THE ECONOMICS OF
LAND DEGRADATION

# Economics of Land Degradation Initiative: **Practitioner's Guide**

**Principles of economic valuation for sustainable land management based on the Massive Open Online Course „The Economics of Land Degradation"**

www.eld-initiative.org

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CHAPTER

# 01 Why a Practitioner's Guide?

Land has a value for each and every one of us. Fertile soil provides us with plant life, vegetables, grains, and fibres. Forests supply us with timber and firewood. We benefit from fresh water, food, and many other ecosystem services that land provides us with. Land is also emotionally valuable to people as well, perhaps through associating treasured memories such as playing on it as a child. In any case, all societies and people assign historical and cultural value to their landscapes, their nature, and all natural phenomena associated with land.

However, lands are in danger. Globally, a frightening 10 to 20 per cent of drylands are currently facing degradation and 24 per cent of usable land is already degraded. According to the Food and Agriculture Organization of the United Nations (FAO), this results in an estimated economic loss of USD 40 billion per year. Evidently, we have to rethink the ways we treat and use our lands. We can no longer take the services that fertile soil presents us with for granted. Common practices concerning current land use need to be reconsidered if we want it to continue providing for us in the future.

> **The nation that destroys its soil destroys itself.**
>
> *Franklin D. Roosevelt [1937]*

One way to help address the imminent threat of degradation is to enable practitioners across the world to calculate the true economic value of land, when development and conservation fall within their responsibilities. This empowers these key individuals to make informed economic decisions and improve the livelihoods of the people and livestock that depend on the continuous ability of the land to provide.

In this **Practitioner's Guide**, we will be looking at these approaches from various perspectives, and will especially investigate society's perspective: What is the value of land, not only for landowners and immediate stakeholders, but for society as a whole? How can this economic value be estimated?

When estimating the true economic value of land and its services, the practitioner takes the perspective of society as a whole. This view integrates a holistic perspective and enables practitioners to make the best possible decisions for all of society as an input to inform policy-making. In some cases, it can also be useful in informing business decisions.

This Practitioner's Guide reaches out to provide practitioners and decision-makers with the skills necessary to make an economic case for preventing or reversing land degradation and to adopt more sustainable land management options. It is intended for individuals who engage in activities that ultimately determine land use and practices. This includes business owners, managers, students and teachers, activists, NGOs, farmers, engineers, politicians, journalists and other media workers, public service employees, and anyone else interested in learning about environmental valuation techniques with hands-on examples.

This Practitioner's Guide was developed from the ELD interim report (available on the ELD website: *http://eld-initiative.org*) and the Massive Open Online Course "The Economics of Land Degradation" (ELD MOOC) organised by the Economics of Land Degradation (ELD) Initiative in 2014:
*http://mooc.eld-initiative.org*
*https://www.youtube.com/user/ELDInitiative/*

The ELD Initiative is a global assessment highlighting the potential benefits derived from adopting sustainable land management practices and seeks to establish global awareness for analysis of the economics of land degradation. The goal is to provide a methodology for total economic valuation that is both locally applicable and globally rele-

vant, enabling informed decision-makers to strengthen sustainable rural development and ensuring global food, energy and water security. Reports will be produced, based on state of the art research provided by a world-wide network of researchers and practitioners. The ELD Initiative also incorporates capacity building activities into its projects to ensure that qualified personnel are available and present in affected countries. The ELD MOOC and this Practitioner's Guide are part of the capacity building 'pillar' of the ELD Initiative. Further information can be found on the ELD website (*http://eld-initiative.org*).

Numerous people contributed to both the MOOC and the content of this guide and the ELD Team is grateful to all contributors for their hard work.

We assembled this Practitioner's Guide through three primary sources. Firstly, the script for the ELD MOOC *"The Economics of Land Degradation – Principles of economic valuation for sustainable management of land"* written by Dr. Emmanuelle Quillérou of the United Nations University Institute for Water, Environment and Health (UNU-INWEH), the organization responsible for the scientific coordination of the ELD Initiative. Secondly, the presentations and texts provided by the numerous tutors and instructors whose dedication and commitment made the ELD MOOC possible: Dr. Thomas Falk (University of Marburg, Germany), Dr. Hans Hurni (University of Bern, Switzerland), Dr. Daniel Plugge (University of Hamburg, Germany), Louise Baker (UNCCD, Germany), Volker Lichtenthäler (GIZ, Germany), Claudia Musekamp (Infoport, Germany), Mark Schauer, Hannes Etter, Sarah Odera, Tobias Gerhartsreiter and Clemens Olbrich (ELD Secretariat, Germany), Stacey Noel (Stockholm Environment Institute, Kenya) as well as Dr. Richard Thomas, Naomi Stewart and Dr. Emmanuelle Quillérou (UNU-INWEH, Canada). Last but not least, we proudly include excerpts from assignments written during the first ELD MOOC by participants from all over the world.

We hope this step-by-step guide will help you develop the expertise required to independently carry out an economic valuation, enhance your decision-making process, and eventually enable you to implement valuation in your daily work in order to sustainably manage land and improve the livelihoods of people.

# 02 The Value of your Land

## Land degradation

*Defined by the United Nations as a reduction or loss of the biologic or economic productivity and complexity of rain-fed cropland, irrigated cropland or range, pasture, forest, and woodland. In this course, it corresponds to the reduction in the economic value of ecosystem services and goods derived from land as a result of anthropogenic activities or natural biophysical evolution.*

It is important to note that value is not just a price. The tool of total economic valuation can be used to inform decision-making so it benefits society as a whole, not just monetarily reward certain individuals or companies. Values derived with this tool can also inform better redistribution of wealth within society.

## Land Degradation: Causes and Prevention

Land degradation is often the result of land mismanagement, including: deforestation, overgrazing, monoculture, salinization, misuse of fertilisers and/or chemicals, poor farming practices, and soil erosion. Soil erosion in particular is a difficult issue as fertile soil is essentially a non-renewable resource in the context of human usage: it takes

BOX 1

### 6+1 steps to estimate the economic benefits and costs of action:

1. ***Inception***
   Identification of the scope, location, spatial scale, and strategic focus of the study
2. ***Geographical characteristics***
   Assessment of quantity, spatial distribution, and ecological characteristics
3. ***Types of ecosystem services***
   Analysis of ecosystem services stocks and flows
4. ***Role of ecosystem services in community livelihoods and economic valuation***
   Role of the assessed ecosystem services in the livelihoods of the communities; role of overall economic development
5. ***Land degradation patterns and pressure***
   Identification of land degradation patterns, drivers and pressure on the sustainable management of land resources
6. ***Cost-benefit analysis and decision-making***
   Assessment of sustainable land management options

***+1 step:*** Take action!

***Read more:*** ELD Interim Report p. 42

about 2,000 years to generate 10 centimetres of topsoil.

