MEGA

Forest Ecosystem Services

Valuation, Conservation, and Sustainable Management

Manual for educators and practitioners in nature conservation

About the publisher

Moldovan Environmental Governance Academy (www.megageneration.com) is a social entrepreneurial organization based in Chisinau, the Republic of Moldova. It is focused on delivering services of gamification, game development, gamified trainings, and e-learning with environmental and social value.

MEGA implements innovative solutions that address the most pressing environmental and social issues in the world. The organization succeeds in realizing these solutions and in helping other organizations do it through gamification, citizen science, and collaborative environmental governance.

The vision of MEGA is a sustainable future, where every person and organization contributes to nature conservation and sustainable development through creation of positive environmental and social impact in a collaborative, enjoyable, and fun way anywhere in the world. The mission of MEGA is to connect people for a sustainable future.

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About the author

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Alexandr is the co-founder, CEO, and research & development coordinator of MEGA since 2013. Within the organization, Alexandr often conducts research projects and organizes educational programmes on the topics of environmental economics, ecosystem services, biodiversity conservation, and sustainable development. He has published over 20 articles related to these topics in various scientific publications.

For his scientific research related to environment and sustainability, Alexandr received the Green Talents award in Germany in 2013 and the Danubius Young Scientist award in Austria in 2016.

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The Codru forest in the Republic of Moldova. The protected area Codru Nature Reserve established within it protects the fragile ecosystem and biodiversity of the remains of once vast forest cover.

Preface

Alexandr Iscenco

Co-founder and CEO

MEGA

Forests are often called the “lungs” of the Earth. This is because forests are the primary source of oxygen, as well as the largest sink of carbon dioxide on the planet. Without properly functioning forests, we would simply not have enough air to breathe, not to mention that climate change would escalate far quicker than it is happening now.

However, forests should be considered much more than just the “lungs”. If we account for all the benefits these ecological systems offer to the natural environment and to people, then forests should be treated as vital multipurpose “organs” responsible for a variety of functions that are essential to maintaining life on the planet. Besides capturing carbon dioxide and producing oxygen, forest ecosystems create fertile soil, purify water, provide habitats for animals, regulate microclimate, and perform many other functions. They also provide many important “services” to people, such as supplying various natural resources and food, contributing to health and wellbeing, offering opportunities for recreation, and even taking part in cultural and scientific development of humanity.

Still, with all the benefits that forests bring to people, we often do not see the value of forest ecosystems beyond them being a source for wood extraction, consumption, and profit generation. This one-sided view causes massive deforestations and degradation of forests all over the globe. Furthermore, we often do not realize that the more forests we cut and ruin with pollution, the less benefits from their functions and “services” we receive.

Clearly, there needs to be a shift in the understanding of the value of forests, in our attitude towards their ecosystems, and in the ways in which we manage them. Simply planting new trees and creating “artificial” forests, while still cutting down the pristine ones, is not sufficient to recreate the complex, intricate, and well-balanced interrelations among various components of untouched forest ecosystems. While continuing with reforestation and afforestation to make up for losses in forest cover of the Earth, we need to conserve and manage the existing forest ecosystem sustainably. We at MEGA have already started working on conservation of the Codru forest in the Republic Moldova, at the same time collaborating with other local organizations to plant trees and create community forests throughout our country. Now, we want to help you do the same with the present publication. We hope that our knowledge and experience shared through it will support you in your activities aimed at protecting forest ecosystems, these vital multipurpose “organs” of our planet.

Abbreviations

CAPI	Computer-assisted Personal Interviews
CBA	Cost-benefit Analysis
CE	Choice Experiments
CM	Choice Modelling
CTA	Call to Action
CV	Contingent Valuation
ES	Ecosystem Services
GDP	Gross Domestic Product
IES	Integrating Ecosystem Services
MEGA	Moldovan Environmental Governance Academy
NPV	Net Present Value
PA	Protected Area
RP	Revealed Preference
SP	Stated Preference
TEV	Total Economic Value
WTA	Willingness to Accept compensation
WTP	Willingness to Pay

Executive Summary

Forest ecosystems are combinations of living organisms, non-living components, and interrelations among them. They deliver a variety of ecosystem services to us. Some of the services we use directly and indirectly, while others we may not use at all, but still value their existence and preservation for the future. Nevertheless, we can estimate economic values of all types of ecosystem services by applying appropriate economic valuation techniques. They are able to show us how important and valuable forest ecosystems and their services are for our wellbeing and welfare.

Nevertheless, even knowing of this importance of forests, we, humans, still continue to overexploit their natural resources, damage their ecosystems, and diminish forest cover on our planet. To address this issue and ensure conservation, responsible use, and sustainable management of forests, a number of approaches have been developed. One of them is the six-step approach to integrating ecosystem services into development planning. Applying this approach helps us to prepare policy proposal for sustainable forest management along with its implementation strategy. In case we have multiple policy options to choose from, we can refer to Cost-benefit analysis and multi-stakeholder analysis to guide our decision-making.

In order to implement our proposal and strategy, we need to gain support and engagement of the most relevant, interested, and influential stakeholders of our forest and its ecosystem services. Stakeholder identification can help us list all relevant economic agents, while stakeholder analysis can guide us in assessing their interests, needs, attitude, position, and levels of power and influence. The Big Five principles of effective communication can then assist us in preparing appropriate communication tactics for each group of stakeholders. Finally, with the use of the Interest-influence Matrix, we can begin engaging key stakeholders into the realization of our sustainable forest management proposal and strategy in an effective and cost-efficient way.

Introduction

Forests provide numerous benefits to both natural environment and people

Forests are unique ecological systems that provide numerous benefits to both the natural environment and people. Forests serve as purifiers of air, water, and soil, converters of organic wastes into fertilizers, regulators of both microclimate and global climate, and habitats for a diversity of animals. For people, these ecosystems represent sources of valuable timber and non-timber products, food, clean air and water, recreational amenities, medicinal substances, and valuable scientific information. Moreover, local communities living near forests very often attach significant cultural and spiritual value to those forest ecosystems.

It is very likely that you are a “customer” of the forest “services” as well. For instance, the table and chair you sit on may have been made from wood extracted from a forest. The food you eat may have been grown on a farmland with agricultural plants pollinated by insects that live in a forest nearby. You may also enjoy walking in the woods, admiring the nature's beauty around, hearing the melodious singing of birds, breathing in clean fresh air, hiding from the hot sun in the shadows of the trees, and so on. What you are doing in all these cases is benefitting from the ecosystem services that the forest continuously provides.

Walking path through a birch forest on the Island of Vilm in Germany.

Unfortunately, such forest ecosystem services, especially the intangible ones, like receiving pleasure from admiring the nature in a forest, are very difficult to quantify. Therefore, they do not have a regulatory market and are usually not considered in forest management and land use planning. This leads to underestimation of long-term benefits and sustainable management of a forest and to prioritization of the cut-and-sell use of trees in this valuable ecosystem. As a result, deforestation in practically all countries of the world accelerates, and our planet is rapidly losing its natural forest cover.

There are many methods to estimate intangible forest ecosystem services

Nevertheless, there is a variety of methods to help us to estimate how valuable the intangible non-market ecosystem services of a forest really are. These methods can also support us in demonstrating how much people appreciate the existence of a forest ecosystem and the long-term benefits coming from it. Having such information translated into a universally understood "language" of money allows us to turn the priorities around and to present the land use and development scenario favouring conservation and sustainable management of the forest. Furthermore, by integrating economic values of ecosystem services into strategic planning, we can decide upon a forest management strategy that is both economically and socially favourable and sufficiently effective in conserving the forest and its biodiversity. Finally, we can clearly communicate such a balanced strategy to relevant stakeholders and engage them into its cost-efficient implementation.

All this is presented and described in the manual "Forest Ecosystem Services: Valuation, Conservation, and Sustainable Management" that you are now reading. The purpose of the manual is to assist you in discovering the many ways that we benefit from forests through ecosystem services and in learning how to protect and manage them sustainably. The publication gives you an overview of the essential theoretic concepts and practical approaches in economic valuation of forest ecosystem services, their conservation, and sustainable management of forests without going in-depth on any of these topics. Therefore, we recommend you to complement it with additional specialized literature that you can find in the References section.

All the information presented in the manual is based upon the two editions of the research and educational project “The Codru Quest” conducted by our organization MEGA in 2017 – 2018. The first edition was aimed at estimating and demonstrating the value of ecosystem services and biodiversity conservation in the Codru forest, which is situated in the Republic of Moldova, and in the protected area called the Codru Nature Reserve and located within the forest.

Inside the Codru forest in the Republic of Moldova.

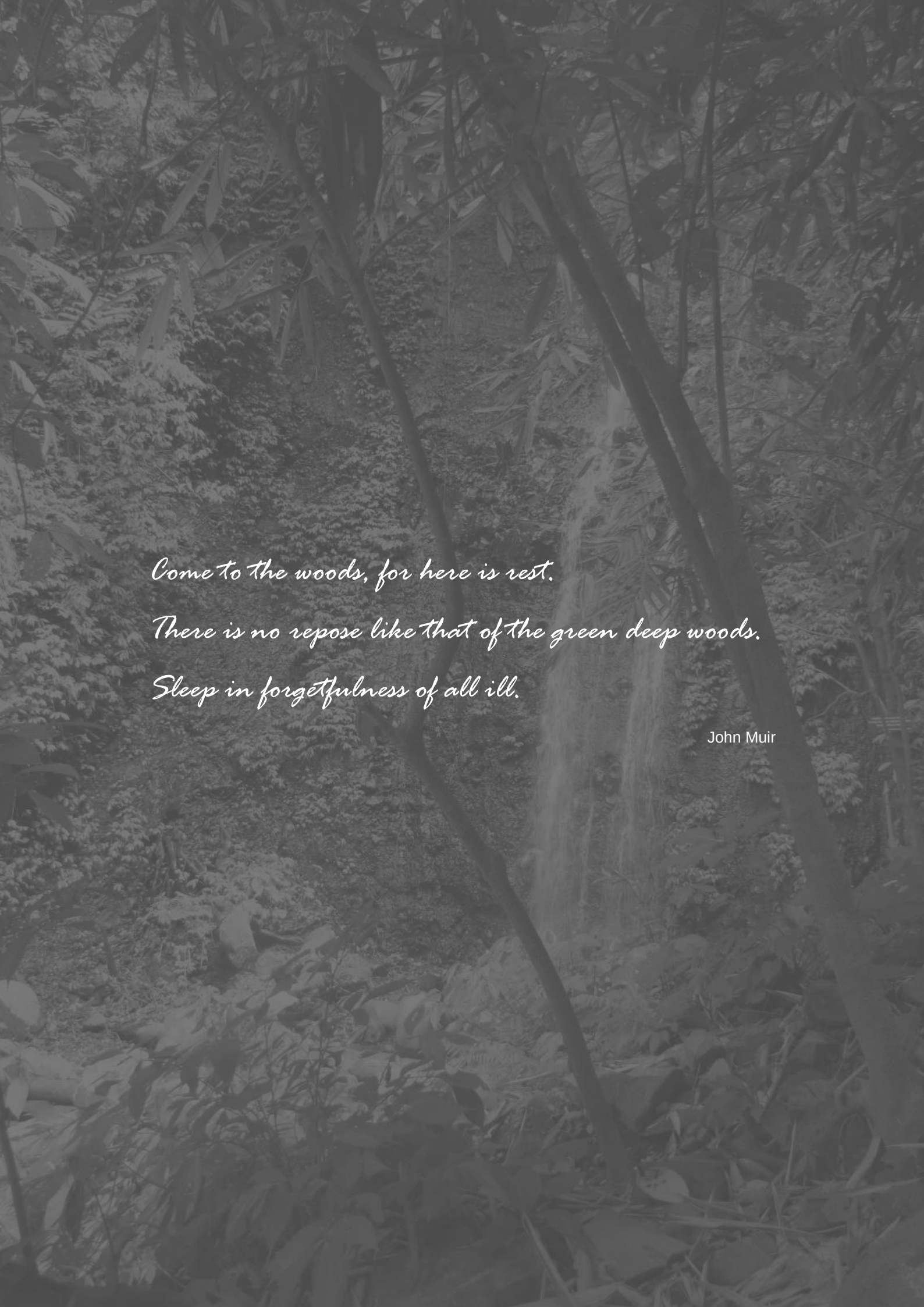
The purpose of the second edition of the Codru Quest was to use the accumulated data and the estimated results from the first one to educate forest managers, conservationists, members of environmental organizations, and other relevant stakeholders, such as you, on how to conserve forests and manage them sustainably by using techniques from Environmental Economics and Management. The present publication is one of the outcomes of the Codru Quest project.

The manual is structured as follows. In the first part entitled “Economic Valuation of Forest Ecosystem Services”, you will learn about what ecosystem services are, how we can estimate them in monetary terms, and whether we really need to put a "price" on nature in a forest. In the second part, “Strategic Planning of Sustainable Forest Management”, you will see what threats forests face nowadays and how you can use values of ecosystem services to mitigate these threats and to design a cost-efficient strategy for sustainable forest management. In the third and final part, “Stakeholder Engagement into Sustainable Forest Management”, you will gain practical knowledge and skills in how you can educate relevant stakeholders about forest ecosystem services and then engage them into conservation and sustainable management of a forest. The manual concludes with an overview of the key lessons from all three parts for you to use as a practical guide for promoting and implementing conservation and sustainable management of forests.

PART I

Economic Valuation of Forest Ecosystem Services

Forest ecosystems provide a large variety of services, including water purification and places for recreation and tourism. Shown here is a waterfall in a forest covering Mount Ungaran in Indonesia.



Come to the woods, for here is rest.

There is no repose like that of the green deep woods.

Sleep in forgetfulness of all ill.

John Muir

Benefits and Services of Forest Ecosystems

Key learning points of the chapter:

- Definitions of ecosystem and ecosystem services;
- Four categories of ecosystem services;
- Examples of benefits of forest ecosystems to environment and people.

