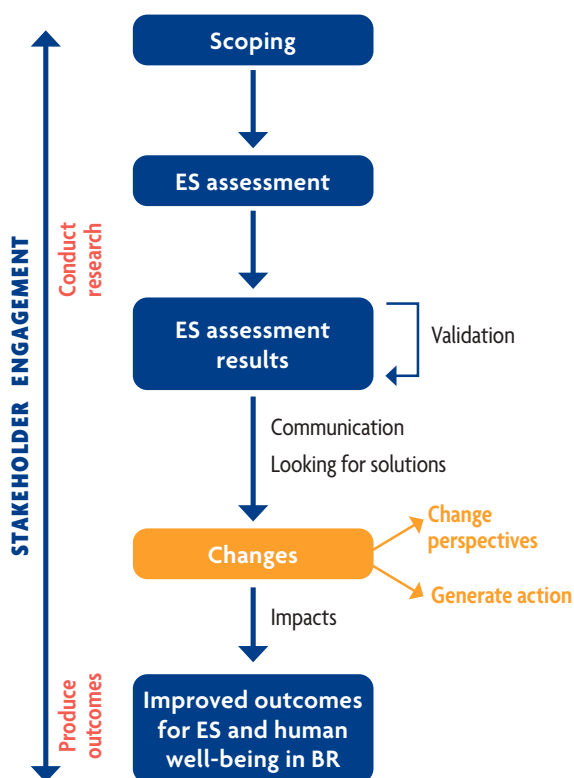
Ecosystem services information can impact decision-making. Ecosystem services tools are particularly useful for changing perspectives and generating action.

The path towards making management decisions for ecosystem services consists of five main steps (Martinez-Harms et al., 2015):

1. Identify the problem in its social–ecological context.
2. Specify the objectives and associated performance measures.
3. Define alternative management actions and evaluate the consequences of those actions.
4. Assess trade-offs and prioritize alternative management actions.
5. Make management decisions.

‘Improved outcomes for ecosystem services and human well-being in biosphere reserves’ can only be achieved if changes occur as a consequence of the ecosystems services assessment. Key elements to induce changes are scoping, continuous stakeholder engagement and communication (Figure 62).

**FIGURE 62.**  
**PROCESS OF ACHIEVING OUTCOMES ON THE BASIS OF ECOSYSTEM SERVICE ASSESSMENT**



**How were you able to put the concept of ecosystems services into practice?**

‘Knowledge sharing to better manage the biosphere reserve. The concept of ecosystem services can enable us to diversify approaches for effective conservation, and also to be friendly to the communities and nature. Once there is trust and transparency, those systems work. For example, based on the knowledge that ecosystem services can be used for the effective conservation of the park, we are now able to convince local communities to protect them.’

*Biosphere reserve manager*

**HOW CAN ECOSYSTEM SERVICES ASSESSMENTS TRIGGER CHANGE?**

Ecosystem services assessment tools focus mainly on changing perspectives and generating action.<sup>1</sup> However, the opportunity to influence decisions may only arise within short time windows (Rose et al., 2017) (see Box 30).

**Ecosystem services assessments change perspectives**

The use of ecosystem services assessments can result in the following shifts in perspectives:

- People increasingly realize that there is a strong connection between people and nature.
- People become aware of, understand and discuss biodiversity and ecosystem services.
- People recognize the multiple values of ecosystem services.
- People start to look at nature differently.
- People acknowledge the vulnerability of ecosystem services provision, and hence the vulnerability of their livelihoods if no action is taken.
- People show willingness to contribute to finding solutions.

**Ecosystem services assessments generate action**

The use of ecosystem services assessments can generate various types of action:

- The inclusion of evidence-based information on ecosystem services in decision-making happens by way of:
  - plans and policies that take impacts on biodiversity and ecosystem services into account with a view to establishing new policy and finance mechanisms (Ruckelshaus et al., 2015);
  - local development plans/management plans that focus on how to maintain and improve the stocks and flows of ecosystem services (once identified through the assessment);
  - improvements in biosphere reserve zonation and regulations that are fine-tuned to maintain and improve the stocks and flows of ecosystem services; and
  - mainstreaming in local bylaws, as a wide range of stakeholders becomes aware of the value and importance of biodiversity and ecosystem services.
- The commitment of key stakeholders is strengthened through the participatory nature of the ecosystem services assessment.
- The use and management of ecosystem services is changed and become more sustainable.
- The ecosystem services assessment contributes to greening the local economy (see Box 31).

<sup>1</sup> See the framework proposed by Ruckelshaus et al. (2015) for further information.

*'The ecosystem services concept helps to bring all stakeholders together. Where I come from, when we think of the ecosystem services approach, we think of farmers, pastoralists, those who are doing the mining, the national park itself, operators, the communities who benefit from tourism. We need to have an ecosystem services approach so that all of us can work together; you can't work in isolation.'*

**Senior Assistant Conservation Commissioner Dr Noelia Myonga  
Lake Manyara National Park (Lake Manyara Biosphere Reserve  
manager, Tanzania)**

*'The concept of ecosystem services allows states to implement commitments made at the Rio Summit on Sustainable Development, and to have tools that lead us towards something concrete. This approach allows states to realize the economic potential of ecosystem services. This potential can be used for local development or the development of the area.'*

**Member of CEEAC**

*'People tend to appreciate and realize how important ecosystem services are as far as improvement of their livelihoods is concerned. The ecosystem evaluation approach is good to help decide among us the different competing users, and whether to do project A or project B.'*