The negative consequences of land degradation affect us all directly or indirectly, through food insecurity, reduced availability of clean water, increased vulnerability to climate change, biodiversity loss, and numerous other impacts.

The good news is that there are clear technical actions and economic instruments to prevent or even reverse land degradation. Technical actions include reforestation, afforestation, and especially the adoption of sustainable agricultural practices. These can be facilitated by economic instruments such as payments for ecosystem services, subsidies, taxes, voluntary payments for environmental conservation, and access to micro-finance and credit.

Through the adoption of sustainable land management alone, up to 2.3 billion additional tons of crop production per year could be delivered, contributing positively to food security and increased income for farmers in degraded areas.

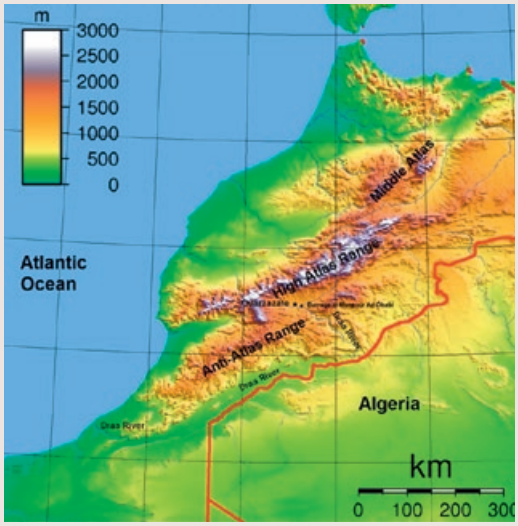
Land degradation is clearly a global issue, but in order to take effective action, issues must also be assessed at the local level. Extensive knowledge about the current state and problems of an ecosystem and its sustainable management is key in developing and implementing projects to prevent land degradation and reverse the negative effects already occurring.

This Practitioner's Guide follows the 6+1 steps to estimate the economic benefits and costs of actions adopted by the ELD Initiative.

BOX 2

**Inception and Geographical Characteristics (steps 1 and 2):**
*Drâa Valley Oasis (Morocco)*

The Drâa Catchment is located south of the central High Atlas Mountain chain between 31.5° north to 29° south and 6.5° to 5.5° west, reaching from the top of the Atlas mountain chain to the Hamada Desert of Lac Irique. It contains an area of 34.000 km$^2$ (square kilometres, equivalent to 3400 ha). Fertile soil in the Drâa catchment is restricted to oasis areas under irrigation agriculture, approximately 2% of the catchments surface. Farmers in the Drâa Valley depend on irrigation for crop cultivation. In the 70s, water for irrigation was mainly drawn from the Drâa River, but during the last decades, irrigation with surface water has been increasingly supplemented by irrigation with groundwater by farmers in the Drâa Valley. Nowadays, farmers in the Drâa Valley use mainly groundwater for irrigation. Agriculture is a major activity for people in the Drâa region. Agricultural products are mainly used for self-consumption to feed large families but also for auxiliary income. Cereals and fodder for animals are the major crops. Date palms and henna used to be cultivated as cash crops, but during the last years agricultural production has changed significantly in the area. This transition occurred due to droughts and changes in prices. Cultivation patterns have changed and many people have migrated to larger cities. The prehistory of the Drâa Valley Oasis land goes back thousands of years, as is evidenced by the many rock art engravings.

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BOX 3

**Inception and Geographical Characteristics (steps 1 and 2):**
*The Notorious Drylands of the Ramanathapuram District (India)*

The target areas are the Muduku-lathur/Kadaladi blocks (Ramanathapuram District):

1. The majority of the cultivable land is left fallow and there is an invasion by alien species (Prosophis juliflora), which leads to continuous degradation of fertile land. The reasons are listed below.
   - Farmers lost the risk appetite to undertake cultivation
   - People migrate to the nearby town in search of decent living as a real alternative livelihood option is not available in the villages
   - Wage labour (cutting P. juliflora) is seasonal and very tough
   - Farmers do not favour animal husbandry since green cover and pasture resources are limited, resulting in poor fodder options. Also, groundwater does not suit animal husbandry options
   - P. juliflora, being an invasive species, is partly responsible for the loss of fertile cultivable land

2. Poor water resources and poor management of existing water resources:
   - Proliferation of P. juliflora led to enhanced degradation of water bodies (tanks, village ponds, waterways, tributaries of rainfed rivers Gundar, Malatar, etc.)
   - Loss of water bodies due to diminishing interest in cultivation among farmers; loss of water storage capacity; invasion of P. juliflora; siltation; encroachment by dwellers etc. (encroachment of waterways by both human and P. juliflora)
   - Poor quality of groundwater resources (saline)
   - Frequent drought occurrences; poor surface water harvesting

3. Non-farming sector activities and industrialisation:
   Gulf of Mannar and Palk Strait – Marine biosphere reserves: Presence of rich biodiversity; priority for marine ecology conservation; coastal zone regulation is a damper for sea resource based industries (a ship breaking

industry was about to settle but the plans were scrapped)
Fishing Industry is limited to Rameswaram areas due to better market linkage and road, transport, and cold store infrastructure etc.
Salt Industry is facing labour issues and infrastructure bottlenecks (incapability to compete with neighbouring Tuticorin district which has better infrastructure and a port).
Sugar Candy Industries (small scale) utilising Palm trees/Palmyrah is not remunerative.
Biomass Power Plants with 10 Megawatt steam generators using biomass (Prosophis) are in operation, but the poor quality of water is not favourable for steam generators, which causes high maintenance costs. Few entrepreneurs have shown interest in spite of favourable policies on power purchase and tax subsidies.
Brick kiln industries & charcoal production related industries are running well but the exploitation of poor people and depleting soil resources are the consequence. [...]
Tourism is restricted only to religious people (Rameswaram-Mandapam-Thirupullani circuit). The islands that are closer to the block are restricted for human entry.
Private drinking water supply is a highly profitable industry. Drinking water is provided to villages and towns through water tankers and plastic cans. But this industry is in decline due to governmental water supply schemes.