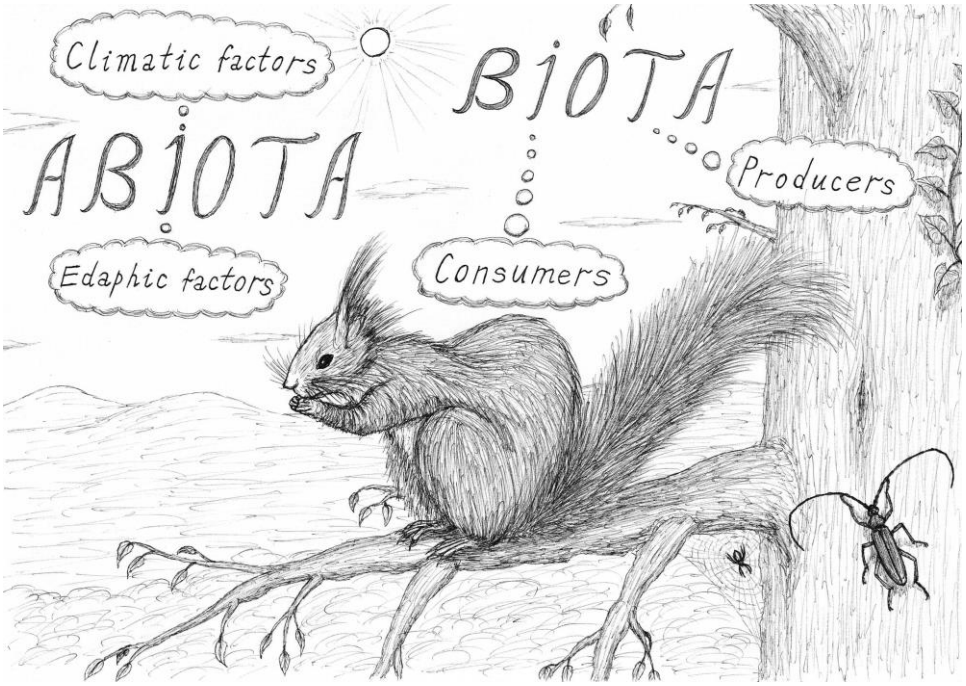
Ecosystem is a community of living organisms and non-living components occupying a limited space

Forest is an ecological system, or shortly ecosystem. **Ecosystem** is a specific community of living organisms, called **biota**, and non-living components, called **abiota**, that occupies a certain limited space. The living and non-living elements of an ecosystem constantly interact among themselves in a closed self-sufficient system through nutrient cycles and energy flows.

The forest with its components and interactions among them forms a complete ecosystem. We can find here many living organisms that are divided into producers (grass, trees, moss, etc.) and consumers (spiders, insects, birds, mammals, etc.). The non-living components of forest ecosystem include air, energy, mainly from the sun, water in the air and soil, nitrogen, and mineral soil.

The combination of biota and abiota and the complex interrelations among them ensure the integrity and stability of the forest ecosystem. Altogether, they are much more than the sum of the individual ecosystem components.

Figure 1. Components of a forest ecosystem.



Living and non-living components of a forest ecosystem in the Muir Woods National Park in the US. Only when these components are balanced and in a healthy state, can the ecosystem perform its essential functions and provide its valuable services.

Ecosystem services are benefits that people receive from an ecosystem

Driven by the dynamic combination of its components and processes, an ecosystem performs certain functions. These functions bring specific benefits to people, who depend on them for well-being and livelihood. The benefits of an ecosystem for people are called **ecosystem services**.

Even a single tree can be a source of many benefits and valuable services. One important service of it is that the tree gives us oxygen to breathe in and at the same time captures our carbon dioxide, which we breathe out. Then, it creates a shadow for us to hide from the scorching sun on a hot day, as well as maintains a pleasant microclimate in the area. If it were a fruit tree, we would also have a source of delicious fruits at our disposal. Moreover, the tree purifies water that enters the spring nearby, which we can drink from. Then, we can use its branches as firewood or even cut the tree and sell timber for economic gain. However, we may prefer the tree to stand where it is, as we may also receive pleasure of admiring it and knowing that it exists. It may even inspire us to write a poem or produce a piece of art. Finally yet importantly, we may feel good knowing that this tree will be here for a long time and will also serve well for our children and future generations.

All these gains, whether direct or indirect ones, are services of the tree. Combine them with benefits coming from other trees and components of the forest, and we will get what is collectively called the **forest ecosystem services**.

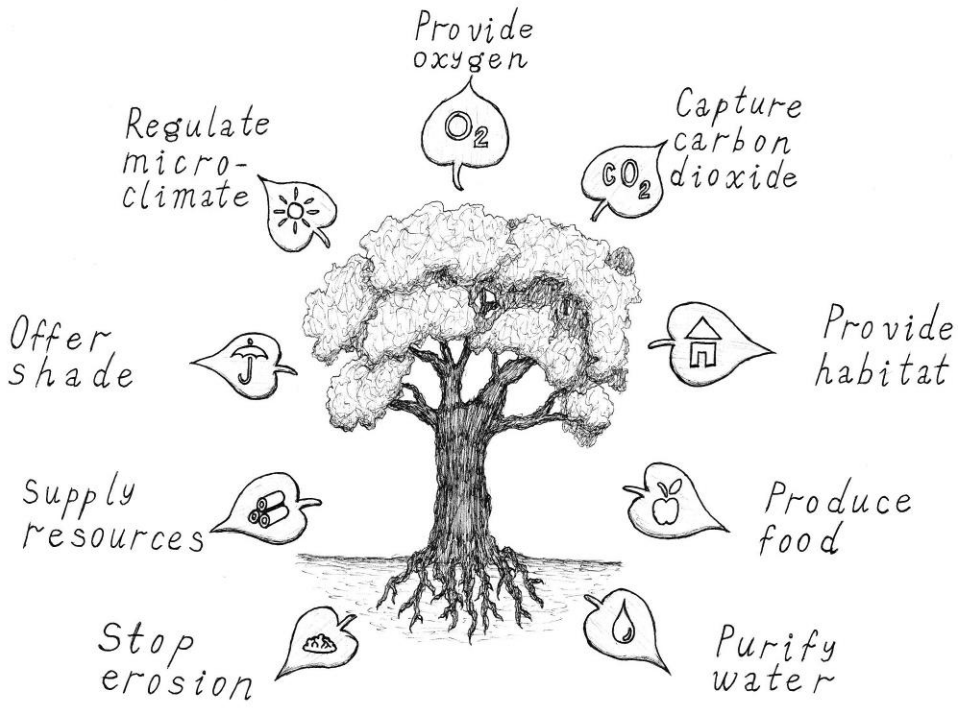


Figure 2. Diverse benefits (services) of a tree.

A tree offers a multitude of services, ranging from generating oxygen for breathing to providing shadow on a hot day.

To make the identification and analysis of ecosystem services easier and more convenient, scientists have organized them into four categories based on the ways the services provide benefits to society and the environment. These are:

- Provisioning services;
- Regulating services;
- Cultural services;
- Supporting services.

Provisioning ecosystem services provide people with resources, materials, and final products

Provisioning ecosystem services, as their name suggests, provide people with a variety of resources, materials, and final products that are necessary for a good life. Examples of this category of services in the forest include:

- Food, such as berries, mushrooms, and wildlife for game;
- Fresh water for drinking, washing, and for agriculture;
- Raw materials, such as timber for constructing houses, firewood for heating and cooking, and organic fertilizer for agriculture;
- Medicinal and genetic resources;
- Energy, such as wind power and biomass fuel;
- Other goods, such as flowers, tree leaves, etc., for decoration, art, fashion, handicraft, and other direct use purposes.

Regulating ecosystem services regulate the natural environment and its processes

Regulating ecosystem services help to regulate the surrounding environment and its processes for favourable and healthy living conditions. These services bring mostly indirect benefits, namely:

- Pollination by insects, which contributes to the supply of food;
- Pest and disease control;
- Purification of water and air in the forest and around it;
- Decomposition and detoxification of waste;
- Carbon sequestration and regulation of climate.

For example, forest ecosystems naturally sequester large amounts of carbon dioxide from the atmosphere and help clean the air around us. Considering that air pollution is one of the world's largest environmental health risks, being able to reduce this risk would contribute to saving millions of lives worldwide.

Cultural ecosystem services stimulate the development of literature, art, science, education, and social relations

Then, there are also **cultural ecosystem services**. They are non-material benefits that stimulate the development of knowledge, literature, art, science, education, social relations, and generally enhance cultural, artistic, scientific, educational, and spiritual life of people. Among the cultural services of the forest, one can identify the following ones:

- Recreational services, when people come to the forest for rest and relaxation, ecotourism, or outdoor sports activities;
- Aesthetic services that bring people pleasure from observing the forest landscape and its biodiversity;
- Artistic and cultural services, when the forest motif is used in poems, novels, paintings, architecture, folklore, etc.;
- Spiritual and historical services, such as using the forest for religious events or appointing historical significance to the forest;
- Scientific and educational services, when people visit the forest for research purposes or for educational excursions.

For instance, the Amazon rainforest has enormous historic, social, and cultural importance to communities living there. Indeed, the rainforest is not only the habitat for a vast diversity of plants and animals, but is also the place, which many local tribes call home for already thousands of years. For these people, the forest ecosystem represents life itself, as it protects local communities from outsiders and gives people everything they need. It is no wonder then that the Amazon rainforest is in the centre of lifestyle and culture of the indigenous communities and that they attach unquantifiable value to this ecosystem.

Supporting ecosystem services make it possible for ecosystems to provide other services

Last but not least, one should not ignore the less obvious, but equally important **supporting ecosystem services**. They are valuable in that they make it possible for ecosystems to function properly and to provide all the previously mentioned services. Supporting ecosystem services of the forest include:

- Photosynthesis in the grass and leaves of trees;
- Primary production of organic compounds;
- Soil formation, retention, and functioning;
- Nutrient cycling in the entire forest ecosystem.

Overall, forest ecosystems provide a multitude of valuable services to people. These services ensure a favourable, healthy, and pleasant living environment with the supply of the necessary resources and stimulation of economic, social, cultural, spiritual, and scientific development. Some of the services are clearly visible, while others are delivered "on the background".

However, why should we consider all these ecosystem services and the benefits they bring to us? Firstly, this approach allows us to recognize the crucial contribution of natural ecosystems to human well-being and economic, social, and cultural development. Secondly, knowing about this contribution, we can assess the benefits that healthy ecosystems bring to us, as well as the losses resulting from polluted and degrading ecosystems. With such assessment and understanding, we can demonstrate and capture the value from preserving natural ecosystems, thus favouring the scenario of long-term sustainable management of the surrounding nature.

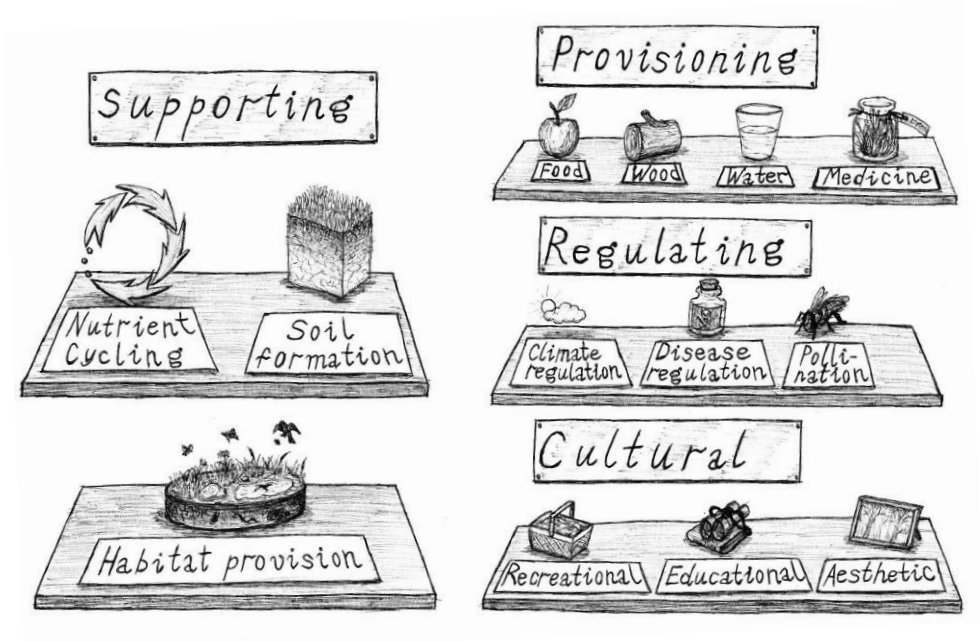


Figure 3. Four categories of ecosystem services.

The Amazon rainforest is the largest rainforest and one of the most important ecosystems in the world

Box 1. Significance of the Amazon Rainforest

The Amazon rainforest stretching across 5.5 mln km^2 (an area larger than the one of the European Union) is the world's largest rainforest and one of the most important ecosystems on the planet. It represents over 60 percent of the world's remaining rainforests, contains about 20 percent of the planet's flowing freshwater and approximately 10 percent of all its biomass, and serves as the habitat for roughly 30 percent of all species on the Earth. With such capacity of its ecosystem, the Amazon rainforest provides a variety of ecosystem services of global significance. Examples of these services are:

- Generator of oxygen: If forests are the „lungs" of our planet, then the Amazong rainforest is the largest part of them. For this forest ecosystem produces about 20 percent of all oxygen in the Earth's atmosphere, thus being one of the key factors of supporting life on the planet.
- Sink for carbon dioxide: Besides producing oxygen, the Amazon rainforest also captures enormous amounts of carbon dioxide from the atmosphere and stores it in leaves, branches, and trunks of its trees, as well as in the soil. It was estimated that around 390 bln trees in this forest store approximately 86 bln tons of carbon dioxide, which is roughly a third of all carbon captured by tropical forests worldwide.
- Supply of fresh water: The Amazon River flowing through the forest offers people water for agriculture, food production, drinking, hygiene, and so on. Forest ecosystem contributes to the purification of the river waters. In addition to that, the Amazon River serves as a waterway for trasporting people and goods.
- Provider of food: The Amazon rainforest is a rich and generous contributor to the global food supply. About 80 percent of the supply of coffee, chocolate, rice, potatoes, bananas, pineaples, and corn comes from the Amazon and other rainforests.
- Stock of medicinal plants: With its incredibly rich biodiversity, the Amazon rainforest is a true storage of a variety of medicinal plants that can cure many known diseases. For instance, malaria can be treated by more than 40 different species of plants found in the forest. Besides that, about 70 percent of plants found to have anticancer properties grow in the Amazon rainforest. Yet, we still have much to discover about the medicinal „treasures" of this ecosystem.