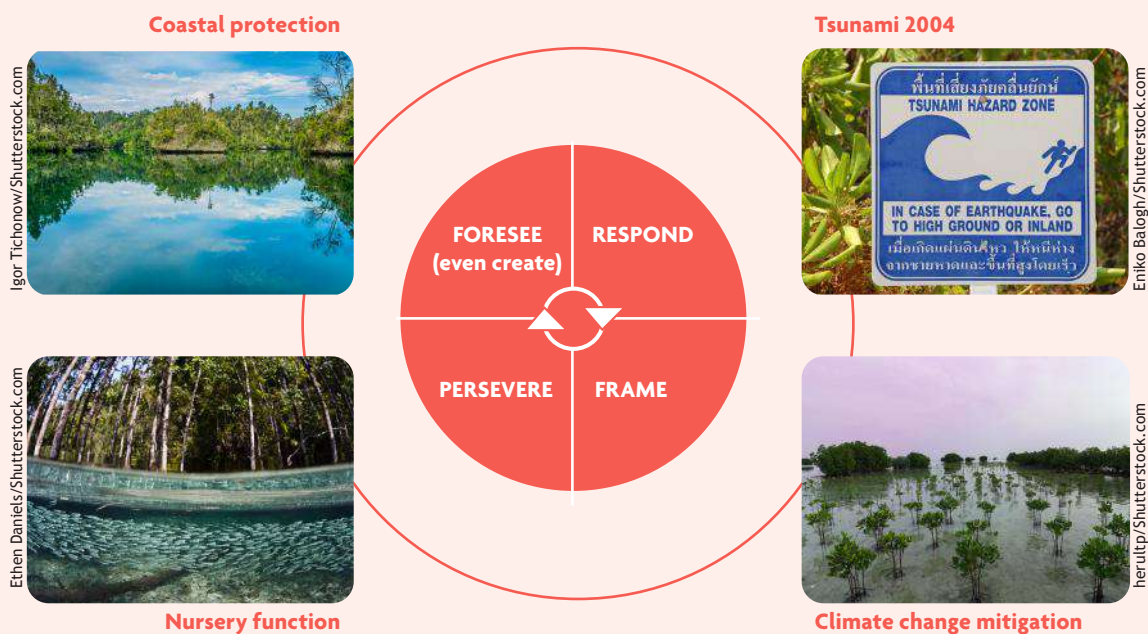
**Scientist**

**BOX 30.  
WINDOWS OF OPPORTUNITY AND HOW TO USE THEM**

Ecosystem services assessments ultimately aim to influence decisions, and hence are designed to have a real-world impact. However, the opportunity to influence management decisions may only arise within short time windows (Rose et al., 2017). An ecosystem assessment exercise may therefore have a negligible or a huge influence depending on when it is presented. These 'windows of opportunity' are sometimes predictable, but are often hard to anticipate. Rose et al. (2017) describe four ways to respond to windows of opportunity and increase the likelihood of knowledge uptake: 1) foresee (and create) emergent windows, 2) respond quickly to opening windows, 3) frame findings in line with appropriate windows, and 4) persevere in closed windows.

Figure 63 illustrates the cycle for responding to policy windows using the example of mangrove conservation and management. The 2004 Asian tsunami was an unexpected event that showcased the role played by mangroves as bio-shields protecting coastal communities. The framing of mangroves as carbon sinks is assuming increasing importance in times of global climate change. Long-term foresight regarding the role of mangroves as coastal protection has also made it easier to react to policy windows when they open. However, for some mangrove functions, such as their role as nurseries for fish, policy windows remain elusive (Koedam, Di Nitto and Hugé, 2018).

**FIGURE 63.  
RESPONDING TO POLICY WINDOWS FOR MANGROVE CONSERVATION AND MANAGEMENT**



Source: Koedam, Di Nitto and Hugé (2018), Elsevier Creative Commons.



**BOX 31.**  
**THE CONTRIBUTION OF THE GREEN ECONOMY TO BIOSPHERE RESERVES**

A focus on ecosystem services as part of the ongoing conservation debate can contribute to a transition towards a greener economy.

According to the United Nations Environment Programme (UNEP), a green economy is an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy is low carbon, resource efficient and socially inclusive (UNEP, 2011). UNEP's Green Economy Initiative (GEI) is designed to assist governments in 'greening' their economies by reshaping and refocusing policies, investments and spending towards a range of sectors, such as clean technologies, renewable energies, water services, green transportation, waste management, green buildings and sustainable agriculture and forests (UNEP, 2019). The 'green economy' narrative is directly relevant for biosphere reserves.

The project 'Green Economy in Biosphere Reserves (GEBR): A means to biodiversity conservation, poverty reduction and sustainable development in sub-Saharan Africa' was implemented in the **Bia Biosphere Reserve (Ghana)**, the **Omo Biosphere Reserve (Nigeria)** and the **East Usambara Biosphere Reserve (Tanzania)**, and focused on the provision of alternative income-generating activities, while reducing the pressure of local communities on forests, lands adjacent to the biosphere reserves and other vital ecosystem services. Specific alternative livelihood activities designed to generate a green economy were designated for each site, such as sustainable palm oil production, apiculture (beekeeping), mushroom farming, the domestication of smaller animals (e.g. snails and

grasscutters), fish farming, sugarcane farming, butterfly farming, local crafts (e.g. basket making and mats) and eco-tourism.

Specific approaches that can contribute to a greener economy in biosphere reserves are as follows:

- Work to better understand the potential of existing ecosystem services for the sustainable development of local communities.
- Install payment for ecosystem service (PES) schemes (see Chapter 4).
- Incorporate environmental externalities into business plans.
- Follow the precautionary principle.
- Apply 'the polluter pays' principle.
- Include local communities in the local and global economy and all development strategies and action plans.
- Implement alternative livelihoods as an alternative to illegal activities.
- Ensure National Biodiversity Strategies and action plans (and similar plans) include a section on the green economy.
- Mainstream biodiversity into economic sectors.
- Mainstream the economy into biodiversity and conservation.
- Involve the private sector in conservation.