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# How to do a cost-benefit Analysis

## Making a choice: Comparing two scenarios

This Practitioner's Guide leads you through the steps involved in planning and assessing an improved land-use scenario. You will become familiar with methods for environmental valuation to estimate monetary values attached to both marketed and non-marketed ecosystem services. We then return to cost-benefit analyses to evaluate whether an improved land use scenario is worth implementing from an economic point of view compared to an 'As-It-Is-Scenario'.

The cost-benefit analysis is a tool that helps decision-makers assess if a project is worth undertaking from an economic perspective. The first step in this approach is to assess the current situation, and the costs and benefits associated with 'business as usual'. We started this process by the inception and geographical characteristics steps to identify the 'As-It-Is-Scenario' (also called 'Without Project scenario').

BOX 4

### Example of cost benefit analysis

*Wadi Gaza (Palestine)*

Without Project scenario: [...] Wadi Gaza used to be home for an extensive variety of endemic plants, reptiles, birds and mammals [...]. Unfortunately since the area is used as a discharge for untreated wastewater [...] the quality and quantity of soil, water, wildlife, and land has suffered considerably. Pollution has led to ecosystem services being lost [...]. Thus also affecting the livelihoods of residents in Wadi Gaza."

"With Project scenario: Wadi Gaza is a livable place where waste is not part of the landscape anymore. People live without their health being threatened. Farming and herding activities have increased but are still expensive because of water shortage due to limited sources for water in the area. Furthermore, some areas are protected for biodiversity purposes (bird/wild life habitats) and other spaces are reserved as recreational areas. A National Park close to the shore will be created [...].

*Author: Ali Salha (Palestine)*

| Wadi Gaza | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| With Project | | | | |
| Benefit (USD Million) | 1 | 2 | 3 | 4 |
| Costs (USD Million) | 55 | 4 | 3 | 3 |
| Without Project | | | | |
| Benefit (USD Million) | 0.5 | 0.4 | 0.4 | 0.3 |
| Costs (USD Million) | 2 | 4 | 4 | 6 |

> Nature is priceless, but not valueless.
>
> *Jonathan Hughes*

The previous section briefly introduced the cost-benefit analysis as a useful tool for decision-making. But costs and benefits are not always available, and putting a price tag on an ecosystem service is not always straightforward. The following paragraphs will give an overview of some basic concepts that need to be considered when estimating the economic costs and benefits of an ecosystem.

## Ecosystem Services

Ecosystem Services refers to the magnitude of beneficial resources and processes an ecosystem provides to stakeholders. It is common to differentiate these benefits in terms of goods and services. Goods are products obtained from ecosystems such as land, resource harvests (timber, fish, coal), water, or genetic material. These goods exist in relatively fixed quantities. On the other hand, Services can be described as a flow of resources in which quantity is renewed over time. Examples include: recreational/tourism benefits, or certain ecological regulatory and habitat functions such as groundwater recharge, flood control, water purification, climate regulation, erosion control, habitat provision, and aesthetic or cultural benefits. To simplify matters, we will refer to both goods and services as ecosystem services.

Environmental valuation distinguishes between **marketed and non-marketed ecosystem services**. A number of services (e.g., clean air), are not usually traded on economic markets ('marketed') but this does not mean that those services are without value to society. Assigning a monetary value to such services is one of the major tasks of environmental valuation. Ask yourself which of the services in your case are marketed and which are non-marketed? What are current prices for marketed services provided by your ecosystem?

## Externalities

An externality is a cost or benefit linked to an ecosystem service that affects stakeholders who did not choose to participate in a trade regarding the service. For example, pollution from an industrial plant could affect the fishing industry, without any compensation provided from the industrial plant to fishers. Externalities may be negative if they impose a cost on a third party (pollution) or positive if they bring a benefit to a third party (free recreation in areas with no entry fee). Which externalities exist in your ecosystem?

Externalities can lead to market failures if the market price does not fully reflect the 'true' economic value of the ecosystem service. For example, the price of agricultural commodities may not fully include externality costs such as nitrate water pollution generated by agricultural production.
Externalities can be internalised (i.e., 'corrected for') if all costs and benefits associated with production are borne by the supplier or consumer. This results in increased prices for the service traded when externalities are negative, and decreased prices when externalities are positive. Economic instruments such as taxes and subsidies can be used to correct for externalities and make prices more closely match the 'true' economic value to society as a whole.

## Transfer Payments

Taxes and subsidies are examples of transfer payments. Transfer payments are payments that are made within the society. They constitute a redistribution of wealth within society (but do not change the overall absolute wealth). Which transfer payments are made in the case of your ecosystem? Who is the recipient and who is paying?

## Multi Stakeholder Approach

The Multi Stakeholder approach aims to identify all groups of people affected by the current state of a piece of land and its future use. The goal is to prevent or reverse land degradation while improving the livelihoods of people. In order to accomplish this goal all relevant groups should be considered in the decision-making process.

BOX 5

## Types of ecosystem services and role of ecosystem services in community livelihoods and economic valuation (steps 3 and 4): An As-It-Is Scenario with consideration of externalities, market prices, and stakeholders

*Drâa Valley Oasis (Morocco)*

The oasis of Drâa, inhabited by approximately 285,000 people, with the majority of the population being stakeholders in the ecosystem. The oasis is used for income generating activities. In recent years the oasis has benefited tourist guides, hotel owners and drivers as numbers of tourists have increased.

The oasis has enabled its inhabitants to cultivate the land and grow palm dates, henna and food crops. Date palm is an important cash crop, and fruit is delicious and nutritious. They help fatten transhumant cattle, raised thanks to the vast rangelands that characterise the region. Locals also use the palm trees to build palaces and Kasbahs. The local women use the resources to make traditional handicrafts. The dried dates are an integral part of local customs, and thus have cultural value. Farmers, herders and their dependents as well as consumers of food stemming from this area are stakeholders.

The oasis provides numerous services. Its tree and plant biomass helps in achieving carbon sequestration. The palm trees serve as windbreakers, which protects houses and the lands. The trees shield from high temperatures by decreasing the rate of evaporation transpiration. The trees decrease the risk of soil erosion, and help to conserve a healthy soil ecosystem. The latter two services benefit the majority of the inhabitants.

Oasis produces are sold on local markets. Dates sell for an average of 2.5–3 dirham/kg, which results in approximately 14.9 million dirhams in annual revenue (approximately 1.4 million USD). Other products are mainly used for subsistence. Wheat grown in the oasis could generate about 46.1 million dirhams if sold in open market. Livestock and other crops are also sold, but available data record is poor. The tourism industry contributes to seven per cent of the valley's economy.