Sources: Amazon Aid Foundation (2018), Mongabay (2014), Rainforest Foundation Norway (2018).

Total Economic Value of Forest Ecosystems

Key learning points of the chapter:

- Types of use and non-use values of ecosystem services;
- Total Economic Value (TEV) framework;
- Application of the TEV framework to sustainable forest management.

In the previous chapter, we explored the definition of an ecosystem, the concept of ecosystem services, and the four categories of these services: provisioning, regulating, cultural, and supporting. We also looked at examples of ecosystem services that one can find in a forest and can benefit from there. Finally, we clarified why we need to consider and apply the concept of ecosystem services: to recognize, demonstrate, and capture the value of the natural environment in a forest in order to make better decisions favouring sustainable management of that forest ecosystem.

Ecosystem services can be observable and unobservable

We also touched upon the fact that that the benefits and value of ecosystem services can be direct and observable, as well as indirect and not easily observable. This categorization relates to the ways we use ecosystem services and obtain benefits and utility from them. For example, we can use the services of a forest ecosystem directly by consuming edible berries and mushrooms there, drinking water from the spring that flows through the forest, cutting wood for construction or burning it for heating, picking up flowers, or going to the forest to enjoy rest and relaxation.

Direct use values are gains that an ecosystem provides to people directly

All these consumptive gains that we receive directly from the local ecosystem are called **direct use values**. They are relatively easy to observe and quantify, as, theoretically, one could see and count how many mushrooms and flowers we picked, how much wood we cut and used, and how many times we went for a walk in the forest. In relation to the four categories of ecosystem services described in the first chapter, the direct use values are associated mostly with provisioning and cultural services.

We also benefit from a forest ecosystem in multiple indirect ways. For instance, the delicious berries that we can eat there and the beautiful flowers that we can pick are the result of many not-so-obvious ecosystem services, one of them being pollination by insects. In addition to that, if we have a farm or an orchard

Indirect use values are benefits that people receive from an ecosystem indirectly

near the forest, we would have gained great value from pollination in terms of the increase of our yields that would have led to more food supply for us. Talking further about agriculture, the ecosystem service of soil formation provided by the nearby forest would have boosted the fertility of the soil on our field as well, which again would have contributed to higher yields of our crops, vegetables, or fruits. Then, the clean water that we can drink from a spring in the forest, the fresh air that we breathe, and the pleasant microclimate in the forest and around it are the "products" of water and air purification processes, as well as the one of climate regulation. As we receive these gains indirectly from the forest ecosystem performing its natural functions, scientists termed them **indirect use values**. These values are linked to regulating ecosystem services.

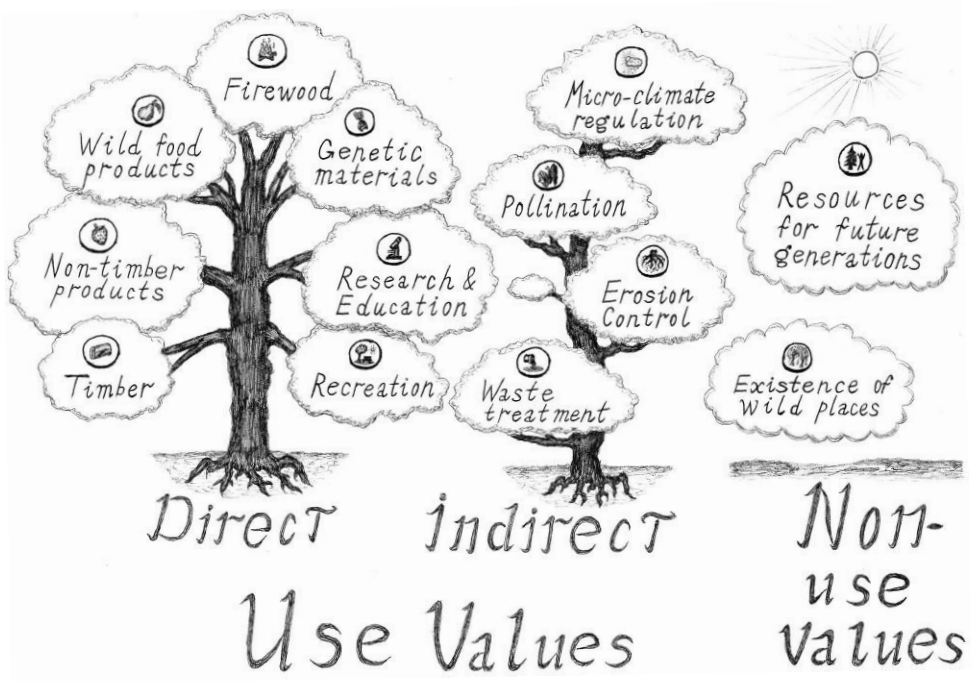
Option value is the possibility to benefit from ecosystem services in the future

Furthermore, besides using the forest ecosystem directly and indirectly nowadays, we may also like the forest to be protected and preserved for long period of time, so that we could always have an option to come to this “hub” of Nature again and enjoy its offerings. This possibility to use an ecosystem service in the future is what scientists call **option value**. It may relate to provisioning, regulating, and supporting services all at once, but extended to their desirable benefits in the future.

All these direct use values, indirect use values, and option value, scientists group into the category of **use values** of ecosystem services. Nevertheless, people can also attach **non-use values** to an ecosystem. It means that they appreciate that a certain ecosystem exists and thrives without actually using it, directly or indirectly, now or in the future. As an example, we may receive pleasure and satisfaction simply from knowing that a certain forest with its ecosystem and biodiversity exists, without considering personal gains from it. We may never use the forest, but may still value its presence in the world.

Many people are willing to protect African elephants (*Loxodonta*) and their habitat just for the sake of their existence.

Figure 4. Different values provided to people by forest ecosystems.



Overall, non-use values are comprised of three subcategories: existence, altruistic, and bequest values. These subcategories reflect different levels of people's appreciation of natural ecosystems that are not used by individuals valuing them in any way.

Existence value is people's appreciation of mere existence of an ecosystem

The appreciation of mere existence of an ecosystem is what scientists call **existence value**. Indeed, we may value certain species of flora and fauna, their habitats, and entire ecosystems only because they exist on the planet Earth, even though we may have never seen them in real life and have no direct or indirect value to derive from them. Considering this, the existence value has certain connections to supporting ecosystem services in a way that the latter helps to ensure the existence of a healthy natural environment and habitat for species.

Altruistic value is people's appreciation of an ecosystem as being valuable to other people

In addition to valuing the existence of a natural ecosystem, we may also care about other people using it or appreciating its existence at present. For example, we may feel good from the fact that farmers and gardeners in villages around a particular forest are currently benefitting from the forest ecosystem being there and providing its services. Hence, we would like the forest to be conserved for them, which means that we have an **altruistic value** associated with it. This value can include all four categories of ecosystem services that other people besides us gain from.

Bequest value is people's appreciation of an ecosystem being preserved for future generations

Finally, we may be concerned not only about people living in the present, but also about future generations and the possibility for them to access a forest. Therefore, we may derive value from knowing that the forest is protected and preserved not just for other people in present or for us in the future, but also for many future generations ahead of us. In this case, we have **bequest value** towards the forest ecosystem. As altruistic value, this final subcategory of non-use values can be associated with all categories of ecosystem services extended into the future.

Altogether, the use and non-use values, as well as an option value, sum up to the Total Economic Value of an ecosystem and its services.

Total Economic Value is a framework containing the entire variety of benefits from an ecosystem and its services

Total Economic Value, or TEV for short, represents a convenient framework to consider the entire variety of benefits, both evident and less obvious ones, which people derive from an ecosystem and its services. This framework can be an important holistic input for any decision-making in relation to land use change, nature conservation activities, and sustainable development policies.

To understand the importance of TEV and its contribution to conservation and sustainable management of forests, we need to have a closer look at the specific values incorporated into this framework. Among the different types of values, we can more or less clearly observe and account for the ones from the direct use category. This is because we can actually see people collecting mushrooms, cutting wood, going for a walk in a forest, enjoying picnics there, and so on. Furthermore, direct use of natural resources from the forest manifests itself on real markets, where berries, timber, and other resources have concrete prices.

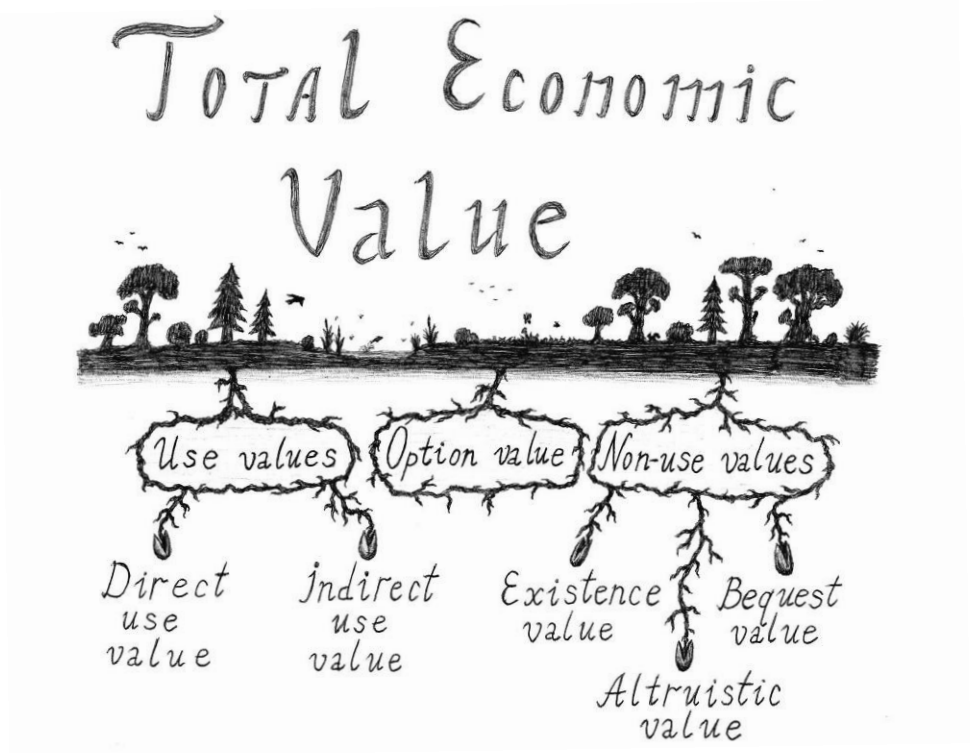


Figure 5. Components of the Total Economic Value framework.

Some ecosystem services, such as provisioning of food, are easily observable, while other, like habitat for biodiversity, are much less evident.

In comparison to the direct use values, the indirect use and non-use ones do not have such markets with prices for them. This discrepancy makes decision makers and forest users prioritise extractive and consumptive behaviour in the forest ecosystem, which is driven by the desire of better-sooner-than-later concrete economic gains. What we usually get from this is unsustainable management of the forest, depletion of its natural resources, degradation of the forest ecosystem, and the loss of its valuable services. In such a grim story, practically everyone loses in the long-term perspective.

However, when we appropriately consider the indirect use and even non-use values that people have for a forest ecosystem, the story takes a more optimistic turn. Because now we can see the entire picture of how important and truly valuable is the forest ecosystem. Additionally, we can understand better what benefits to well-being and welfare people would lose if the forest were overexploited. Having this information, we can use it to try to correct market failures in terms of the consumption of natural resources, to inform relevant stakeholders about all the benefits and potential losses to them, and to prevent possible damages to the forest ecosystem. We can also influence land use planning and policy making, so that they support protection and sustainable management of the forest. In such way, the TEV framework appeals to the basics of human psychology: the more we know about the benefits we receive from a forest and the losses we may incur due to its degradation, the more we value this forest. The more we value the forest, the more we want to keep its benefits flowing and to prevent their losses from occurring. In the end, we are more likely to support conservation and sustainable use of that forest ecosystem.

Box 2. Total Economic Value of Planet's Forests

Total economic value of all ecosystem services on the planet was estimated firstly at over 33 trillion US dollars per year and then reassessed to about 125 trillion US dollars per year

What is the total economic value of all ecosystems on our planet? This was the question that a group of researchers asked themselves back in 1997. In search for the answer, they conducted an ambitious study entitled „*The Value of the World's Ecosystem Services and Natural Capital*". The researchers assessed 17 ecosystem services around the world and estimated that these services provide over 33 trillion US dollars in economic value each year.

However, the study and the research paper with the same title received a flow of critique. Besides bringing up the moral issue with „putting a price tag on the Nature", the critique was also about the very rough estimate and the very low value of global ecosystem services presented in the paper with the study results. To address the critique, in 2014, largely the same team of researchers conducted another study, where they reassessed the total economic value of global ecosystem services. This time they included much wider range of ecosystem services and applied better methodology. The results of the study were published in a new research paper entitled „*Changes in the global value of ecosystem services*".

According to the updated study, the total economic value of services provided by our planet's ecosystems to humanity each year is approximately 125 trillion US dollars. For comparison, the total Gross Domestic Product (GDP) of all countries in the world was about 81 trillion US dollars in 2017.

Total economic value of all forests on the Earth is roughly 16 trillion US dollars per year

Within the total estimate of the value of the Earth's ecosystem services, the researchers also tried to assess the value of each type of ecosystem. In relation to forests, they arrived at an estimate of 3800 US dollars per hectare per year. By multiplying this estimate to the global area of forests, the researchers got the total economic value of our planet's forests at roughly 16 trillion US dollars per year.