It is important, however, to note that the 'green economy' concept can provoke controversy, especially with regard to ecological and social trade-offs. This suggests that limits and social standards may be required (Heinrich Böll Stiftung, 2012).

More information on GEBR is available at [www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/man-and-biosphere-programme/networks/afriab/gebr-project](http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/man-and-biosphere-programme/networks/afriab/gebr-project).

**FROM ECOSYSTEM SERVICES TO VALUE CHAINS**

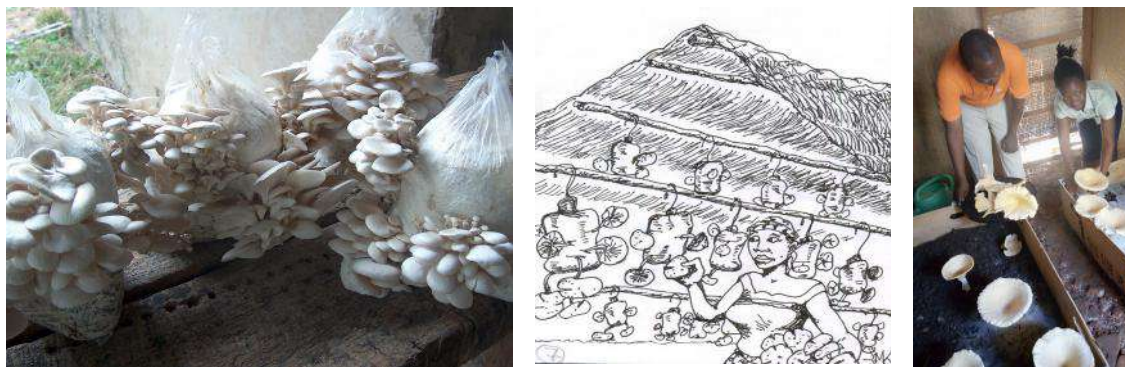
Decisions regarding how best to promote and develop the different values (ecological, economic, social and cultural) of identified ecosystem services into value chains will be strongly dependent on the local context and existing development plans.

A variety of approaches exist that may cover diverse topics (see **Box 31**). For example, an **integrated water management plan** could be developed to ensure a more equal sharing of water resources among the different beneficiaries of ecosystem

services (e.g. food from agriculture, cattle grazing, tourism, drinking water and biodiversity conservation).

Alternatively, the cultivation of **wild edible mushrooms** could be transformed into small businesses, through credits, equipment, market analysis, business plans and capacity building, with a view to sustainably harvesting or cultivating and processing the mushrooms for own consumption and the market (see **Figure 64**).

**FIGURE 64.**  
**CULTIVATING MUSHROOMS IN THE AFRICAN GREAT LAKES REGION**



© S. Dibaluka and Y. Mwinyi Waziri  
Source: Kiyuku, Dibaluka and Degreef (2020); Mwinyi Waziri et al. (2020).

The **ecosystem service value chain analysis (ESVCA)** framework (Rawlins, De Lange and Fraser, 2008) aims at facilitating and analysing ecosystem services value chains. It is based on a study about flood attenuation services in South Africa and may help uncover ways to develop such value chains related to or derived from ecosystem services in biosphere reserves. The framework applies many aspects discussed in this manual, such as stakeholder analysis, focus groups, problem tree analysis and rapid assessment tools (see **Chapter 3**).

Traditionally, **value chain analyses** trace the value added at each step in the life cycle of a particular good or service, from production/harvesting through to final consumption or utilization and waste disposal (Baleta and Pegram, 2014; Kaplinsky and Morris, 2000). At present, the incorporation of ecosystem services thinking into value chain assessments is still in its infancy. As a result, complex system dynamics make provisioning and some regulating services more amenable to detailed analysis because of the relative ease in determining multiple intermediate services (i.e. services that only provide benefits to humans indirectly) (Fisher, Turner and Morling, 2009; Johnston and Russell, 2011).

The **ESVCA process cycle** is divided into five steps (see **Figure 56**):

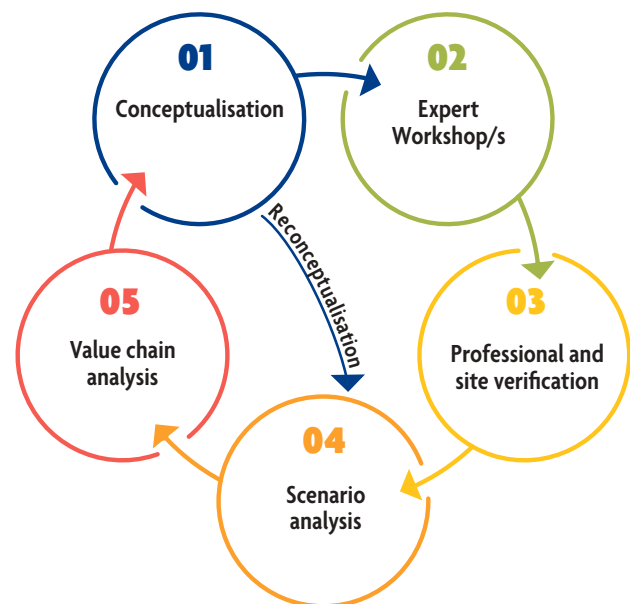
- 1. Conceptualisation.** Delimiting the scope of the problem involves defining the physical extent of the study area, the relevant stakeholders and the particular ecosystem services of interest. The assessment tools described in **Chapter 3** may contribute strongly to this step and to step 2.
- 2. Expert workshops.** This step involves hosting one or more expert workshops with participants from academic and professional backgrounds in the relevant science (e.g. mycology, geomorphology, environmental modelling, ecological economics, hydrology, etc.). The specific objectives of the workshop are to: a) identify and describe ecosystem services that occur in the study area, and b) develop causal loop diagram(s), similar to the 'problem tree', where problem causes and effects are interlinked in a visual manner.
- 3. Professional and site verification.** In this step, an open dialogue is propagated around the realism and accuracy of the diagram produced in the workshop, in order to facilitate the relevant knowledge inputs necessary to define each variable, the relationships between services and the units of measurement.
- 4. Scenario analyses.** A particular system change or disturbance is identified, and the resultant impacts throughout the system are methodically analysed to