Numerous production inputs are not traded. For example, rangelands and water are common resources and free for all. Due to the lack of economic value for common natural resources overexploitation is the consequence. Women and

farmers rarely receive an hourly wage, and have an income only if they sell their produce. Houses are not sold either, but are passed from generation to generation instead.

Given that many ecosystem services are not traded, it is unsurprising that there are numerous externalities. The latter are a result of the financial price not reflecting the true economic cost. [...] In this case study, one prominent negative externality is the overuse and pollution of water sources. It arises from the indiscriminate use of chemical pesticides for crop protection as well as from the carpet production industry that requires extensive use of synthetic dyes. These products also negatively impact the health of the workers employed in the carpet industry. Also, cattle herding damages the ecosystem of the rangelands. Positive externalities are those that benefit individuals not involved in the transaction. Growing palm trees helps to provide some ecosystem services that benefit and improve biodiversity. Livestock dung/droppings can be used as eco-friendly manure and for production of biogas. The increase in ecotourism has resulted in increased and improved modes of transportation.

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# 04 Developing a new Scenario

## Prevent land degradation and improve livelihoods

Now we need to conceptualise a scenario that is an alternative to the current land use, bearing in mind that the goal of the ELD Initiative is to prevent or reverse land degradation while improving people's livelihoods. Proposed novel land scenarios should reflect this goal. The new scenario could include a variety of actions: e.g., adapting new land use practice, changing agricultural methods, using the land for a business/factory, excluding the land from use, turning it into a preserved national park, etc. The actions are selected in order to prevent (or reverse) land degradation through adopting more sustainable management practices or adopting alternative livelihood activities, while improving the livelihoods of stakeholders.

While you develop an improved scenario, ask yourself the following questions:

What measurements are to be taken? Whose livelihood will you improve? What is the time span of your project? Are you going to include transfer payments (taxes, subsidies, etc.)? It might be helpful to write down a list of factors and items (ecosystem services) that represent costs and benefits for the two scenarios. Consultation with local stakeholders at this stage can be productive as well.

BOX 6

**Improved Land Use Scenario:**
*Bwindi Impenetrable National Park (Kanungu District, Uganda)*

*Current situation:*
Since 1991, when Bwindi became a national park, the relationship between the park management and local communities has been negatively affected. Original dwellers, Batwa communities, were evicted from the park without being given compensation. Firstly, they lost access to a place of huge spiritual and cultural importance. Secondly, other communities surrounding the conservation areas were denied access to natural resources in the park. Due to conservation activities, the number of wild animals increased significantly; and since hunting them is prohibited, hence farmers suffer from increasing damages to crops caused by wild animals that inhabit the park.

*Proposed Scenario:*
Priority for the indigenous communities by providing them with specific areas for

- implementing agroforestry activities
- Capacity building (NGOs, UWA) in exchange with indigenous knowledge
- Tea Management plan for farmers

Resulting first, in Batwa and non-Batwa communities co-existing within the park because of the reclassification of the land use system. Second, Batwa will be involved in activities directed in conserving wildlife while creating revenues from the agricultural activities. Third, tea plantations will serve as a buffer system, while generating economic benefits for the surrounding communities.

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# How to appraise

## Selected methods

By now the concepts for the 'As-It-Is Scenario' and improved-use scenario should be established. The next step estimates the economic values associated with both scenarios, and requires some planning.

The following introduces the most important methods used in environmental valuation, and are accompanied by a guide for choosing an appropriate method and developing a research plan. Please keep in mind that some of these procedures can be very time consuming and might require extensive knowledge about both physical and statistical analyses. If work related resources are limited, it might be beneficial to adjust the procedures associated with a methodology to include such constraints.

## Non-demand based approaches

The first group of tools introduced here are 'non-demand based' approaches to economic valuation of ecosystem services. These methods are often convenient to use because they make efficient use of already available figures and do not require extensive data acquisition. However, they lead to values, which do not fully reflect the 'true' economic value of the ecosystem services considered.

**Market prices** are the result of an exchange on a market for money (trade). In economic theory, perfect competition is a necessary condition for prices to reflect the true economic value of the ecosystem service considered. Market prices can thus be used for ecosystem services (clean water supply, coal) that are traded. However, in order to estimate the true economic value of a good or service, transfer payments such as taxes and subsidies need to be removed from market prices.

**Replacement costs** also rely on market prices, but the value of the good or service is measured by how much it would cost to replace it through other alternatives. For instance, benefits provided by an established forest are timber exports, water filtration, carbon storage, or recreational and amenity values. The replacement cost for an established forest would include the costs of seedlings and replanting harvested trees, the cost of lost water filtration, and the cost of carbon storage loss (Recreational and amenity values are typically lost).

**Dose-response methods** are based on linking a change in output – typically a change in productivity – to a change in environmental quality. For instance, a paper mill produces paper but also creates water pollution, which may be damaging to downstream users. Increasing paper production increases water pollution (decreases the environmental quality). In this example, the cost of improving environmental quality by one unit is the cost (forgone profit) of decreasing paper production to achieve that improvement.

**Mitigation behaviour** relates to actions that people take to avoid the negative consequences of environmental degradation, for example, using face masks to avoid inhaling dust. Mitigation costs only represent a fraction of the total economic cost to society.

**Opportunity costs** are based on the next best alternative available to the current state. This is typically used when several mutually exclusive management options exist. For example, an alternative to preserving a forest could be to convert it to farmland. The profit that could be made from agricultural production represents the opportunity cost of preserving the forest. In other words, the opportunity cost of forest preservation is the forgone agricultural profit.

## Demand based approaches

The second group of tools are 'demand-based' approaches to environmental valuation. Keep in mind that the implementation of some of these

methods might be time consuming. As mentioned earlier, in some cases it might be useful to adjust the described procedures, means of data acquisition, and/or analysis in order to suit your capabilities and needs. There are two types of demand based methods: revealed preference and stated preference methods.

The **Hedonic Price Method** is one of the two revealed preference methods. It relies on a surrogate markets to 'reveal' preferences, often real estate or land markets. The idea is that a fraction of the price paid for a piece of land is for ecosystem services provided through this land.

The **Travel Cost Method** is the other revealed preference method. It relies on a surrogate markets to 'reveal' preferences. The idea is that the more time people spend and pay to travel to a site of interest, the more that site is economically worth to society as a whole.