Finally yet importantly, the authors of the study and the related research paper revealed the estimate of how much humanity is losing in the value of ecosystem services worldwide. Their results showed that between 1997 and 2011, the world had been losing annually between 4 and 20 trillion US dollars in ecosystem services. The greatest losses of value were identified in relation to coral reefs, wetlands, and forests.

Sources: Costanza et al. (1997), Costanza et al. (2014), World Bank (2018).

Economic Valuation of Forest Ecosystems

Key learning points of the chapter:

- Economic valuation techniques;
- Revealed and stated preference techniques and their methods;
- Application of different methods of economic valuation.

Previously, we learnt about different categories of benefits that people receive from forest ecosystems and various types of value that individuals attach to these ecosystems. We also found out that people might use a forest ecosystem directly, might benefit from it indirectly, or might not use it at all, but still value mere existence of that ecosystem and its preservation for other people, for future generations, or just for its own sake. This fact gives us different categories of values, namely use values, including their direct and indirect use subcategories, option value, and non-use values comprised of existence, altruistic, and bequest values. Altogether, they form the Total Economic Value of a particular ecosystem and its services.

All values of an ecosystem should be considered in decision making regarding the use of that ecosystem

We concluded the previous chapter with the need to consider all values of the Total Economic Value framework and to demonstrate both use and non-use values of ecosystem services to relevant stakeholders. This is necessary for inclusion of these values in land use planning and decision making related to the present and future use of a particular ecosystem. In turn, such comprehensive and transparent consideration of the importance of that ecosystem helps us to convince decision-makers to support the scenario of its sustainable management.

To make the consideration and demonstration happen, we can "translate" the values of ecosystem services, especially the ones without real markets and prices for them, into the universally understood "language" of money. This “translation” balances observable values and associated ecosystem services with “hidden” ones and makes the latter visible in cost-benefit analysis (CBA) for options of various projects to be implemented, land use planning, policy-making related to management of that particular ecosystem and so on. This is exactly where economic valuation techniques come to our aid.

Economic valuation is a collection of techniques for translating ecosystem services into quantifiable values

Economic valuation of ecosystem services is a collection of scientific techniques for translating the services provided by natural ecosystems into quantifiable values (usually monetary) that can then be used in cost-benefit analysis, land use planning, environmental policy-making, and for other purposes. In essence, economic valuation techniques are a set of tools to assess and demonstrate how important and valuable ecosystem services really are, especially when no actual market for these services exists.

Generally, scientists define two broad categories of economic valuation techniques: revealed preference techniques and stated preference techniques. This distinction is made to specify different ways in which the economic valuation is conducted.

Revealed preference techniques are approaches to reveal people's values from their behaviour or from existing markets

In **revealed preference techniques**, we elicit, or reveal people's values in relation to ecosystem services from the observed behaviour of these people or from real markets, where the outputs of ecosystem services are traded. One example here can be estimating the value of provisioning ecosystem services of a forest by looking at the prices and amounts of timber and non-timber products originating from that forest that are sold on respective markets. Another example, where these techniques are commonly applied, is valuing the recreational service of a forest in a national park by the price visitors are paying to enter it and the number of visitors that the forest and the park host every year. As you may have already guessed, revealed preference techniques are very good for eliciting use values, but are not suitable for capturing and demonstrating non-use values, which are not traded on actual markets.

Stated preference techniques are approaches to elicit people's values from their answers to questionnaires and interviews

When we apply **stated preference techniques**, we ask people directly about their values for ecosystem services via on-line questionnaires, face-to-face interviews, and other methods. By completing a questionnaire or answering our questions in an interview, people state how much they value, for example, the services that a forest offers them, and, hence, how much they are willing to pay to preserve it or willing to accept compensation in case of its degradation or even possible loss. In this respect, stated preference techniques use information not from the real markets, but from the hypothetical ones described in questionnaires. This allows us to ask people not only about their use values, but also inquire about their non-use value. For example, we can inquire our respondents about the existence value towards a particular forest ecosystem with a question: “Are you willing to pay for conservation of the forest and its biodiversity, even if you do not use them? If yes, how much are you willing to pay?” If we also want to know the respondents’ bequest value, we can pose another question: “How much are you willing to pay to preserve the forest for future generations?".

To determine the value of cultural ecosystem services of the Piacersk Forest in Belarus, its visitors can be asked to state how much they are willing to pay to preserve the recreational, fishing, swimming, aesthetic, and other similar amenities of the forest.

Each of these two categories of economic valuation techniques contains specific methods that help researchers to elicit people's values for ecosystem services in different ways. Here we will look only at the most common and widely used ones.

In the "family" of revealed preference techniques, the methods of hedonic pricing and travel cost are frequently applied to estimate and demonstrate direct and indirect use values of ecosystem services.

Hedonic pricing is a revealed preference method for determining values from characteristics and prices of market goods

Hedonic pricing is a method of eliciting economic values for ecosystem services from the fact that these services are part of the characteristics bundle of some market goods (or bads), where price is clearly observable. Most commonly used goods in this method are residential property on the housing market. For instance, by considering market prices for houses located near a certain forest ecosystem with its specific characteristics and services and by comparing these prices to the ones of ideally equal houses in some other location, we could see the premium that people are willing to pay for having the forest nearby. This premium is exactly what determines these people's values towards ecosystem services of that forest. The main strength of the hedonic pricing method is that it is based on real market data, which allows us to get relatively robust estimates of economic values of ecosystem services. However, the method also has is weaknesses, which include the need for large amounts of data and the limitation to characteristics and services related to the reference market, specifically, the one for residential property.

Travel cost is a revealed preference method for eliciting values from people's expenditures needed to get to a particular site

Travel cost is another method that allows us to obtain value of ecosystem services. This time, we use complementary market goods and services, as well as the value of time, which are associated with accessing a particular site, such as forest or national park, for people to benefit from its ecosystem services. For example, if we want to demonstrate the recreational value of a particular forest within a national park, we can estimate it by obtaining the number of visitors coming to the park and then combining this number with the cost of travelling there, the monetary equivalent of time visitors spent on getting to the park, the price of the entrance ticket, and all other extra purchases related to visiting that park, such as guided hike, food and drinks, souvenirs, etc. The key advantage of the travel cost method is that it brings us the necessary data from the real behaviour of users of ecosystem services and from people's actual expenditures on getting these services. The disadvantages here are connected to the limitation of the method to estimate only recreational and other cultural ecosystem services and to the fact that people might be making trips to multiple sites and for other purposes than recreational and cultural. In addition to that, the travel cost method, just like hedonic pricing and other revealed preference techniques, cannot elicit non-use values of ecosystem services.

Shifting to the stated preference techniques, here we can mention the most frequently used methods of contingent valuation and choice modelling. Both of these methods can help us estimate and demonstrate use and non-use values of ecosystems and their services. In both cases, we present hypothetical scenarios of changes in the provisioning and quality of ecosystem services to our respondents and then ask them for either willingness to pay or willingness to accept compensation in relation to these changes.

Contingent valuation is a stated preference method for obtaining values by asking people about their WTP or WTA directly

Contingent valuation is a method of economic valuation, where we directly ask people to state their willingness to pay or willingness to accept compensation for a change in the provision and quality of an ecosystem service. Alternatively, we can offer our respondents to choose between "bundles" of attributes of the ecosystem in question, thus allowing them to indicate their economic values for the services of this ecosystem. To give an example, we may conduct a contingent valuation study, where we might ask people: "How much are you willing to pay to keep the forest near your location intact and to continue enjoying it now and in the future?" Otherwise, we may be interested in how our respondents value enhancement of an ecosystem and its services. In this case, our question could be the following: "How much are you willing to contribute to an environmental afforestation initiative that would increase the area of the forest by 5% and the diversity of tree species in it by 10%?" Besides its ability to estimate all range of values from the TEV framework, contingent valuation is also good in offering researchers a straightforward way to ask people about their preferences and values regarding ecosystem services. The weaknesses of the method include hypothetical nature of the market presented to respondents, which may not be credible to them, possible biases in people's responses, and the need to have a large sample of respondents to produce valid and reliable results.

Common stag beetle (*Lucanus cervus*), a species used in a stated preference study The Codru Quest to determine people's valuation of biodiversity in the Codru forest in Moldova.

Choice modelling is a stated preference method for eliciting values from people's preferences expressed through surveys with choice sets

Choice modelling, also known as conjoint analysis or conjoint choice analysis, is a method of economic valuation similar to contingent valuation. However, here we do not ask people about their economic values directly but rather estimate respondents' willingness to pay or willingness to accept compensation for changes in ecosystem services from their stated choices and preferences. These choices and preferences the respondents make by completing our survey or answering our questions in an interview, where a number of questions represent choice sets. Every choice set contains several scenarios with different changes in specific characteristics (attributes) of ecosystem services in question, as well as a baseline (status quo) scenario with no changes. Except status quo, each alternative scenario in every choice set has a specific "price" the respondents are expected to consider while choosing their preferences. The economic values are then calculated from the chosen scenarios and their "prices". For instance, if we want to estimate and demonstrate some of the use and non-use values of a certain forest ecosystem, we may present people a questionnaire with a number of scenarios of how the forest could be enlarged and its biodiversity could be enriched presently with long-term effects on ecosystem services there projected into the future. In the alternative scenarios, we may introduce changes in the area of the forest, the diversity and richness of species of flora and fauna in it, and the monetary value people would have to contribute to this project or the price they would have to pay to access the preserved and improved forest. Then, after collecting the required amount of answers, we would use specific econometric models and statistical computing software to estimate economic values of specific attributes of the forest and its ecosystem services.

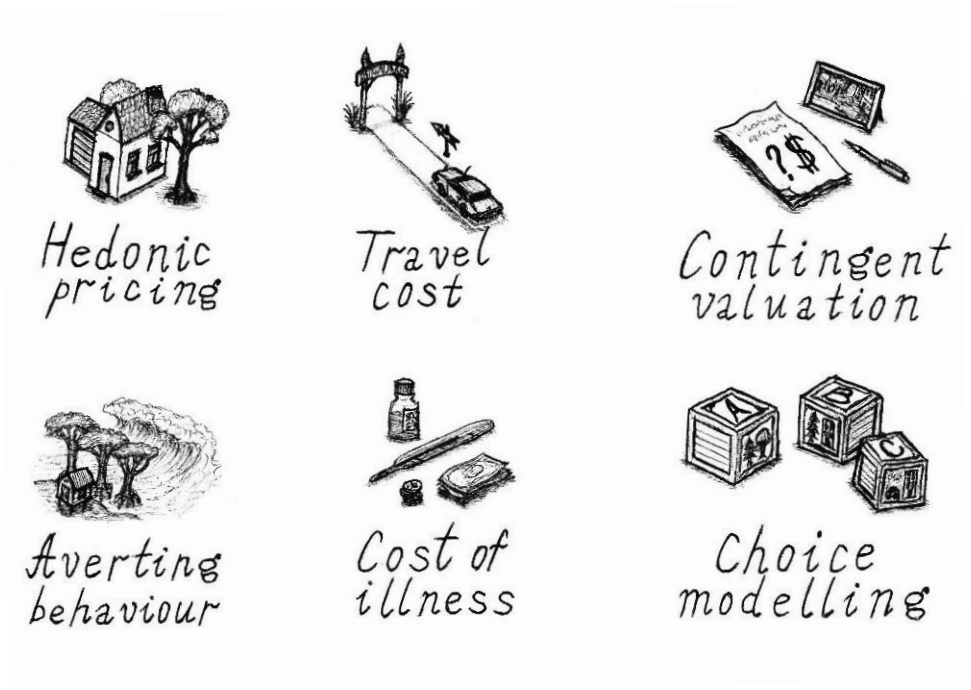


Figure 6. Most commonly used methods of economic valuation of ecosystem services.

Although, choice modelling method elicits values in a more subtle way than contingent valuation does, it still shares its strengths in capturing both use and non-use values and weaknesses related to hypothetical market, biases in people's responses, and the need for significant sample of respondents. Besides that, choice modelling suffers from problems of cognitive burden on the respondents due to complex structure of its questionnaires containing multiple scenarios and choice sets and of sensitivity of the results to the way a choice modelling questionnaire is designed.

Benefit transfer technique is an approach to estimate values of ecosystem services by transferring them from existing studies and adjusting them to a new context

All these methods from both revealed preference and stated preference categories of economic valuation techniques are usually quite complex, time-consuming, and expensive to be conducted from the very beginning. A less time-and-resource-consuming alternative to them is the **benefit transfer** technique. It essentially consists in finding a previously realised economic valuation study on an ecosystem and its services (study site) similar to the one of our interest (policy site) and transferring economic values from there to our own research. Certainly, this transfer is done with the necessary adjustments for differences in characteristics of the two ecosystems, socio-economic conditions, demographics, and other factors. An illustrative example of applying benefit transfer is needed here. Initially, before deciding whether to conduct any primary economic valuation study on a forest ecosystem in question or not, we may want to search existing scientific literature on whether there have already been any research works done on economic valuation of a forest similar to ours in size and type. In case there is any such study, we may then use its calculated economic values to estimate the values of the forest ecosystem and its services that we focus on. As a result, we would get the result similar to the existing economic valuation research, but adapted to the specifics of our forest ecosystem. In such manner, benefit transfer technique allows us to reduce the need to conduct complex economic valuation studies from the very beginning, thus saving costs, efforts, and time. Unfortunately, the complexity of ecosystems, unobserved differences between them, and possible biases in primary studies used for value transfer may undermine the accuracy and reliability of benefit transfer outcomes.

Certainly, there are many more economic valuation techniques and methods that are worth mentioning. There is also much more to say about each of these methods and how to apply it for demonstrating the importance and value of ecosystems and their services and then for using this value in decision-making. This chapter was meant just for introducing the methodology of economic valuation of ecosystem services to you. To learn more about this topic and to "dive" deeper into practical application of economic valuation techniques, you are encouraged to check and use the reference list of this manual for additional learning resources.