scrutinize the accuracy of the model and address the problem statement. Each scenario either simulates a potential opportunity or challenge that directly or indirectly affects the provision of a particular ecosystem service.

- 5. Value chain analysis** (eventually resulting in a reconceptualisation linking back to step 4). Finally, the workshop participants analyse several possible value chains of the socio-ecological system considered and indicate which elements in the diagram have been mobilized to this end. The discussion focuses on the demand side, identifying causal pathways and leverage points to attain the objective of increasing the value of identified ecosystem services. The process explores potential management options for each of the scenarios to provide future planning opportunities to improve positive impacts or mitigate negative impacts on the provision of ecosystem services.

Concrete examples for each step of the process, applied to flood attenuation services in South Africa, may be found in Rawlins et al. (2018).

**FIGURE 65.**  
**THE PROCESS CYCLE OF ECOSYSTEM SERVICE VALUE CHAIN ANALYSIS (ESVCA)**



Source: Rawlins, De Lange and Fraser (2018).

## STAKEHOLDERS: HOW AND WHEN TO ENGAGE THEM

Biosphere reserve management and decision-makers need to create a safe context or safe space where local people, including all social, gender and age groups, can air their opinions about management decisions concerning the area in which they live or on which they depend, in relation to water allocation, hunting or fishing quotas, community co-management and other issues. This is especially the case in biosphere reserves where various stakeholders participate in management of the area.

In the context of conservation and management of protected areas, the term 'stakeholders' refers to people that have a stake in something. This can be defined according to several criteria, such as their **interest** in the topic (e.g. water, conservation, integrated management), as well as their potential or real **influence** on the processes under consideration.

Mapping of stakeholders or stakeholder analysis is an important step that must be undertaken **prior to any other assessment**, because any ecosystem services assessment will refer to possible changes and actions at the level of stakeholders.

Several methods exist to map stakeholders, but the **power (influence) – interest grid** is one of the most visual and explicit (See Thompson (2020)). It plots different stakeholders across the four quadrants of a figure while relating them to each other. It also suggests approaches such as 'keep them satisfied', 'manage them closely' and so on.

This kind of exercise can be conducted in a focus group setting or a workshop. However, it is important to be conscious of the composition of the stakeholder group. If the hierarchy gradient is very wide, people with less 'power' will also be inclined to express themselves in a group setting, since the 'power dynamics' will prevail. This is particularly true for women and marginalized groups.

Next to the degree of power and interest (e.g. expressed with a score system or – and + signs), stakeholders should be listed according to their affiliation, role, sector, expectations from the project, internal or external position to the project, gender and so on. **Box 32** provides an example of a stakeholder analysis.

### BOX 32. STAKEHOLDER ANALYSIS: LAKE MANYARA BASIN (TANZANIA)



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A stakeholder workshop was organized in **Lake Manyara Biosphere Reserve, Tanzania** in 2015. One of the objectives was to perform a stakeholder analysis to better understand the complex social-ecological system of the Lake Manyara basin, in particular regarding water use and management.

The analysis listed 31 stakeholders with a stake in water management in the area, as well as their interest, activities and/or area of focus. **Table 15** provides an extract from the analysis.

The initial list of stakeholders was then classified into four categories, and the power-interest grid was applied.

This exercise enables collective discussion about the role of each stakeholder, highlights key stakeholders, and helps determine how best to involve and communicate with each of these groups throughout the project. For example, those placed in the top-right quadrant (High interest/high power) should be fully engaged in the project.

**TABLE 15.**  
**STAKEHOLDER ANALYSIS CONDUCTED DURING A STAKEHOLDER WORKSHOP IN LAKE MANYARA**

Stakeholder	Interest, activities and area of focus
Ujamaa-CRT	Land use, pastoralists, land use rights, land protection
Trias NGO	Sustainable natural resources, small-scale farmers
Mwiwata (farmers org.)	Small-scale farmers
Monduli district	Administration planning land aspects and natural resources
TANAPA (Tanzania National Parks)	Conservation of Lake Manyara and associated biodiversity; improving the livelihoods of surrounding communities in support of conservation
Royal Belgian Institute of Natural Sciences	Communication at the science-policy interface; translating aquatic science into socio-economic relevance; linkages with the vice president's office
Nelson Mandela Institute African Sc and Tech	Academia for society; translating the management of water resources and biodiversity into benefits for communities
Internal drainage basin water board	Water management and allocation; abstraction from bore holes; furrows (irrigation)
Tour operators	Tourists within and outside the national park
Pastoralists	Land use, land rights, land protection (Datonga, Sukuma, Masaai)
Farmers (small-scale)	Rice, banana, maize, beans, vegetables, fruits, sugar cane
Farmers (large-scale)	Rice, sugar cane, maize, beans
Mto Wa Mbu cultural tourism programme	Walking around villages (homesteads, dancing, cooking, etc.), walking safaris, community support, cultural tourism
Ngorongoro conservation Area Authority (NCAA)	Springs, forest water catchments, multiple land uses (e.g. visiting the crater for salt licking)

**TABLE 16.**  
**POWER-INTEREST GRID APPLIED TO THE STAKEHOLDERS IN LAKE MANYARA**

High interest/low power	High interest/high power
Universities, hunting companies, tour operators, pastoralists, small-scale farmers, fishermen, middlemen	Trias NGO, Mwiwata, TANAPA, Ujamaa-CRT, Monduli district, Internal drainage basin water board, regional commissioners, large-scale farmers, Mto wa Mbu, wards, NCAA
Low interest/low power	Low interest/high power
World Vision NGO	Districts



## Why is involving stakeholders important?

There are two reasons why stakeholder participation is important.