The Travel Cost Method might be suitable if the following characteristics apply to your case:

- The majority of significant services within the ecosystem constitute as use values;
- The site is primarily valuable to people as a recreational site, and;
- The expenditures for projects to protect the site are relatively low.

**Stage 1** – Define the valuation problem

1. Description of the characteristics of the environmental good or service valued in your survey, and;
2. Define the group of the stakeholders.

**Stage 2** – Build your survey

1. Define a sample representative of the population, the size of this sample, and how you plan to connect with them;
2. Build the actual questionnaire and items for the survey based on the principles of the Travel Cost

BOX 7

### Example for a Travel Cost Questionnaire:

*Niagara Region (Ontario, Canada)*

1. Would you please tell us your nationality and the location of your home? [...]
2. Are you visiting the Niagara and the surrounding tourist area for the first time?
3. How many times have you visited the site in the past 10 years?
4. Would you please tell us the period of visit (the number of days including travel)
5. How many days would you like to stay in this pristine environment?
6. What financial planning did you do prior to the visit? Can you please give us a rough estimate on the cost of the visit?
7. Are you a sponsored tourist [...]?
8. Is your visit limited to the Niagara region or other tourist attractions in Ontario?
9. Is there other purpose involved in the visit [...]?
10. Being a natural heritage, would you please comment on the serenity and environmental quality of the site? Is the water quality [...] good [...]?
11. Tell us about similar sites that are of interest to you?
12. Have you prepared a shopping list before the visit? What unique commodities (wine/souvenir/fruit products etc.) did you purchase? Is there any other item you may wish to purchase?
13. After visiting the Niagara region, would you recommend visiting the site to family and friends or online?
14. We did our best to provide extensive service for tourists. Would you please comment on the quality of services you received?
15. What improvements would you like us to make in the future (logistics, travel, accommodation, tourism, informative media, etc.)?

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Method. The questionnaire needs to include questions that cover following aspects:

- Origin of each respondent's journey to the site of interest (e.g., from their home or hotel to the site);
- Journey costs and time;
- Number of visits for a defined timeframe (week, month, year);
- Distance to substitute sites (e.g., another nearby park), and;
- Characteristics of the respondents (income range, age, level of education)

3. Decide how the questionnaire will be delivered (e.g., face-to-face, telephone).

The **Contingent Valuation** method is one of the two stated preference methods. It does not rely on a surrogate markets to 'reveal' preferences but is based on a statement of how much (or rather how much more) respondents would be willing to pay. Contingent Valuation might be suitable if the following characteristics apply to your case:

- The majority of the ecosystem services have non-use values.

**Stage 1** – Define the valuation problem and set up a hypothetical market

1. Description of the environmental good or service valuated in your survey
   - Describe the current state;
   - List the consequences of a change from the current state;
   - Identify who will be affected by this change, and;
   - Identify when benefits from this change are likely to arise (e.g., 2 or 10 years from now).
2. Define the institutional context in which the good or service is to be provided (e.g., private, public)
3. Define a method of payment or financing, and;
   - Various payment vehicles are possible (e.g., entrance fees, local taxes, national income taxes, sales taxes).

**Stage 2** – Build your survey

1. Define a sample representative of the population, the size of this sample, and how you plan to connect with them
2. Define the instrument for the survey (e.g., face-to-face, email, telephone)
3. Formulate the actual questions and items for the survey based on the hypothetical market defined in Stage 1
   - Define different formats for participants answers;
   - Make sure to include a short description of the case in order for participants to adequately understand the situation, and;
   - Include pictures where applicable to enhance participant understanding.

**Choice experiment**, also called choice modelling or conjoint analysis, is the second stated preference method. It was designed to overcome some of the limitations of contingent valuation by making respondents explicitly choose between alternative scenarios. These scenarios include levels of environmental or non-environmental attributes and a level of payment which varies between scenarios.

BOX 8

### Example for a Contingent Valuation approach:
*Paso Grande (Argentina)*

The contingent valuation method was used to estimate use and non-use economic values for ecosystem services [...]. This method involves directly asking people about how much they would be willing to pay for specific ecosystem services. In order to create an offer for tourists it was necessary to find out their willingness to pay as well as their willingness to accept to pay for alterations of the quantity and quality of ecosystem services. Locals, whose land is not fertile and generating high costs, might be willing to accept a payment. For example, change the land use from agricultural to forest ('Forest Planning'). [...]

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BOX 9

**Example for a Contingent Choice Design:**
*Lake Victoria (Tanzania; Uganda; Kenya)*

In our research we will use the contingent choice method and thereby give the stakeholders the possibility to choose between three different scenarios: the current situation, an optimal scenario and a third scenario in between. Each scenario includes changes and different states of the ecosystems' main attributes linked to the respective levels of payment. The developed choice cards could roughly look as the following:

*Scenario 1 (continuing current situation):* Continuing high pressure on and intensive use of ecosystem services; no important efforts of mitigation of negative effects on biodiversity and water quality; Lake Victoria Basin continues in a vulnerable state; decreasing fish stocks, low quality fish, low water quality or water even unusable for domestic and industrial use, eutrophication and contaminated lake shores, deteriorating state of lake and shore biodiversity; low or non-existing level of payment; in the long run the fishing sector and stakeholders dependent on treated lake water struggle with costs; adaptation measures: quotas taxes.

*Scenario 2 (optimal):* effective implementation of tools for protecting important ecosystem services and functions of the ecosystem; goals of biodiversity protection and increase of water quality are met nearly as intended by planners; first years bring high costs for many stakeholders (less electricity production, lower yields, lower fish catches, higher environmental standards for industry and agriculture); in the long run there is an overall economic benefit (high quality fish for exportation, low adaption/mitigation costs, restored biodiversity level ...); adaptation measures: investment of all stakeholders; wastewater treatment , changes of habits, community groups for environmental vigilance.

*Scenario 3 (low effort):* awareness of environmental problems in some stakeholder groups (e.g. local governments) leads to protection and regulation incentives; uncoordinated and weak implementation; lack of balanced and holistic project plans; punctual improvement in some areas with low implementation costs and low stakeholder resistance; investment of some stakeholders; only few activities launched (cleaning of some eutrophication zones); manageable payment costs.

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**The Choice experiment method** might be suitable if the following characteristics apply to your case:

- In terms of significant ecosystem services, both use and non-use values are important, and;
- There are several possible options for preserving and/or using the site, each of which have different impacts on the site. Thus, several options must be weighed in terms of costs and benefits to the public.