The Codru forest in the Republic of Moldova. In 2017, this forest ecosystem was used as a study site for an experimental research project called The Codru Quest. Within the project, a stated preference technique, namely the choice experiments method, was applied.

Box 3. Economic Valuation of a Forest Ecosystem in Moldova

The Codru Quest study conducted in 2017 was the first case of applying a stated preference technique to estimate economic values of a forest ecosystem in Moldova

In 2017, our organisation MEGA conducted an experimental economic valuation study in the Republic of Moldova as part of the first edition of the project The Codru Quest. In this study, we used a variation of the choice modelling method called choice experiments to estimate and present indirect use and non-use values of ecosystem services and biodiversity conservation in the Codru forest and the Codru Nature Reserve, the oldest protected area in Moldova, situated within this forest. The Codru Quest study became the first case of applying a stated preference technique to assess economic value of a forest ecosystem and its services in the country.

In our study, we surveyed over 200 citizens of Moldova by means of an on-line questionnaire and computer-assisted personal interviews (CAPI). The design of our questionnaire included six choice sets, each featuring a baseline scenario and two alternative ones with changes in certain attributes of the Codru forest ecosystem. These attributes were the size of the territory of the forest, richness of species of plants and insects conserved, abundance of specific endangered species, and the hypothetic price people would have to pay to visit the Codru forest and the Codru Nature Reserve.

The study showed that people valued conservation of insect species at 2688 EUR per year and of endangered species at 3028 EUR per year

After collecting the necessary amount of data, we used a statistical software called R and certain econometric models to estimate people's willingness to pay for better protection and sustainable management of the Codru forest ecosystem and its biodiversity. The results of our estimations showed that people had been in favour of conserving insects in the forest and had been willing to pay a cumulative of 2688 EUR per year to have greater diversity and richness of insect species there. Respondents also supported better protection of endangered species of both flora and fauna with a total willingness to pay of 3028 EUR per year. These monetary estimates are low due to challenging socio-economic situation and high rate of poverty in the country. Nevertheless, they reflect the recreational, existence, bequest, and altruistic values that Moldovan citizens attach to the Codru forest ecosystem.

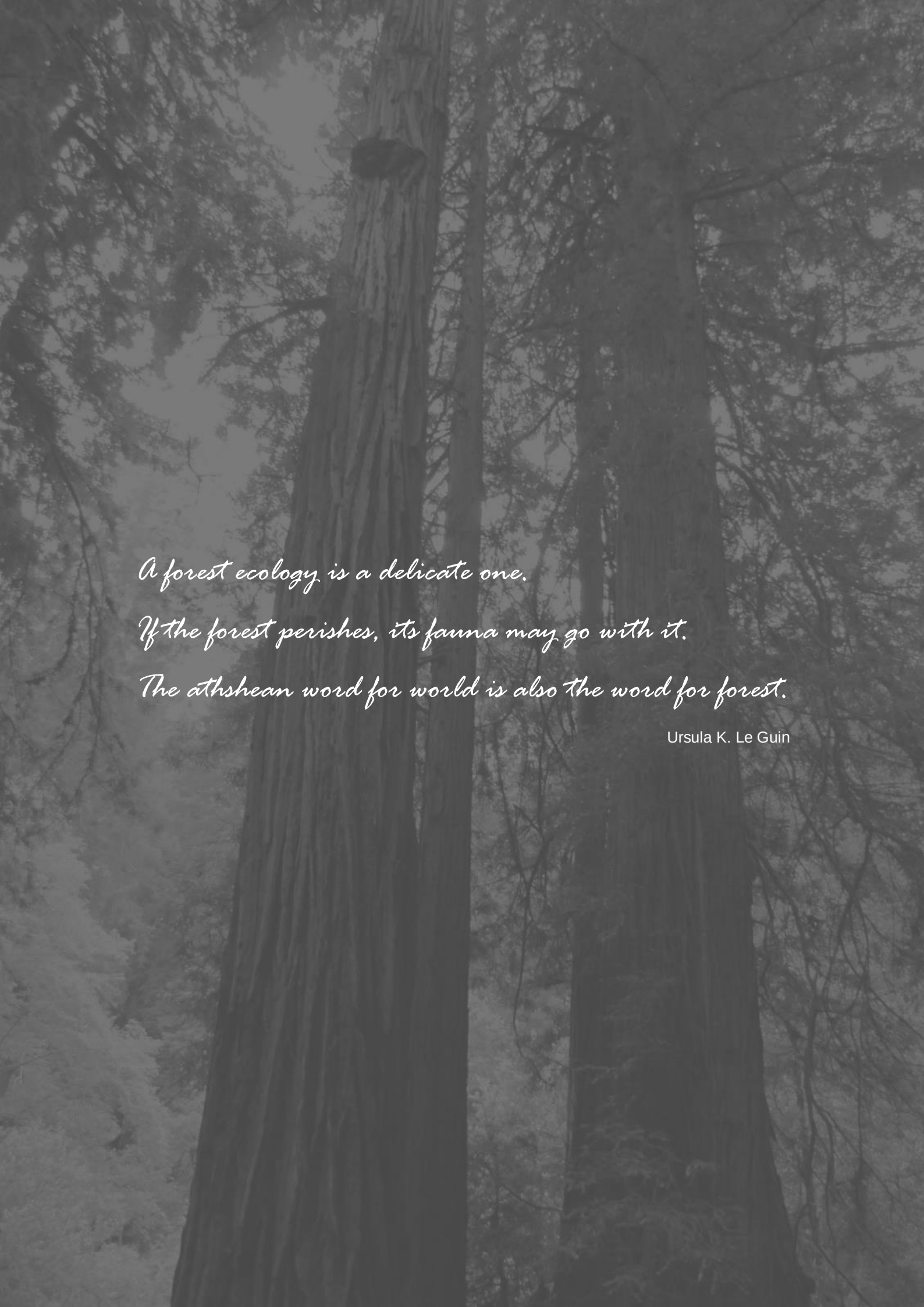
The results of the Codru Quest study are now available on-line in the form of the Final Report along with a thorough methodological guide, a sample questionnaire, and all datasets. You can find them at the Codru Quest webpage, as well as in the list of references of this manual.

Sources: Iscenco and Ungureanu (2018), MEGA (2017a), The Rufford Foundation (2017).

PART II

Strategic Planning of Sustainable Forest Management

When a forest is protected and managed sustainably, it can become an attractive touristic location. Shown here are two giant coastal redwood trees (*Sequoia sempervirens*) in the Muir Woods National Park in the US.



A forest ecology is a delicate one.

If the forest perishes, its fauna may go with it.

The athshean word for world is also the word for forest.

Ursula K. Le Guin

Human Influence on Forest Ecosystems

Key learning points of the chapter:

- Human influence on forests, their ecosystems, and biodiversity;
- Threats to forests caused by human interventions;
- Negative consequences of human influence on forests.

In the first part, we discussed about forest ecosystems, the benefits and value they bring to us, and the influence of forest ecosystem services on our wellbeing. We also saw how we could evaluate these benefits and influence of ecosystems in economic units, thus making even subtle ecosystem services observable and applicable in project management, land use planning, and policy-making.

However, our relations with forests are not one-sided. While benefitting from their ecosystem services, we, humans, also influence the state of natural resources, ecosystems, and biodiversity in forests. Unfortunately, this influence is not always positive; in fact, the constantly expanding human population on the planet and our increasing pressure on the surrounding nature threaten forest ecosystems all over the world. Presented further are some of the ways in which we affect forest ecosystems and solutions that we can implement to prevent or mitigate their negative consequences.

Commonly people interact with ecosystems by consuming and exploiting their resources, which relates to direct use values of ecosystem services

The most common and obvious way in which we interact with forest ecosystems is direct consumption and exploitation of their natural resources. If we recall the TEV framework, this interaction relates to direct use values that we derive from ecosystem services. In terms of the four categories of ecosystem services, it is the provisioning service that allows us to obtain and use forest resources.

Mainly, we consume timber for its uses in construction and decoration of our living spaces, furniture industry, musical instruments industry, boatbuilding, pulp and paper production, thermal energy generation for heating and cooking, and other purposes. This requires cutting trees and either using timber directly or selling it to third parties. When this is done sustainably, in a specially planted and managed forest, with enough time given for it to grow new trees in place of the cut ones, then such way of consuming timber can be considered an acceptable economic activity with benefits to people and minimal harm to the natural environment.

Cutting of trees for wood – a very common human intervention into the Codru forest in Moldova.

The trouble starts, when we invade into a natural, pristine forest and start cutting its trees with heavy machinery without considering the forest regrowth rates and all the damages to fragile forest ecosystem that comes with such intervention. This overconsumption of natural resources and overexploitation of forests is usually the result of inefficient economic instruments, imbalance of economic incentives, weak regulatory policies, their ineffective enforcement, low prioritization of long-term sustainable uses of forests, underestimation of their non-consumptive benefits and intrinsic value, and many other factors. The consequences of all these factors are accelerating deforestation and degradation of forests, rapid depletion of their natural resources, loss of biodiversity, and decline in the provisioning and quality of practically all forest ecosystem services.

A major cause of deforestation worldwide is changes in land use, where forests are replaced by economic activities requiring physical space

However, trees are being cut and forests are being diminished not just because of the valuable timber that they contain. Another major cause of deforestation worldwide is changes in land use, where forests are replaced by agricultural fields, residential areas, artificial touristic attractions, mining sites, and other economic activities requiring physical space on the face of our planet. Unsustainable agriculture characterised by mass-produced monoculture crops for both people and livestock is particularly threatening for any kind of natural terrestrial ecosystems, including forests. This is because such agricultural practice depletes practically all fertility potential of the soil, pollutes it along with groundwater with chemicals, ruins the productive biodiversity in the area, and therefore requires continuous expansion to new yet unpolluted territories. Since physical space on the surface of the Earth is limited, this expansion turns into an invasion onto natural ecosystems, forests included.

Not only trees are in danger of being cut and their wood being overconsumed by the never-ending human needs and desires. Other non-timber forest products, such as medicinal plants, flowers, berries, and mushrooms are vulnerable to being collected by people visiting forests. If this collection is properly regulated and forest visitors do it sustainably and in small quantities, then there is little danger to the ecosystem. However, when we are talking about unsustainable and excessive collection of plants, especially the endangered species of flora, then this activity becomes a threat to the forest ecosystem and its biodiversity, which in turn undermines a number of services the forest provides.

A common enemy of forests with recreational value is waste pollution, which penetrates into soil and groundwater and causes deaths of forest animals

Waste pollution is yet another common enemy of forest ecosystems. The recreational value of forests attracts people to visit them, to have a walk through the woods, to organise picnics with families in them, and so on. Unfortunately, if these people are not used to taking their trash with them and if there are no facilities for proper waste disposal around, what is left after their enjoyment of the recreational value are piles of solid and organic waste. One can find here a variety of packaging waste, plastic bottles, and food scraps. However, the consequences of waste pollution in forests are much worse than mere displeasure of seeing post-picnic trash sites and open waste dumps in the woods. This waste pollutes soil, undermining its biological and ecological functions and fertility. Toxins and small particles from slowly decomposing also penetrate through soil and enter groundwater, which then emerges into a spring, rover, or lake. At the same time, animals in the forest mistake pieces of plastic and other inorganic waste for food, swallow them, and in many cases die from accumulation of waste items in their digestive system. This is why it is so important to take our waste from the forest with us and dispose it in a place with proper waste collection and processing facilities.

One of the post-picnic places in the Codru forest in Moldova.

Figure 7. Major human induced threats to forests.

Uncontrolled hunting and poaching are other harmful human interventions into forest ecosystems. These activities, especially when they affect endangered species of fauna, can make a serious blow to the biodiversity in the forest and stability of its fragile ecosystem.

Finally yet importantly, mere disturbance of forest ecosystems by logging machinery, nearby road traffic, noisy tourists, families on a picnic, and other human interventions can be harmful to the stability of habitats in forests. When the disturbance persists in one location within the forest, animals leave this location and try to find a more peaceful habitat. Unfortunately, the forest, like any other ecosystem, has its limits. Therefore, when human disturbance is present all over the territory of the forest, animals have simply nowhere to go and remain suffering from our road traffic, picnics, and other disturbing activities.

Certainly, we influence forest ecosystems, either directly or indirectly, in many other ways. We can also mention here soil erosion from changing land uses, damages to ecosystems from mining activities and dams, habitat fragmentation, air pollution, forest fires, invasive species, effects of climate change, and other. Thus, while forests offer us natural resources and ecosystem services for our wellbeing and welfare, we return the "favour" mostly by overexploiting forests and causing harm to them in multiple ways. Nevertheless, it is still possible to remediate the situation, to conserve our forests, and to use them sustainably. In the following chapters, we will see how we can do it.

Box 4. Suffering of Forest and the Sovereignty of Man

The Codru forest located in the Republic of Moldova is comprised of small patches that were once part of a vast forest ecosystem. While in the former times, the share of forest cover in Moldova was approximately 60% of the total territory of the country, nowadays it is reduced to only 11 – 15%.

Every year, from 2000 to 4000 m^3 of timber from the Codru forest is cut and sold, and these numbers do not account for illegal logging in the forest

One of the main factors of such extensive deforestation is continuous logging taking place in the Codru forest. Every year, from 2000 to 4000 cubic meters of timber from the forest is cut and sold on the market. In 2015, when the latest official data is available, the volume of timber extracted and sold rose to over 4500 cubic meters. Moreover, these are the official numbers that do not take into account the volume of timber cut illegally, which is either unknown or not communicated publicly. What is known, however, is that every year local rangers and the police register about 800 cases of illegal logging in the Codru forest. Therefore, it is reasonable to assume that the damage of ongoing deforestation is much greater than it is officially stated.