First, involving stakeholders **impacts the relationships between stakeholders** in many ways. The mere fact of interacting and getting to know each other and the diverse interests and issues at stake, is a key first step in moving towards effective, socially robust conservation. Engaging with stakeholders on a specific topic, such as mapping the ecosystem services in a specific area, or playing a game to illustrate the power balances or benefits related to these services, has both direct and indirect impacts on stakeholders and their mutual relations.

Such collective exercises can build awareness, acceptance, trust, ownership, societal support and mutual understanding, and promote peace and conflict mitigation as part of a continuous learning process.

Second, involving stakeholders **allows for the collection of a range of useful knowledge, information, traditional beliefs and knowledge, scientific facts and figures**. These can provide new insights into power balances, help identify knowledge gaps, determine priorities for scientific research, and help identify conflicts, common interests and possible synergies, as well as possible solutions (which can be discussed and voted upon through a multicriteria decision analysis).

However, when engaging with stakeholders, it is essential to remember the following:

- Be clear about the objective of the venue, event, seminar, workshop and focus group.
- Explain these objectives in a clear and transparent way.
- Avoid the creation of false or unrealistic expectations (e.g. 'after the workshop you will all have a better life').
- Acknowledge complexity and conflicts and analyse them without prior judgement.
- Be well aware of the prevailing governance structure or map it in a stakeholder analysis.
- Avoid polarization, but promote common understanding through 'neutral grounds or language' such as the DPSIR framework (see **Box 13**).
- Ensure moderation is performed by a third party accepted as sufficiently neutral and objective.
- Disseminate the workshop report to all those involved.
- Undertake follow-up to avoid 'one shot actions'.  
A subsequent workshop can aim to:
  - deepen the subject;
  - fine-tune the results;
  - add some stakeholders;
  - work out a timeline with milestones to achieve clear goals;
  - encourage stakeholders with decision and management power to commit themselves; and
  - devise a strategy to locate resources to achieve the more ambitious changes.

### BOX 33.

#### ENGAGING LOCAL STAKEHOLDERS IN ASSESSMENT OF THE SUPPLY AND USE OF ECOSYSTEM SERVICES IN THE DJA BIOSPHERE RESERVE, CAMEROON

By S. Lhoest (University of Liège, Gembloux Agro-Bio Tech, Belgium)

The Dja Biosphere Reserve is situated in the dense forest ecosystems of the Guineo-Congolian Region in Cameroon, Central Africa. Efforts to engage with local stakeholders through 225 individual interviews in the Dja area have elicited perceptions of the importance and abundance of ecosystem services, their supply and use (Lhoest et al., 2019). Complementary participative field monitoring and interviews were used to determine the ecosystem services for which supply was perceived as the most variable, namely bushmeat, firewood, timber and all cultural services (Lhoest et al., 2020).

This assessment focused on local populations as direct beneficiaries of ecosystem services, and engaged with the wide range of local forest stakeholders including: local populations, logging companies, the Ministry of Forestry and Wildlife, community forest entities, NGOs and the associative sector, universities, consultants and researchers. This approach was essential to ensure the social inclusiveness and political legitimacy of the findings and conclusions. Participative and social approaches also support awareness raising and training of local stakeholders about the challenges of social-ecological system management.

Broad stakeholder engagement also allowed for the identification of conflicts and discussion about diverse ways to resolve them. In the Dja Biosphere Reserve, rural populations frequently expressed negative attitudes about the state and conservation in the context of unemployment and high poverty. They considered themselves to be the best potential protectors of nature, but also needed job opportunities (e.g. through the private sector in logging and mining companies) and alternatives to bushmeat in order to generate income, such as ecotourism or the development of a supply chain for fish and non-timber forest products (NTFP). Local communities have also demanded recognition of their user rights to forest resources – an issue that must be considered as part of management of the biosphere reserve. Promoting innovative livelihood-based initiatives for the autonomy of rural communities is acknowledged as a priority for reconciling nature conservation, food security and sustainable forest use.



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### Which stakeholders should be involved?