Because both contingent valuation and choice experiments are stated preference methods, their application has similar characteristics. The main differences are in the design of the valuation question(s), and the data analysis.

**Stage 1** – Define the valuation problem. Which scenarios are valued and who is the relevant population (stakeholders)?

1. Define the different scenarios and the levels of payment associated with every scenario, and;
2. Build unique choice cards by selecting combinations from all possible scenarios. Each scenario is a bundle of attributes and payments.

**Stage 2** – Build your survey

1. Define a sample representative of the population, the size of this sample, and how you plan to connect with them;
2. Build the actual questionnaire and items for the survey based on the choice cards defined in Stage 1;
3. Include a description of the current state, likely changes, and positive and negative consequences to facilitate real-life answers by the participants. Include pictures where applicable to enhance participants understanding, and;
4. Define how the questionnaire will be delivered (e.g. face-to-face, email).

Economic valuations can be costly in terms of financial, time and human resources. Benefit transfer offers a cheaper alternative to other valuation methods as it reuses already available information. Benefit transfer simply consists in transferring economic values from one case study with a known non-market economic value to a similar site to be valued in monetary terms. This transfer of values can be in theory made across time, space, populations, and sometimes across ecosystem services.

**Benefit Transfer** might be suitable if the following characteristics apply to your case:

- A literature research reveals that information from studies already completed in another location and/or context is available.

The goal of benefit transfer is to estimate benefits for one context by adapting an estimate of benefits from another context. This approach can be very time and cost efficient.

**Stage 1** – Identify existing studies or values that can be used for the transfer

1. Find studies that value the same ecosystem services within a similar geographical setting, and;
2. Evaluate the quality of studies to be transferred.

**Stage 2** – Decide whether these values are transferable

1. Define the level of similarity in terms of provided ecosystem services between your case and the case you are transferring the benefits from;
2. Define the level of similarity in terms of population sizes and characteristics, and;
3. Decide if adjustments must be made to the existing values (i.e., income differences).

BOX 10

**Example for a Benefit Transfer Design:**
*Drâa Valley Oasis (Morocco)*

In order to estimate the pricing structure of this program [Water pricing scheme], we will use the Benefit-Transfer method. The Drâa valley region has been the subject of numerous studies, and a few have focused on implementing a pricing structure for the hydrological resources, as well as identifying the demand for irrigation water in the region. We will mostly rely on peer reviewed and grey literature [...].

The main paper we will use for our research project will be "Demand Estimation for Irrigation Water in the Moroccan Drâa Valley using Contingent Valuation", which can be found at http://ageconsearch.umn.edu/bitstream/162895/2/dispap10_01.pdf.

This research project was conducted using contingent valuation [...]. In order to calculate the costs of items and services, we will scour the literature and use the average costs. We will then adjust it to 2014 prices. To account for measurement errors we will perform a sensitivity analysis in our cost benefit analysis by varying the values. We will then record the range at which the results change from economically viable to nonviable.

An analysis is only as good as the assumptions made. In this case, we will be using cost benefit analysis to evaluate a range within which the projects are economically viable. The water prices are a calculation, and thus have some inbuilt error [...] (e.g.) people tend to understate their willingness to pay for items. Furthermore, some of the calculations require making assumptions [...]. Some error will also result from how we construct the calculations. For example, we will have to make an assumption on the interest [...] and some of the prices we pick will be estimates and averages.

In general, benefit transfer ultimately remains dependent on the quality of the original benefit estimation. The accuracy of benefit transfers is partially conditioned on the errors contained in the main original benefit study. To control these errors, the benefit transfer requires accurate and full reporting of the original research design and procedures, including factors such as response rates, survey procedures, and spatial-biophysical contexts that may be constant within one study but may vary across different studies.

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# Carry out the Research: asking Stakeholders

## Example for a sampling plan

In addition to choosing the appropriate method for your case, it is essential for successful demand based valuations to outline a valid sampling plan and have appropriate surveying instruments.

**The Sampling Plan** defines the way in which a group of subjects is drawn out of a population of stakeholders to gather data from. Important aspects to consider when selecting your samples are:

- Participants should be representative of the population of relevant stakeholders and all groups should be considered in your sample;
- Variables such as income, age, and level of education should be considered when defining your sample, and;
- Each person in the population should have the same chance of being selected for the survey (random selection). This can be achieved by randomly drawing names from a list with all potential stakeholders (e.g., from a phonebook). Another option is a selection method called 'convenience sampling' where people are randomly selected for interviews or to fill out surveys in different public places. While 'convenience sampling' is very time and cost efficient it has the disadvantage that it tends to attract a faction of people that have similar psychologies while it deters others. This might falsify the results.

Different **Survey Instruments** are appropriate for different economic valuations. You may want to consider including either questionnaires or face-to-face interviews into your survey design. Face-to-face interviews ensure a higher level of responses and help assess the respondent's understanding and commitment to the issue. On the other hand, questionnaires are often more time and cost efficient since multiple participants can partake in the survey simultaneously and they can be filled out online. Questionnaires also facilitate collection of numbers for quantitative analysis.

BOX 11

**Example for a Sampling Plan:**
*Lake Victoria (Tanzania; Uganda; Kenya)*

The relevant stakeholders for the case can be divided into two groups:

The primary stakeholders are: fishermen, farmers, miners, beekeepers, local authorities, national authorities (e.g. Fisheries Departments), environmental/ecosystem activists and NGOs, and intergovernmental agencies (Lake Victoria Basin Commission). The secondary stakeholders are: civil society and the private sector (e.g. researchers, exporters, traders) as well as local and international media.

The primary stakeholder groups can be reached by gathering their representatives in local and thematic meetings. There, the application of participatory and visualising research methods like the net mapping method followed by a transect-walk and an expertise talk will help the actors realise the state of the lake and its surroundings. Face-to-face interviews of important stakeholder representatives on questions regarding their characteristics and their attitudes towards protection and mitigation efforts will deliver high quality information. The influence of the various actors on the success of the project will be classified by scoring points (e.g. 1-5). Respondents could even come out with own strategies and proposals, which could then be discussed within the meeting. Moreover, a platform for knowledge sharing and management can be created, including all stakeholders.