Not only trees in the Codru forest are suffering from harmful human interventions. Populations of already rare and endangered species of local flora, such as snowdrops (genus *Galanthus*), are at risk of being depleted due to their uncontrolled collection by forest visitors. This collection is driven by the local market demand for snowdrops and other flowers, backed by promises of significant economic gains for collectors. This demand skyrockets in spring, during local holidays and celebrations with their flower-gifting tradition. The result is that the population of snowdrops and other rare and endangered species of plants in the forest keeps shrinking.

Poaching without prosecution gives more opportunities for poachers to hunt forest wildlife

Fauna in the Codru forest is also not safe from people's ecosystem-damaging actions there. Each year, rangers and the police register over 400 cases of poaching in the forest. Unfortunately, many of these cases remain without prosecution. This gives poachers more opportunities to hunt the local wildlife, thus harming the forest ecosystem and its biodiversity further.

In addition to all the above, the Codru forest is surrounded by a number of roadways. Several of them even go through the forest, splitting its territory into parts. These conditions put animals moving from one part of the forest to another in peril of being hit by fast-moving cars and heavy trucks.

Sources: CrimeMoldova (2016), Ecology.md (2015), Iscenco et al. (2017), Iscenco and Ungureanu (2018).

Integration of Ecosystem Services into Forest Management

Key learning points of the chapter:

- Causes of overexploitation and degradation of forest ecosystems;
- Integration of ecosystem services into forest management planning;
- IES approach and its application in forest management planning.

In the last chapter, we looked through the ways, in which we, humans, influence forests and biodiversity in them. We understood that, in many cases, people overconsume natural resources and overuse forest ecosystems, thus causing deforestation, degradation of habitats, biodiversity loss, pollution with waste, and ultimately deterioration of the quality of ecosystem functions and services. However, if forests bring us so many valuable benefits and a variety of essential ecosystem services now and in the future, why do we have such destructive relations with them?

One of the causes of forest overexploitation is that indirect use and non-use values are not integrated into forest management and land use plans

One of the underlying causes of overconsumption and overexploitation of natural resources in a forest is that, in comparison to the direct use values of forest ecosystem services, indirect use and non-use ones cannot be easily observed and assessed. Therefore, these values are usually overlooked and are not integrated into forest management and land use planning. People and institutions that make or influence decisions regarding forest management see and prioritize mostly economic gains from direct uses of a forest ecosystem, such as cutting of wood, allocation of land for agriculture or industrial activities, and other. Decision-makers observe and understand direct gains from forest exploitation, because such natural resources, as timber and land, have concrete prices on the respective markets that suggest their value to people. These prices give economic incentive signals to cut trees and sell timber or to clear out a forest and set up a farm on its place. Even worse, the more people cut and sell or the faster they turn an “unproductive” forest into a productive farm, the higher is the promise of their direct economic gain.

At the same time, those forest ecosystem services that provide people with indirect use and non-use values in the long term are usually not priced and do not have real markets. For example, how can we put a price on clean air in a forest that gives us health benefits and is generally essential for our living? Or

how can we trade on the market the pleasure from knowing that this forest and its rich biodiversity simply exist? Such "invisibility" of long-term indirect use and non-use values over clear market signals of short-term direct benefits influences decision-makers to go for the "cut-and-sell" or “clear-and-replace” management of forests. Furthermore, if there are other stakeholders competing for the same land and natural resources in the same forest ecosystem, then this "cut-and-sell" and “clean-and-replace” strategy becomes the race to forest overexploitation.

What can we do in this unsustainable situation, where in the end practically everyone, including forest exploiters, loses? What actions we need to implement to protect forests from the “overexploitation race”? Certainly, we can conduct economic valuation research and present the non-market values of forest ecosystem services "translated" into the "money language" to relevant decision-makers, an approach that we discussed in the chapter about economic valuation.

Ecosystem services need to be integrated into forest management policies, strategies, and plans

However, simply doing so is not enough to convince decision-makers to shift forest management towards the "conservation and sustainability dimension". We need to integrate ecosystem services into forest management policies, strategies, and plans, so that all relevant and influential stakeholders clearly see the economic and social trade-offs between the unsustainable "cut-and-sell" or “clear-and-replace” scenario and the sustainable and ecosystem-friendly one. Only in this case we have the opportunity to motivate our stakeholders for considering the non-consumptive benefits and value of forests and for supporting the decision to pursue the latter scenario.

How can this be achieved and such an opportunity be created? An answer to this question can be the six-step approach to integrating ecosystem services (IES) into development planning, also known as the **IES approach**. It was elaborated by the German organisation GIZ within its project called ValuES. Detailed information about this approach and the entire ValuES project can be found on the project’s website and in manuals and guides of GIZ listed in the references of this manual. Here, we will just have a brief look at the steps of the IES approach, guiding questions of each step, and examples of applying them into practice.

IES approach is a practical framework for integrating ecosystem services into development planning

The aim of the IES approach is to provide researchers, conservationists, and other practitioners with a hands-on and policy-relevant framework for integrating ecosystem services into development and management planning. In such way, the approach makes it possible to recognise, demonstrate, and capture the value of forest ecosystems, their services, and biodiversity for sustainable development and management of these ecosystems. Moreover, this practical framework helps to assess and present conditions of ecosystem services, demands for them and influences on them from various stakeholders, opportunities for effective intervention into policy-making, and other aspects of development planning.

Coniferous forest within the Ala Archa National Park situated in the Tian Shan Mountains in Kyrgyzstan. Here, in 2016, the organization GIZ applied the IES approach and trained local stakeholders on how to use it to integrate local ecosystem services into development planning.

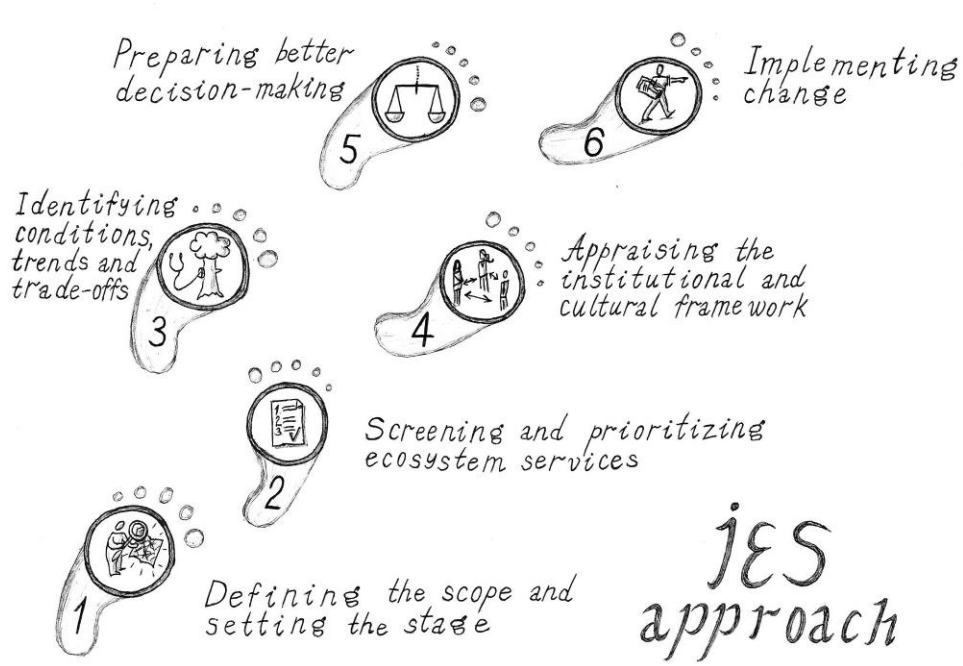


Figure 8. Six steps of the IES approach developed by GIZ within the ValuES project.

As the name of the six-step IES approach suggests, this framework of integrating ecosystem services into development and management planning consists of six consecutive steps.

These steps are:

1. Defining the scope and setting the stage;
2. Screening and prioritising ecosystem services;
3. Identifying conditions, trends, and trade-offs;
4. Appraising the institutional and cultural framework;
5. Preparing better decision-making;
6. Implementing change.

Further, we will take a closer look at each of the listed steps one by one.

First step of the IES approach is about defining objectives, scope, and expected outcomes

Initially, we need to launch the IES implementation process by defining the scope of our assessment of ecosystem services and their integration into development planning. We also need to establish concrete objectives for doing the assessment and integration, identify the most important stakeholders and resources to be involved into the IES process, as well as set the stage for further actions. Generally, with this first step we want to answer such questions, as "What is the area we are working with? What are the main development and management issues here that we are dealing with and want to resolve?

Why do we want to resolve them? What are the milestones and outcomes that we want to achieve? Finally, what capacities, funds, and other resources do we require for carrying out the IES approach here successfully?" As a result of the first step, we should get clear understanding of the development and management issues we had chosen to address, concrete objectives, scope, and expected outcomes of the IES process, and detailed action plan with requirements for capacities and resources to carry out the IES approach.

Second step of the IES approach is when priority ecosystem services, their risks, and opportunities in relation to the development plan are identified

When we know the focus area, the main issues to be addressed in this area, the scope of our assessment, the objectives for our development and management plan, the expected results, and the resources needed to achieve them, we can bring in ecosystem services. This is the second step in the IES approach, where we document all relevant ecosystem services in the forest, screen them in relation to the existing development and management plan, and prioritize these services according to our needs and the needs of our key stakeholders and the natural environment. Here, we also want to see how the development and management plan connects to forest ecosystem services and affects them in relation to the creation of both risks and opportunities. Therefore, the questions we want to answer at this step are "What ecosystem services in the forest are the most important and relevant to the development and management plan and why? How does the development plan depend on them and at the same time impact the forest ecosystem services? Which of the stakeholders are expected to be affected by the development plan and the changes in ecosystem services that it brings? What benefits and costs are associated with changes in the forest ecosystem services and how will these be distributed among the affected stakeholders? Lastly, will this distribution create any conflicts, competition, or synergies among the stakeholders?" When all these questions are answered, we will get a list of priority ecosystem services to focus our attention on along with a matrix of dependencies and impacts of the development and management plan upon these services. We will also see whether there are any areas of conflict or competition among the affected stakeholders that we should consider.

Third step of the IES approach is focused on describing the conditions, future trends, and trade-offs of ecosystem services

Having defined specific forest ecosystem services that we would work with, as well as their changes, risk, and opportunities in connection with the development and management plan, we then need to assess what condition the ecosystem services are in nowadays and what are the main trends in the supply and demand for them. We may also be interested in knowing how the supply and demand are likely to change in the future and what the key factors and drivers of this change are. Besides that, we should also identify the existence of any trade-offs among different stakeholders, development goals, and ecosystem services. This is what the third step of the framework is about: identifying ecosystem service conditions, trends, and trade-offs. In this way, we describe the cause-

and-effect relationships between our priority ecosystem services and the development and management plan. The key questions here are "What information on the state and trends of the chosen forest ecosystem services exists? Based on that information, what is the current state of these ecosystem services? How this state is likely to change due to possible future trends in supply and demand for these services? What are the main drivers of that change? Finally, what trade-offs might exist between the forest ecosystem services and the goals of the development plan and how do these trade-offs affect different stakeholders?" The third step thus concludes with an overview of the present condition of our priority ecosystem services, their future trends and likely changes, drivers affecting these changes, and any trade-offs existing between the ecosystem services and the development and management plan.

Fourth step of the IES approach is related to appraising the institutional, legal, and cultural framework behind changes in ecosystem services

At the fourth step of the six-step process of integrating ecosystem services into development and management planning, we want to know exactly who are the key stakeholders and institutions that influence the chosen forest ecosystem services and the demand and supply trends for them. Specifically, we need to learn what the stakeholders' positions and interests regarding the ecosystem services are and what needs and values lie under these interests. We also want to know what policies, regulations, and informal rules existing among the stakeholders govern current forest uses and management practices. This knowledge will help us to understand better how people use, manage, and influence forest ecosystem and its services, as well as to learn what institutional, legal, and cultural factors can cause positive or negative changes in the ecosystem. In other words, at this step, we need to appraise the institutional, legal, and cultural framework underlying the drivers, which affect the forest ecosystem services. This means, that we want to answer such questions as "Which stakeholders and institutions govern our targeted forest ecosystem and its services? Who of these stakeholders takes part in decision-making regarding the forest ecosystem and in what role? What are the positions, interests, needs, and values of these stakeholders that drive their ecosystem use and management choices? What are the policies, regulations, informal rules, and other incentive structures that influence stakeholders' use and management of the ecosystem services? Lastly, are there any conflicts or inconsistencies among different institutional, legal, and cultural frameworks that affect the demand and supply of the ecosystem services, as well as any changes in them?" The output of the fourth step represents a detailed information about the main stakeholders with their positions, interests, needs, and values, as well as a list of key policies, regulations, and informal rules, which influence the ways these stakeholders use, manage, and affect our priority ecosystem services. In addition, this step brings us a summary of causes and drivers underlying the degradation of our forest.

Fifth step of the IES approach consists in identifying policy options, instruments, and entry points for preparing better decision-making with regard to ecosystem services

The fifth step of implementing the IES approach consists in summarising all the information generated during the previous steps and in capitalising upon it to prepare the amendments for the development and management plan regarding the focus area and its ecosystem. Here we aim to investigate and determine possible ecosystem-related risks and opportunities for our development plan. We also attempt to identify suitable policy options, instruments, and intervention points for influencing decision-making that are necessary to maintain or increase the quality and provisioning of our priority ecosystem services, as well as to reduce or avoid any negative effects on them. The questions for us at this step are "What are the ecosystem-related risks and opportunities for our development and management plan? How can economic valuation of ecosystem services help us at this stage? What are the most feasible policy options and entry points for us to use in order to capture ecosystem service opportunities and reduce or avoid risks? Finally, how can our suggested policy options, instruments, and intervention points capitalise upon already existing practices and experiences?" Answers to these questions will give us a list of risks and opportunities in connection with the chosen ecosystem services and our development plan and another list of policy options, instruments, and entry points into decision-making regarding the use and management of the targeted forest ecosystem.