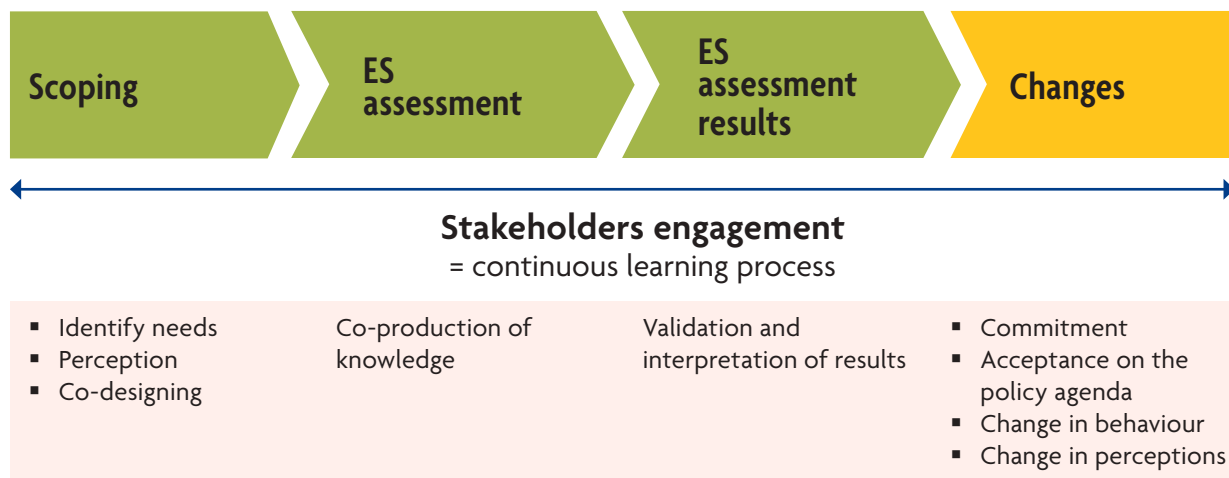
- Most of the important stakeholders will be 'local', but will come from a slightly wider circle than those directly involved. They can be grouped under community leaders (including women, youth, religious and customary), local government, NGOs and entrepreneurs.
- Remote stakeholders outside the boundary of the biosphere reserve that have an impact within the boundaries of the site should be included.
- At the national level, a long list of ministries and departments may need to be considered. These may be reachable collectively through the national MAB Committee.
- Members of Parliament, journalists and business platforms should be involved.
- Depending on the context, regional bodies may be interested and supportive, as well as global organizations (international, NGO) and potential bilateral donors and investors.

Efforts should be made throughout the process to understand who might have a stake in the area of focus (positively or negatively), and which approach may work best to engage them in the proceedings (see **Figure 67**).

**BOX 34.**  
**CO-PRODUCTION OF KNOWLEDGE**

Co-production of knowledge refers to the contribution of multiple actors and their many and various sources of knowledge and capacities to address complex problems (Djenontin and Meadow, 2018). The management of biosphere reserves, which are social-ecological systems in which people and nature are closely linked, benefits from diverse views and types of knowledge. A co-production approach is essential when assessing ecosystem services, as the value of these services will depend on the collective perceptions, use and knowledge of a wide range of stakeholders. Multiple ecosystem services assessment tools focus on co-production, and are explicitly participatory and inter and transdisciplinary. **Box 17** (in **Chapter 3**) proposes various stakeholder engagement methods to facilitate this co-production in practice. The present manual can also be seen as the result of a process of co-production of knowledge.

**FIGURE 67.**  
**STAKEHOLDER ENGAGEMENT THROUGHOUT THE ENTIRE ECOSYSTEM SERVICES ASSESSMENT PROCESS**



## COMMUNICATION

### How to communicate and with whom?

Communicating the key results and conclusions of ecosystem services assessments is of crucial importance to achieving real change and impacts. Whether targeting decision-makers to ensure they consider ecosystems services in plans and policies, or local communities to raise awareness or suggest alternative management options, messages should be carefully tailored to their audience (e.g. clearly explaining benefits) and communication tools should be selected carefully to effectively reach the target public.

**What** to communicate and **to whom** will depend on the results of the stakeholder analysis. How to communicate will depend on the profile of the stakeholders and their interest in the issues at stake (see **Table 17**).

Local communities and youth are key to biosphere reserve engagement and management. The following ideas may be used to communicate the values of ecosystem services to this target group:

- Use local media (e.g. radio shows).
- Collaborate with natural history museums, schools and scientists (link field visit knowledge with museum knowledge).
- Contact UN Goodwill Ambassadors.
- Create activities for Biosphere Reserve Celebration Day (if one exists).
- Link sport competitions to ecosystem services.
- Organize field visits for local communities to allow them to see the core areas of biosphere reserves.
- Give awards for the greenest village, the zero-fire village, etc.
- Establish a link with education (e.g. the Burkina Faso programme 'One school, one forest').
- Support local champions (change makers).
- Develop local brands.
- Use mobile telecommunications operator networks to convey messages regarding ecosystem services, especially to isolated areas.
- Use traditional events (e.g. Christmas, the end of Ramadan) as opportunities to reconnect urban visitors with their home villages in terms of linking people and nature.
- Use tales, drama, dance and music to communicate information about ecosystem services.

**TABLE 17.**  
**COMMUNICATION METHODS BEST SUITED FOR DIFFERENT TARGET AUDIENCES IN BIOSPHERE RESERVES**

Target audience	Interest in ecosystem services provided by the biosphere reserve	Use of the ecosystem services assessment study	Communication tools
Local community	Extractive use, recreational use, harvesting, derived economic benefit (e.g. tourism)	Increase in knowledge about the value of ecosystem services, demonstrate need for and benefits of sustainable use of natural resources	Local outreach, e.g. community education campaign, community meetings, local news story, local radio
NGOs	Conservation, poverty reduction, social and economic development	Provision to all parties of the same data on which to come to a consensus about the economic benefits and losses of biosphere reserves	Policy brief and full report, presentation, side event at regional or international conservation meeting, short film
Decision-makers	Possibly very low interest, lack of awareness of uses and services provided and associated economic benefits	Increase in awareness of the economic use of the ecosystem, describe national and local economic benefits associated with protecting ecosystems and the potential costs/ economic loss of degraded ecosystems	Presentation, maps, policy brief, poll results, individual meetings, short film, story placement in high-profile media
Multilateral/bilateral donors	Possibly low, focused on development agenda	Increase in awareness of the link between biosphere reserves, poverty reduction and social and economic development	Policy brief, presentations at high-level international meetings, individual meetings, international high-profile media

Source: adapted from Hamrick and Gallant (2018).