The majority of stakeholders will be approached with a survey that is based on choice cards and questions [please refer to the example under Choice Experiments in the Methods section]. The survey will appraise their role as stakeholders and their attitudes towards environmental protection measures as well as their social and professional background (age, income, education, type of work, living place, etc.). In addition to the choice cards, personal views and observed changes in important ecosystem attributes such as general environmental changes, plant and animal diversity, land use types, water quality, and living costs will be collected. The sample size will be around 1000-1400, equally representing the structure (including their nationality's proportions) of the stakeholder groups.

Nevertheless, there are some sources for biases and restrictions that could limit the informative value of the results. For example, the unequal distribution of both, the Lake Victoria basin area as well as the population and the sources of current pollution from three different countries could generate problems in terms of acceptance and organisation. Connected to this, political leaders have to show their willingness to cooperate or otherwise measures will not be completed properly. A misunderstanding on the side of the stakeholders concerning how ecosystems are valued as well as a fear of being neglected both present possible biases for the survey. In addition to that, the method [Contingent Valuation] requires a high level of staff and skills, which makes it even more important to ensure a balanced and strong coordination between participating organisation.

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# Analyse the Results

## Analysis, possible biases

By now all the necessary data have been collected. The last step, before the cost benefit analysis can be conducted, will be to analyse the collected data. Some raw data might require considerable knowledge of statistical procedures to derive the desired conclusions. However, a basic analysis of the data can be done with basic knowledge of commercial arithmetic. In some cases, the results may suffice to make informed decisions. Keep in mind that you might not use the full potential of the data if only simplified calculations are applied.

BOX 12

### Analysis of data obtained with Contingent Valuation design and report of results:
*Ejido La Victoria (El Salto, Mexico)*

In the town of El Salto, Pueblo Nuevo, Durango, there are 21,793 beneficiaries of the environmental water services provided by the dam La Rosilla II, which provides 1.3 million m3 of water/year. This quantity can't meet the total demand, since considering the average water use of 260 litres per capita per day, 2.07 million m3/yr are required. Therefore, a significant number of households do not have water and for various other households water is rationed.

The sample size was defined according to the size of the population of El Salto and the number of dwellings. Three variables were analysed: Willingness to pay (WTP) for water service, educational level, and income. On this basis, 242 surveys were conducted with beneficiaries of the water. Participants were randomly selected using a map of the city and trying to cover a wide range of different sectors of the population.

Similarly, for water service providers, consisting of 99 of Ejidatarios, a sample of 21 people was selected to estimate the willingness to accept (WTA) payment for water service. Sizes of the respondents' families ranged from 2-9 members per family, with an average of 5 members per family. The monthly income was in the range from 2,400 to 16,000 pesos, with a weighted average of 6.323 pesos. The level of education of the respondents that were asked for their WTA was: Baccalaureate 5 per cent, Professional 10 per cent, Elementary 66 per cent, High School 14 per cent, Graduate 5 per cent.

*Willingness to pay by the water users*

A 90.5 per cent of respondents said that water is vital, and the remaining 9.5 per cent considered it as important. 71 per cent do not currently pay for the service of water supply, arguing that it is a benefit to be obtained by Ejidatarios, and owners of the lands where the springs are located. 29 per cent of the respondents paid to SIDEAPAS (the system of drinkable water of the municipality of El Salto) a weighted average of 54.16 Mexican pesos/month for water services. A 63.6 per cent of respondents believe that forests and vegetation are vital to maintain water supply, 33.9% consider it very important and 0.8 per cent of the respondents considered vegetation unimportant (1.7 per cent did not answer the question). Also, respondents believed that the caretakers of the forest should be the entirety of the relevant citizens (81.8 per cent) or a combination of citizens and owners of the forests (13.6 per cent). It was perceived that some people are unaware of the magnitude of externalities caused in forests and many benefits such as carbon sequestration or biodiversity conservation are not perceived as relevant on a local level or at the farm level, but only on a global level.

BOX 12 – CONTINUED FROM PAGE 21

A 90 per cent of respondents are willing to make a payment for hydrological ecosystem services. Regarding the form of payment collection, 41.3 per cent believe that it should be done through the same receipt of SIDEAPAS and almost the same percentage (40.5 per cent) believes that there should be an additional receipt. 7.6 per cent felt that payment must be made directly to the Ejido and 10.7 per cent did not respond. The results of the survey indicate that the WTP is 27.54 pesos/month per household, while the logistic models that were estimated for the selected scenario suggest a WTP up to 44.01 pesos/month.

*Willingness to accept payment by water providers*

The 21 surveys used to estimate the WTA included 21.4 per cent of the Ejidatarios. All of them expressed their willingness to receive or accept a compensation payment for the provision of water supply [...]. On the first occasion they were asked about the WTA, the weighted average amount they would accept as a payment was 7.14 pesos/ha per year, equivalent to 0.37 pesos/m3 of water and 12.67 pesos/month for each room of the house that is supplied with water by the public network in El Salto. The variables found to be most significant are the level of education and the number of members in the family.

In order of importance, the respondents rated the importance of projects that the raised funds should be allocated to as followed: forest fire protection (23 per cent), reforestation (14 per cent), fine soil conservation (12 per cent) and control of forest waste.

It was observed that the Ejidatarios in Ejido La Victoria do not know the real value of water. Neither do they realise that their acceptance of economic benefits by generating water implies the elimination of conventional economic practices in the watershed. Total water production costs outweigh the economic benefits obtained by the WTP.

[...] We derived three recommendations from the data: First, the micro watershed should be subjected to commercial projects to capture carbon and hydrological services. Second, these forests need to be subjected to government support programs. Third, funding through state and local governments needs to be pursued in order to cover the remaining costs.

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# Cost-benefit Analysis

## Summarising your results

By now, all necessary data including economic values associated with both the current-use as well as the improved-livelihood scenarios should be acquired and analysed. Consequently, we can perform the final step of the environmental valuation: a basic Cost-Benefit Analysis that will determine if implementing the improved livelihood project is economically advantageous for society as a whole. The only figure missing in order to effectively weigh a project costs against its benefits is the social discount rate.

**The social discount rate** determines how much future benefits are worth today. The discount rate follows the same principles as receiving interests on a bank account. A bank pays you money to leave your funds in their bank to compensate you for not spending the money today. A low discount rate favours investments in the future while high discount rates favour present profits. In short: high discount rates reflect lower values for benefits in the future. Choosing an appropriate discount rate can be challenging since there is no consensus amongst economists on how to best estimate it. The decision is usually based on the individual characteristics of the case under consideration as well as the opportunity costs of a project. A rough estimate is that developed countries usually apply a discount rate between 3 to 7 per cent while developing countries apply a higher rate of 8 to 15 per cent. Specific decisions must be made based on a case-by-case basis. You can also change the discount rate to assess whether your results and conclusion change with it.