Sixth step of the IES approach concludes its application with strategy and work plan for realizing policy options and implementing changes in the development plan

Finally, the last, sixth step of the IES approach is about implementing the necessary change. Here we define and develop the implementation strategy for integrating forest ecosystem services and policy options that were identified in the previous step into the development and management plan. We also establish a concrete work plan for this strategy with the necessary instruments, stakeholder involvement activities, communication tactics, and other specific actions and responsibilities for them. Thus, the questions we focus on here include "What are concrete actions that need to be undertaken in order to realize our policy recommendations and to integrate them into the development and management plan? Are these recommendations and actions realistic, feasible, acceptable, and consistent with the development plan? Who is going to be involved in implementing these actions and what are their specific responsibilities? Do we have the necessary financial, technical, human resources, and institutional capacities to deliver the proposed policy options and changes in the development plan? Lastly, how will the impacts of the policy options and the development plan be monitored and communicated to the stakeholders?" The results of the sixth step, as well as of the entire IES approach, are the implementation strategy and the work plan for realizing policy options proposed for the forest development and management plan along with the communication tactics to inform the main stakeholders about our recommendations and to engage them into sustainable forest management.

By applying the IES approach, we can reduce or even halt pollution and degradation of the Codru forest and at the same time conserve its habitats and biodiversity. Ultimately, this brings benefits in terms of improved ecosystem services to practically all local stakeholders.

Box 5. Practical Application of the IES Approach

The application of the IES approach can be illustrated with an example of the Codru forest and the Codru Nature Reserve in the Republic of Moldova.

The Codru forest is home to a number of species of plants and animals with the status of vulnerable, endangered, and critically endangered in Moldova

In the first step of the IES process, defining the scope and setting the stage, we may discuss and write that we are working with a forest ecosystem located at a distance of about 49 km to northeast from Chisinau, the capital city of Moldova. This ecosystem includes more than 1000 species of protected plants, 43 species of mammals, 145 species of birds, 7 species of reptiles, 10 species of fish, and over 8000 species of insects. It also serves as the habitat for a number of species of flora and fauna that are included in the Red Book of Moldova as vulnerable, endangered, and critically endangered for the country. Next, we may also identify the focus area of our assessment and intervention, which is the Codru Nature Reserve, a protected area occupying approximately 5176 ha of the Codru forest. The issue we are dealing with here is the degradation of this forest ecosystem due to a number of threats, such as unsustainable logging, collection of endangered species of plants, poaching, waste pollution, conflicting interests over local land use, and other (for details see Box 4). Lastly, the aim that we want to achieve is halting the degradation of the Codru forest and establishing policies and practices for its sustainable use and management based on proper consideration of the value of the forest ecosystem services.

In the second step, screening and prioritising ecosystem services, we may assess all possible ecosystem services of the Codru forest and then focus strictly on the provisioning and cultural services as the ones underlying most of the conflicting interests of local stakeholders. These services would be connected with use value of timber, non-timber products, and recreational benefits, and non-use values of pure existence of the forest, of its significance for local communities, and of long-term gains of its ecosystem for future generations. We may also want to list all key stakeholders that influence the prioritised ecosystem services and/or that are dependent upon them: logging companies, poachers, farmers, tourists, policy makers, and others. Additionally, to assess how valuable the chosen ecosystem services are for these stakeholders and to demonstrate this value in quantifiable metric, such as money, we may conduct an economic valuation study.

Shifting to the third step, identifying conditions, trends, and trade-offs, here we may consider how current practices of forest use and management affect the provisioning and cultural ecosystem services offered by the Codru forest.

Box 5. Practical Application of the IES Approach (continued)

We may also attempt to determine how the conditions of these services are likely to change under continuous human pressure and what the driving factors of that pressure are. At the same time, we may reflect upon the possible changes in the quality of our targeted ecosystem services, as well as in supply and demand for these services. Finally, we may identify trade-offs between the ecosystem services and the goals of the development plan, such as keeping the Codru Nature Reserve as a protected area inaccessible for visitors or transforming it into a national park with recreational amenities.

The fourth step of applying the IES approach to the Codru forest, appraising the institutional and cultural framework, may be about the assessment of existing policies, legal documents, and cultural norms that govern the use and management of the forest ecosystems in Moldova in general and the Codru forest with the Codru Nature Reserve within it in particular. We may also want to look at how this institutional, legal, and cultural framework influences forest management practices in terms of timber extraction, collection of non-timber products, and recreation and tourism. In addition, we may consider doing a more in-depth analysis of the main stakeholders, namely of their positions, interests, and needs in relation to the Codru forest.

The fifth step, preparing better decision-making, means that we need to prepare our policy recommendations and amendments to the development plan that favour sustainable use and management of the Codru forest. Our recommendations and amendments should include possible risks of the plan, such as overexploiting provisioning services with unsustainable logging, and important opportunities to capitalise upon, such as socio-economic gains from recreational and cultural services of the forest ecosystem.

The result of applying the IES process is the forest sustainable management strategy with its action plan

Finally, at the sixth step of the IES approach, implementing change, we conclude the process by preparing the Codru forest sustainable management strategy aimed at implementing our policy recommendations and amendments in practice. The strategy should be accompanied by an action plan with the communication tactics, list of personnel and resources required, and budget. After that, obviously, we should start executing the strategy and action plan to create the scenario that secures sustainable use of the Codru forest, conservation of its habitats and biodiversity, and long-term benefits from ecosystem services available for all key stakeholders.

Sources: GIZ (2012), Iscenco and Ungureanu (2018).

Decision-making in Forest Management

Key learning points of the chapter:

- Opportunity costs in forest use and management;
- Cost-benefit analysis, net present value, and their practical application;
- Multi-stakeholder analysis and other decision-making approaches.

Previously, we have learnt that one of the underlying causes of overuse and degradation of forest ecosystems is that their users and decision-makers, who can influence forest management policies and practices, prioritize consumptive direct use of these ecosystems and underestimate or even completely ignore indirect use and non-use values of forests. We have also found out how we can integrate both market and non-market values of forest ecosystem services into development and management planning. This allows decision-makers to rely on complete information of the total economic value of forests and to consider their conservation and long-term sustainable use in policies, regulations, and plans. To make it happen, we can refer to the six-step approach of integrating ecosystem services into development planning suggested by the ValuES project of the organisation GIZ.

Application of the IES approach can result in several feasible policy options and strategies, but it is likely that there are insufficient resources to implement all of them

However, while applying the IES approach to our focus area with its ecosystem services, stakeholders, and different relations among them, we may end up with not one, but several feasible and attractive policy options and strategies for sustainable forest management. From the first sight, all of these options and strategies may look good and promise significant benefits to a large number of our stakeholders, as well as to the natural environment. What should we do in this case? Can we actually implement all of the policy options and strategies that we came up with after applying the IES approach?

Unfortunately, pursuing multiple options at once is usually inefficient and even unrealistic. One issue here is that we have limited financial, technical, human, and other resources, as well as insufficient time, to invest in implementing all policy recommendations and changes in the development plan that we came up with. At the same time, while some options can be realised with comparatively little resources, but also give very few benefits, other pathways may require practically all the available resources, but result in many more and much greater

gains for stakeholders and the natural environment. “So, let us go for one of the latter options that promise greater benefits to both our stakeholders and the forest", you may suggest here. However, the world is not so simple and “linear”, especially when it comes to ecosystems with their multiple components, complex interactions, unclear interdependencies, and competing interests for their services. To make as economically optimal, socially ethical and fair, and environmentally friendly decision as possible, we need to consider a number of additional decision-influencing factors. These factors lie behind answers to such questions, as “What is at stake in each of our options? What unintended side effects may arise from pursuing any of the options? Who are the winners and losers in each development and management scenario proposed? What ethical and moral considerations come with different pathways? Lastly, what are the opportunity costs entailed with each choice that we make?”

We will talk about winners and losers among stakeholders and ethical and moral considerations of different policy options in further chapters. Right now, let us focus on the economic side of decision-making in forest management. Specifically, let us have a look at one of the key concepts in economics – opportunity costs.

Opportunity costs are the value of potential gains forgone from choosing among several mutually exclusive alternatives

Opportunity costs, also known as alternative costs, are a special category of economic costs that represents potential gains forgone due to the choice of one particular alternative between two or more mutually exclusive options. In other words, these are potential benefits that individuals could have received from alternative options, but that these individuals would lose, because only one of the options is chosen for implementation. These potential benefits forgone can be not only financial. Unused opportunities, lost time, pleasure not experienced, and any other missed gain that could have provided utility can also be included in opportunity costs.

Opportunity costs are not the sum of all benefits forgone of all alternative options that we did not pursue. Instead, they represent the value of gains of the next best and next most valuable alternative that was put aside to give room for implementing the best option there is, in our view.

Opportunity costs stand at the basis of a relationship between scarcity (of goods, resources, time, etc.) and choice. They drive our attempts to use limited resources and time in the most efficient way possible. We always want to make sure that we make the best decision among the alternatives, which maximises our gains and minimises our sacrifices. Indeed, opportunity costs appear, when we have to sacrifice something, be it time, money, or any other valuable resource. If there is no sacrifice involved in our decision-making, then there are no opportunity costs for us.

Opportunity costs of declaring most of the forest on the Island of Vilm in Germany a restricted protected area may be the economic and social benefits of undeveloped eco-tourism there forgone.

It may be quite difficult to grasp such complex and confusing definition of opportunity costs. To explain it, we can try illustrating opportunity costs on an example of a pristine forest with rich biodiversity. For the sake of simplicity and clarity, let us assume that we have only two alternative forest management options. The first option is to transform the forest into a national park with eco-tourism infrastructure that is accessible for visitors. The second one is to designate the territory of the forest as a strictly protected area and therefore restrict any access to it in order to conserve the naturally developing forest ecosystem and its rich biodiversity.

If we choose the first alternative to pursue and establish an open-for-tourists national park in our forest, the opportunity costs would be better protection of the forest ecosystem and larger diversity and richness of species that are lost due to disturbances of the ecosystem by visitors and infrastructure developments. This would also affect the economic value of better functioning forest ecosystem that is lost because of not pursuing the second option. If instead we decide to go for the second alternative and restrict access to our forest, the opportunity costs would be the economic gains from eco-tourism that could no longer be claimed and possibly reinvested into nature conservation activities in the forest ecosystem. We can also consider here social and health benefits from visiting the forest that people would no longer be able to enjoy due to not choosing the first option of the national park. Finally, the opportunity costs of selecting and implementing any of these two alternatives could also be the profits from cutting and selling timber that we would no longer receive and would not be able to invest into socio-economic activities, not to mention the inability to produce any timber-based product that could be valuable to people.

Opportunity costs can be forgone benefits related to the choice of investing our scarce resources at one site, but not at the other

The issue with understanding and considering opportunity costs is even more complex in that these costs can relate to the choice not only between mutually exclusive alternatives at one site, but also between competing options at other possible sites. Once again, this has a direct connection with scarcity and sacrifice. For instance, implementing conservation and sustainable management plan in our forest means that we do not invest our resources, time, and efforts in protecting another forest ecosystem, which may be no less valuable in terms of ecosystem services and biodiversity than the chosen one. Hence, our opportunity costs here are the forgone benefits (economic, recreational, etc.) that we could have enjoyed in that other forest if it would have been protected better. Besides that, by choosing to use our scarce resources in one way, we are no longer investing them in other directions, such as alternative environmental projects, support for local communities, economic activities, and other. The value of forgone gains of the next best alternative among these competing directions are our opportunity costs.

What all this means for our forest management planning is that we need to choose one or several policy options and implementation strategies that can be realized within the limits of our financial, technical, human, and other resources. To make our choice as optimal as possible, we need to minimize our costs, while maximizing the expected benefits of our proposed policy and strategy. Furthermore, we need to do it in such way that these benefits not only exceed the real costs in the budget, but also the opportunity costs of not pursuing the second best available option. Only in such case, we can make sure that we create the maximum possible positive change for our forest ecosystem and its stakeholders with the minimum possible expenditures of our scarce resources to achieve this change.

To aid us in such complex and challenging decision-making, there are a number of approaches designed to assess and compare alternative projects in transparent, thorough, and justified ways. One of the most well-known and therefore most commonly used approaches is the cost-benefits analysis.

Cost-benefit analysis (CBA) is an approach to compare alternative options based on their benefits and costs

Cost-benefit analysis, or CBA for short (sometimes also called benefit-cost analysis, or BCA), is an economic approach to estimate, as its name suggests, costs and benefits of alternatives and to determine the best option to achieve maximum benefits while preserving valuable resources. Besides comparing benefits and costs, or advantages and disadvantages, among alternative options already realized in the present, this approach is able to do so for scenarios that could potentially happen in the future as well. Due to these features of CBA, people frequently apply it in project management and decision-making in such domains as business, investment, and public policy.

CBA can be applied both to evaluation of an individual project and to comparison between multiple alternatives

Mainly, CBA is used for two purposes:

- In case of an individual project, the approach is applied to determine whether the project's benefits outweigh its implementation and management costs and therefore whether the initiative is worth pursuing at all.
- In case of multiple projects, CBA is brought up to compare total expected benefits and total expected costs of each alternative option available and to decide upon the best project or projects to go forward with.

How can this help us in conservation and sustainable management of forest ecosystems? Firstly, by applying CBA to our development and management planning, we can determine which alternative policy options and strategies have total expected benefits exceeding total expected costs and which do not. We can then immediately exclude the latter options and leave only the former, more promising ones, where the benefits are higher than costs or, to put it scientifically, the benefit-to-cost ratio is greater than one. Secondly, we can compare the remaining alternatives among them, check, which ones promise the most gains for all key stakeholders and the natural environment together with the minimum costs incurred, and choose the best strategy or strategies to implement in our forest management endeavour.

In CBA, benefits and costs of a project are expressed and compared in single metric: monetary units. Therefore, the results of economic valuation techniques are crucial for us to be able to consider all relevant forest ecosystem services and the gains they provide in CBA. Having economic values of ecosystem services and their benefits "translated" into the "language" of money allows us to compare them with costs of implementing the proposed changes in forest management and with opportunity costs of not pursuing alternative projects.