**BOX 35.**

**POLICY BRIEFS ADDRESSING ECOSYSTEM SERVICES IN PENDJARI BIOSPHERE RESERVE AND LAKE TANA BIOSPHERE RESERVE**

Two policy briefs were produced within the framework of the EVAMAB project (see **Figure 68**). The objective of such documents is to convey a simple message and to present results in a synthetic and visual way. The first brief was created to raise awareness about the importance of key ecosystem services in Pendjari Biosphere Reserve. It was distributed to local research and development

partners and disseminated during a stakeholder workshop with representatives from NGOs, park management authorities, scientists and so on. The second brief aimed at illustrating the economic impact of water hyacinth infestation on farmers in Lake Tana Biosphere Reserve. It was shared among stakeholders involved at different stages of the research project and local authorities (**Figure 68**).

**FIGURE 68.**

**POLICY BRIEFS ON KEY ECOSYSTEM SERVICES IN PENDJARI BIOSPHERE RESERVE AND THE ECONOMIC IMPACT OF WATER HYACINTH INFESTATION ON FARMERS IN LAKE TANA BIOSPHERE RESERVE**

**Les services écosystémiques dans la Réserve de Biosphère de la Pendjari (Bénin)**

**Contexte**

Les populations dépendent de la biodiversité pour leur bien-être quotidien, en particulier dans les zones naturelles telles que la Réserve de Biosphère (RB) de la Pendjari au Bénin. Les bénéfices (biens et services) fournis par les écosystèmes de cette réserve et qui profitent aux populations sont connus sous le terme « services écosystémiques » (SE). Ils sont d'une importance capitale pour le bien-être des populations et pour la subsistance des populations riveraines.

**Que sont les SE ?**

Tous les bénéfices que les populations obtiennent de l'environnement sont les services écosystémiques. Ces services sous-tendent le bien-être des populations en termes d'éducation, de santé, de nutrition, de sécurité et d'identité culturelle. Or, les changements globaux (accroissement de la population, changements climatiques, etc.) exercent une pression sans précédent sur les écosystèmes compromettant parfois irréversiblement la capacité de ces écosystèmes à fournir les SE.

Globalement, les SE sont classés en quatre catégories (cf. Fig. 1) et permettent notamment de :

- limiter les effets du changement climatique ;
- maintenir la fertilité des sols ;
- produire de la nourriture (animale, produits forestiers non ligneux, etc.) ;
- produire de l'énergie et purifier l'air et l'eau ;
- offrir des remèdes contre les maladies ;
- etc.

**Fig. 1.** Les écosystèmes fournissent des services dont dépendent directement les populations, en particulier celles vivant proches d'aires naturelles.

\* Cette classification est en évolution continue, voir <https://doi.org/10.1016/j.ecosyst.2018.05.001>

CEBioS PB n° 12

**The economic impact of water hyacinth infestation on farmers: Case of Lake Tana in Ethiopia**

**Key message**

Local communities in rural areas often depend on the services provided by the ecosystem. Degradation of the ecosystem – in this case through invasive species – may threaten livelihoods and the environment of these communities. Putting an economic value on the impact of the water hyacinth infestation on the actors affected is crucial to proceed to informed, evidence-based decision making at the higher level. This suits in the transition towards the sustainable management of ecosystems, enhancing the quality of life for people, while safeguarding nature's resources. This study aims to investigate the impacts of water hyacinth infestation on the local farming communities in terms of the willingness to contribute in monetary terms as well as willingness to contribute days of labor to reduce or remove the infestation.

CEBioS PB n° 13  
in collaboration with CIBAGISA

Source: Copyright AJ Rochette.

The policy briefs can be accessed here [www.archives.biodiv.be/evamab/docs/publications/copy\\_of\\_peer-reviewed](http://www.archives.biodiv.be/evamab/docs/publications/copy_of_peer-reviewed).

**Short versus medium/long term**

While journalists and politicians react to immediate issues that are gaining traction, 'slower variables' of education, trust building, respect, recognition and partnerships are key to success over the longer term. It is therefore important that short-term issues support the changes needed for the longer term.

## MORE INFORMATION

### Additional resources linked to environmental governance

- Examples proposed by the *European Committee of the Regions* report in 2017  
<https://cor.europa.eu/en/engage/studies/Documents/Environmental-governance.pdf>.
- Jones, T. 2002. Policy coherence, global environmental governance, and poverty reduction. *International Environmental Agreements: Politics, Law and Economics*, Vol. 2, pp. 389–401.
- Fundamental principles of good environmental governance  
<https://globalpact.informea.org/sites/default/files/documents/International%20Environmental%20Governance.pdf>.

### Stakeholder engagement

- The *Biodiversa Stakeholder Engagement Handbook* is a non-academic practical guide for researchers planning and carrying out research projects. It is designed to assist research teams in identifying relevant stakeholders to engage with in order to enhance the impact of their work [www.biodiversa.org/702](http://www.biodiversa.org/702).
- *Valuing Nature: Assessing Protected Area Benefits A Quick Guide for Protected Areas Practitioners*  
[www.researchgate.net/publication/236262751\\_Valuing\\_Nature\\_Assessing\\_Protected\\_Area\\_Benefits\\_A\\_Quick\\_Guide\\_for\\_Protected\\_Areas\\_Practitioners](http://www.researchgate.net/publication/236262751_Valuing_Nature_Assessing_Protected_Area_Benefits_A_Quick_Guide_for_Protected_Areas_Practitioners).