**Calculating the present value of future benefits** is the first step in the cost benefit analysis. After you choose the discount rate, you can use table 1 in the appendix for your calculations.

After determining the present value for your projects benefits you can now turn to determine if your project is worth undertaking.

**Several economic indicators of a project's desirability** exist to assess whether a project is worth implementing. The main three indicators used for assessment are the net present value (NPV), the internal rate of return (IRR) and the benefit-to-cost ratio (BCR). To keep it simple, this guide focuses on net present value as an indicator for whether a project is worth undertaking. The **net present value (NPV)** for the with-project scenario is computed by subtracting the costs from the benefits for the project duration. The same is then done for the without-project scenario ('As-It-Is-Scenario'). The net incremental benefit corresponds to the extra benefit derived from the project and is computed by subtracting the net benefit without the project from net benefit with the project. The discounted value of the incremental net benefit is then computed taking year 1 as the year of reference and the discount rate that you set before. The NPV of the project is the sum of the present value of the incremental net benefits across all years.

The project is considered worth undertaking for a NPV greater than 0 (positive) and not worth undertaking for a NPV less than 0 (negative). This indicator does not allow comparisons across alternative projects, but only to decide whether a given project is worth undertaking or not. For instance, for a project with a NPV of 100 and a project with a NPV of 1, both projects are worth undertaking. However, the project with the lowest NPV might be of more value to society as a whole despite being characterised by this lower value. This is because NPV values are not comparable for projects with different timeframes, scales and scopes.

# 09 How to make your Scenario happen?

Now you have an economic case for taking action: a useful tool to convince decision-makers in your company, local government, national representatives, NGOs, or private donor institutions to implement your ideas.

In order to bring your ideas from the paper to the field and to take action you need to consider some important aspects:

1. What is your ultimate goal, what are your objectives?
2. Identifying the driving forces of change;
3. Evaluating alternative strategies that would affect scenario outcomes;
4. Which are the stakeholders beyond the main beneficiaries or donors of your project you need to approach, e.g., is it enough to approach your local council or should you approach a higher level with more decision-making competencies?
5. Which other stakeholders can support your idea and might be willing to support your project? Here you might return to those you have already approached for a questionnaire.
6. Do you 'speak the same language' or are there cultural or other differences, which might hinder a successful cooperation?

Now it is time to develop a convincing communication strategy. How will you present the issue to a decision-maker? Who might be able to support you in your claims?

Make sure the following points are covered:

- **Relevance:** Land degradation is a global issue, but must be tackled locally. Your cost-benefit analysis shows that a new scenario is possible and makes sense from a social and environmental, but above all from an economic point of view. Most importantly, your ideas are about implementation, not just talking.

- **Time frames:** Often, decision-makers only think in short term intervals, however implementing sustainable land management, combating soil erosion or reversing land degradation takes time. Make sure your cost-benefit analysis is convincing enough to show that it is time to act now in order to get rewards in future. You may want to show short-, medium-, and long-term benefits from an economics perspective as well as from the point of view of the person you are trying to convince.

- **Coordination:** As your new scenario might involve numerous stakeholders from different sectors it is important to have an idea how to coordinate them in an efficient way and avoid duplications or fragmentation. You might also be thinking about evaluation and monitoring of your project as this is an important aspect for decision-makers as well.

- **Broader Policy Context:** Politically, the current discussion on Sustainable Development Goals (SDGs) within the context of the UN Post 2015 Development Agenda offers an opportu-

nity to influence decision-makers by providing alternative economic scenarios related to land degradation. The proposed Goal 15 of the SDGs relates specifically to land, and the restoration and promotion of sustainable land use, to reach a land-degradation neutral world. The broader context of this global push is helpful to keep in mind when developing your own scenario and valuation, as it strengthens the argument for implementation.

Once you have convinced decision-makers to implement your project it is important to maintain linkages to the project and key stakeholders involved. After all, you are the expert who came up with a new scenario! It is important to ensure continuity. Plan early for sustainability and anticipate unexpected or worst-case scenarios. Regular feedback, maybe through 'interim reports', maintains high motivation among all active stakeholders to continue the implementation of your project and can help attract further support.
We hope this short outline has provided you with some ideas on how to approach decision-makers and build a network that turns your scenario into reality.

Please be aware that there are no blueprints for building and maintaining partnerships and it can be a very sensitive issue. In some situations it might be useful to approach a decision-maker directly, in others this is only possible if you build up a strong network first.

For some very useful and more detailed information on how to build long lasting partnerships with stakeholders turn to:
*http://www.unccd.int/Lists/SiteDocumentLibrary/Partnerships/Mini_Guide.pdf*

For more information on stakeholder participation and involvement see the article on stakeholder involvement at:
*www.biodiversity-plants.de/biodivers_ecol/publishing/b-e.00275.pdf*

Land degradation is a global issue and threatens people's livelihood as well as food-, water and energy-security. However, there are often simple local solutions.

This guide has equipped you with tools to develop economically convincing arguments to promote sustainable land use practice, combat soil erosion and enhance the productivity of lands. Economic valuation and cost-benefit analyses are complex techniques but can easily be adapted and implemented even under budgetary and human capacity constraints. The ELD MOOC provides a few examples of this.


## Soil counts – preserve it!

# Appendix:

**Discount factor = 1 / (1 + Discount rate in %)** number of years – 1

TABLE 1

**Present Value = Discount factor * Benefit**

| | Year 1 (present) | Year 2 | Year 3 | Year X |
|---|---|---|---|---|
| Benefits | | | | |
| Discount rate in % | | | | |
| Discount factor | | | | |
| Present value | | | | |

TABLE 2

**Cost-Benefit-Analysis**

| With Projects | Year 1 (present) | Year 2 | Year 3 | Year X |
|---|---|---|---|---|
| Benefits | | | | |
| Costs | | | | |
| Net benefit | | | | |

| Without Projects | Year 1 (present) | Year 2 | Year 3 | Year X |
|---|---|---|---|---|
| Benefits | | | | |
| Costs | | | | |
| Net benefit | | | | |

| | | | | |
|---|---|---|---|---|
| Incremental net benefit | | | | |
| Present value of incremental net benefit (your discount rate) | | | | |
| Economic Net present value (your discount rate) | | | | |

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