## APPENDIX 1

### Some examples of economic valuation conducted in biosphere reserves

#### Market price

- Analysis and resolution of protected area–people conflicts in Nanda Devi Biosphere Reserve, India  
[www.geocities.ws/srkottapalli/ksrao/maikhurieta2000-agf.pdf](http://www.geocities.ws/srkottapalli/ksrao/maikhurieta2000-agf.pdf).
- Assessing the Ecosystem Services Value of Can Gio Mangrove Biosphere Reserve: Combining Earth-Observation- and Household-Survey-based Analyses  
[www.researchgate.net/publication/257346300\\_Assessing\\_the\\_Ecosystem\\_Services\\_Value\\_of\\_Can\\_Gio\\_Mangrove\\_Biosphere\\_Reserve\\_Combining\\_Earth-Observation-\\_and\\_Household-Survey-based\\_Analyses](http://www.researchgate.net/publication/257346300_Assessing_the_Ecosystem_Services_Value_of_Can_Gio_Mangrove_Biosphere_Reserve_Combining_Earth-Observation-_and_Household-Survey-based_Analyses).
- Nontimber forest product extraction, utilization and valuation: A case study from the Nilgiri Biosphere reserve, southern India  
<https://link.springer.com/article/10.1007/BF02871715>.

#### Contingent valuation method

- Economic valuation of water in a natural protected area of an emerging economy: Recommendations for El Vizcaino Biosphere Reserve, Mexico  
[www.redalyc.org/pdf/339/33926985005.pdf](http://www.redalyc.org/pdf/339/33926985005.pdf).
- What are we missing? Economic value of an urban forest in Ghana  
[www.sciencedirect.com/science/article/abs/pii/S221204161300048X](http://www.sciencedirect.com/science/article/abs/pii/S221204161300048X).
- Recreation Value of Hara Biosphere Reserve using Willingness-to-pay method  
[https://ijer.ut.ac.ir/article\\_19\\_a80b3fb1df7a8627d905cc84cf4343c1.pdf](https://ijer.ut.ac.ir/article_19_a80b3fb1df7a8627d905cc84cf4343c1.pdf).

#### Opportunity cost and alternative cost methods

- Valuing ecological functions of biodiversity in Changbaishan Mountain Biosphere Reserve in Northeast China  
[www.academia.edu/download/33149323/Valuing\\_ecological\\_functions\\_of\\_biodiversity\\_in\\_China\\_Xue\\_and\\_Tisdell\\_2001.pdf](http://www.academia.edu/download/33149323/Valuing_ecological_functions_of_biodiversity_in_China_Xue_and_Tisdell_2001.pdf).

#### Travel cost approach

- Biodiversity and the tourism value of Changbai Mountain Biosphere Reserve, China: A Travel Cost approach  
<https://core.ac.uk/download/pdf/14998179.pdf>.
- The economic benefits of whale watching in El Vizcaino Biosphere Reserve, Mexico  
[www.redalyc.org/pdf/111/11145317006.pdf](http://www.redalyc.org/pdf/111/11145317006.pdf).

#### Choice modelling

- Tourists' and Locals' Preferences Toward Ecotourism Development in the Maya Biosphere Reserve, Guatemala  
[www.researchgate.net/profile/Robert\\_Hearne/publication/225458535\\_Tourists'\\_and\\_Locals'\\_Preferences\\_Toward\\_Ecotourism\\_Development\\_in\\_the\\_Maya\\_Biosphere\\_Reserve\\_Guatemala/links/5540f2450cf232227314ccf.pdf](http://www.researchgate.net/profile/Robert_Hearne/publication/225458535_Tourists'_and_Locals'_Preferences_Toward_Ecotourism_Development_in_the_Maya_Biosphere_Reserve_Guatemala/links/5540f2450cf232227314ccf.pdf).
- Valuing biodiversity attributes and water supply using choice experiments: A case study of La Campana Peñuelas Biosphere Reserve, Chile  
<http://repositorio.uchile.cl/bitstream/handle/2250/120380/Valuing%20biodiversity.pdf?sequence=1>.
- The valuation of forest carbon services by Mexican citizens: The case of Guadalajara city and La Primavera biosphere reserve  
<https://kar.kent.ac.uk/33304/7/ArturoRegionalEnvironmentalChange.pdf>.

- Non-market economic valuation of the benefits provided by temperate ecosystems at the extreme south of the Americas  
<http://repositorio.uchile.cl/bitstream/handle/2250/120384/Non-market-economic-valuation%20of-the-benefits-provided-by-temperate-ecosystems-at-the-extreme-south-of-the-Americas.pdf%3Bjsessionid%3D686FBF311A239338472D9A04004862DB?sequence%3D1>.

#### Mixed approach

- Coupling spatial analysis and economic valuation of ecosystem services to inform the management of an UNESCO World Biosphere Reserve (Manicouagan-Uapishka World Biosphere Reserve, Canada)  
<https://journals.plos.org/plosone/article/file?type=printable&id=10.1371/journal.pone.0205935>.
- Valuation of the Mangrove Ecosystem in Can Gio Mangrove Biosphere Reserve, Vietnam  
[www.iucn.org/backup\\_iucn/cmsdata.iucn.org/downloads/04\\_can\\_gio\\_mangrove\\_valuation.pdf](http://www.iucn.org/backup_iucn/cmsdata.iucn.org/downloads/04_can_gio_mangrove_valuation.pdf).
- Quantifying the potential of restored natural capital to alleviate poverty and help conserve nature: A case study from South Africa  
[https://repository.up.ac.za/bitstream/handle/2263/5813/Blignaut\\_Quantifying%282006%29.pdf?sequence=1](https://repository.up.ac.za/bitstream/handle/2263/5813/Blignaut_Quantifying%282006%29.pdf?sequence=1).