Cost-benefit analysis can assist in deciding upon the best use of the Piacersk Forest in Belarus: to continue managing it as an urban park or to transform it into a protected area.

In evaluating and comparing projects, one needs to consider flows of their benefits and costs at present time and into the future

However, ecosystem services, if properly protected and sustainably managed, provide valuable benefits not only now, but also for a long time into the future. Failure to consider this leads to severe underestimation of many important ecosystem services, which in turn causes the “cut-and-sell” and “clear-and-replace” short-term scenarios to look very promising and beneficial to choose. Therefore, in order to account for the true value of gains coming from all ecosystem services, we need to consider not only present, but also future flows of these gains. The same should be done in connection with costs, as besides accounting for project implementation costs at present time, we also need to consider its management and maintenance costs occurring in the future.

Nevertheless, psychologically we prioritize present benefits over potential gains in the future. Similarly, we are more worried about present costs rather than possible expenditures later on. This is one of the reasons, why we should gradually reduce the value of benefits and costs of our policy options and strategies as we go further into the future in our analysis. In scientific language, this is called **discounting** and it means that we should discount future flows of benefits and costs to their present values.

Net present value (NPV) is an economic metric representing an aggregate of all flows of benefits and costs discounted over time

Considering this, what we get as an output of our CBA exercise is the comparison between all discounted flows of benefits that we would receive if we implement each of our alternative options, as well as discounted flows of costs related to the implementation and management of each alternative over time. The economic metric representing this comparison is called **net present value** (NPV) or net present worth (NPW) of a project, policy, or strategy. Generally, it is an aggregate of the present value of all benefits and costs spread over many years from now and into the future. The higher is the NPV of a particular forest management option, the more beneficial, attractive, and promising it is.

Certainly, CBA has its drawbacks. For example, how can we integrate intrinsic values of forest ecosystems and biodiversity and non-economic significance of forests to indigenous communities living there in such an economic approach? How can we introduce ethical and moral considerations into this analysis to make the decision that is not only cost-effective, but also ethically and morally correct? For such cases, there are other analytical and decision-making approaches. For instance, one of them is the **multi-stakeholder analysis**, where we invite representatives of all key stakeholders to consider the available alternatives, to weigh all their 'pros' and 'cons', and to decide upon the options to implement.

There is much more to learn about CBA, multi-stakeholder analysis, and other useful approaches. This chapter is just for briefly introducing these approaches to you. To learn more about them and their practical application, you are encouraged to check the reference list of the manual for additional resources.

The farther one looks into the future, the higher grows the net present value of conservation and sustainable management of the Codru forest in the Republic of Moldova, and the more beneficial and appealing this forest-friendly scenario becomes in cost-benefit analysis.

Box 6. Practical Application of CBA

Cost-benefit analysis can be integrated into the IES approach applied to the case of the Codru forest and the Codru Nature Reserve in the Republic of Moldova (see Box 5). This can be done both when we have only one policy proposal and implementation strategy to pursue and when we end up with two or more proposals and strategies to choose from. In the first situation, CBA would assist us in comparing all benefits and costs of our policy proposal and strategy that we might expect now and in the future. This would help us to decide whether it is worth pursuing our proposal and strategy or not. In the second situation, the analysis would guide us in comparing discounted benefits-to-costs ratios of all policy options and strategies that we had come up with during the IES approach. The result should inform us on which one of these alternatives is the most promising and beneficial one to invest our scarce resources, time, and efforts into.

The process of conducting CBA requires following a number of consecutive steps

Conducting a well-executed and useful CBA requires following a number of steps. In the first step, we need to determine the policy or strategy that needs to be evaluated. If there is more than one alternative for consideration, we need to know what these alternative options are and how they compare between each other. For the sake of simplicity in the Codru forest example, we can assume that we have only two mutually exclusive options for decision-making. The first one is to designate the forest primarily as a source of economic resources, thus allowing logging and sales of timber from there. The second option is to make the entire Codru forest a protected area for conserving its habitats and biodiversity with a certain part of its territory open for eco-tourism and recreational opportunities.

In CBA, each alternative option should meet the net present value criterion

In the second step of CBA, we need to do the screening of our alternative options against the net present value criterion. In order to be considered for further analysis, each policy proposal and strategy should have the present value of benefits exceeding the present value of costs. Both of our alternatives seem to pass this initial screening, but in different ways connected to how we see the flow of their benefits and costs over time.

The first alternative, the one treating the Codru forest purely as a source of timber, is likely to be very beneficial and attractive in the short-term perspective, as with minimal costs this option brings immediate and relatively high economic gains. However, as the forest ecosystem degrades and diminishes due to active deforestation, the flow of its resources and benefits also reduces, making the scenario undesirable in the long-term perspective.

Box 6. Practical Application of CBA (continued)

The second forest use and management strategy, the one featuring a protected area combined with eco-tourism and recreation site, however, may not be profitable in the first years of implementation. It is also likely to have quite high initial costs of setting up the infrastructure for eco-tourism and recreation and opportunity costs of not exploiting natural resources in the forest for direct economic gain. However, we can expect that in this scenario the Codru forest would provide stable flows of valuable ecosystems services far into the future. These services would not be limited only to recreational and health benefits, but would comprise a variety of additional gains to local communities living in villages around the forest, farmers having their farms and orchards nearby, and other stakeholders.

Standing is a step of CBA needed for considering whose benefits and costs are to count in further analysis

Talking about stakeholders, they should be considered in the next step of CBA called standing. Standing means that we need to consider whose benefits and costs we should count in our analysis. Do we consider the logging companies and timber sellers as important stakeholders for us? Or do we give more weight to local communities and farmers, who are dependent on healthy forest ecosystem for their wellbeing? Finally, should benefits and opportunity costs of tourists and city residents visiting the Codru forest for recreation be also included?

Since in CBA we are dealing with benefits and costs of our policy proposals and strategies across time, we also need to consider the time horizon of our analysis. In other words, we need to see how far into the future should we count the benefits and costs. Is it just five years from now? Ten years? Or should we consider even longer timeframe for comparing our alternative options between each other? The shorter the timeframe, the more beneficial the first alternative appears. However, the further we look into the future, the higher grows the net present value of the second, sustainable forest management scenario, and the more appealing this scenario becomes.

In the final step of CBA, risks and uncertainties have to be taken into account

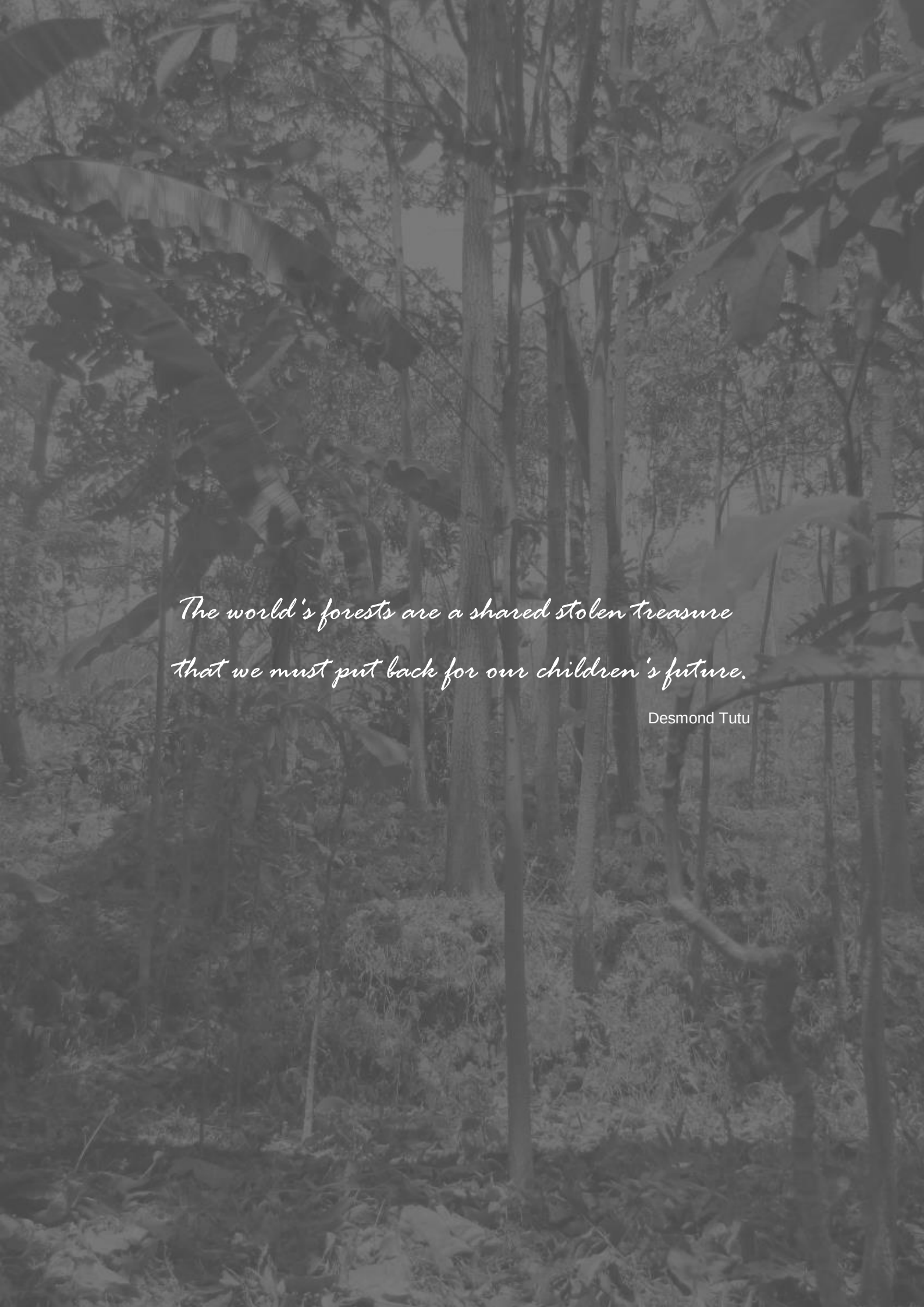
In the last step of our analysis, we need to take into account any possible risks and uncertainties of our alternative options, since benefits and costs are rarely known with certainty, especially far into the future. Finally, besides risks and uncertainties, it is also important to consider how the benefits and costs of our policy proposal and strategy are going to be distributed among the key stakeholders and between the present and future generations.

Sources: Hanley and Barbier (2009), OECD (2006).

PART III

Stakeholder Engagement into Sustainable Forest Management

Local communities can benefit from engaging into forest conservation and sustainable management in many ways. Shown here are agroforestry plantations near the Indrokilo village in Indonesia.


The world's forests are a shared stolen treasure
that we must put back for our children's future.
Desmond Tutu

Main Stakeholders in Forest Management

Key learning points of the chapter:

- Internal and external stakeholders in forest management;
- Stakeholder management process and its four main steps;
- Stakeholder analysis and its output, stakeholder register.

From the second part, we learnt how to use the six-step IES approach and cost-benefit analysis to prepare well-designed, structured, sound, and potentially effective policy proposal and implementation strategy for our forest. Ideally, such a proposal and strategy are based on the principles and benefits of nature conservation and sustainable use of natural resources and ecosystems.

Engagement of relevant stakeholders is required for successful implementation of any forest management proposal and strategy

However, even if our policy proposal and strategy for sustainable forest management look appealing and promising, they still exist only in our minds, on paper, and/or in the storage space of our computer. To realize the proposal and strategy and to bring them to fruition, we need to present and explain their aims, benefits, costs, actions, expected outcomes, and other features to relevant people. Then, we should engage stakeholders into implementing the proposal and strategy by investing their time, resources, and efforts into the necessary actions, so that ultimately these stakeholders could enjoy the flow of benefits promised. If we applied the multi-stakeholder analysis during the IES and decision-making processes, we should have started engaging certain people already at the proposal elaboration and discussion stage.

Still, we cannot present and explain our sustainable forest management proposal and strategy to all people in the country and then to engage all of them into its realization. It is neither efficient nor reasonable. It can also be infeasible at all. Therefore, we need to identify and choose the most relevant individuals, groups, organisations, companies, and state authorities, who have certain interests and stakes in the current state and management of the forest ecosystem in question, as well as in its future uses. We would also like to take into account economic agents, who have sufficient degree of influence over the fate of our forest. In other words, we need to conduct stakeholder analysis for our proposal and strategy. Who our key stakeholders are, how we can identify them, and whom we should choose for collaboration – this is what we will explore in this chapter.

Stakeholder is any economic agent, who influence a policy, strategy, or project or is affected by them

First of all, the term **stakeholder** defines any individual, group, community, organisation, company, or public authority, who may influence, be influenced by, or perceive to be influenced by a certain decision, activity, or an outcome of a proposal, policy, strategy, or project. In broader sense, this is also any economic agent, who has interest in the implementation and results of that policy or project.

The most evident stakeholders of a policy proposal or forest management strategy are the authors of the proposal and strategy themselves. This is because they are usually the most influential ones in terms of implementing their output in reality, as well as the most interested ones in observing its results and impact. The organisation that the proposal authors and project managers work in and represent can also be considered a major stakeholder, as it is likely to have both interest in the proposal and influence over it through internal work procedures, available resources, network of relevant contacts, etc. Altogether, these are **internal stakeholders** of a proposal, policy, strategy, or project.

In a project, external stakeholders can become a success driver or a tough obstacle

Equally or even more important to the success of a policy proposal or forest management strategy are **external stakeholders**. Commonly, they are one of the reasons why we embarked on preparing and implementing the proposal and strategy in the first place. External stakeholders can also be one of the main drivers of successful realization of our vision and goals for a forest or act as one of the toughest obstacles to overcome on our way.

Such high importance of external stakeholders to a proposal or strategy means that we need to involve and manage them carefully and thoroughly throughout the implementation of our forest management initiative. Generally, **stakeholder management** includes four steps that we need to go through: stakeholder identification, stakeholder analysis, stakeholder communication, and stakeholder engagement. In this chapter, we will describe only the first two steps. The two remaining ones will be explained in the following chapters.

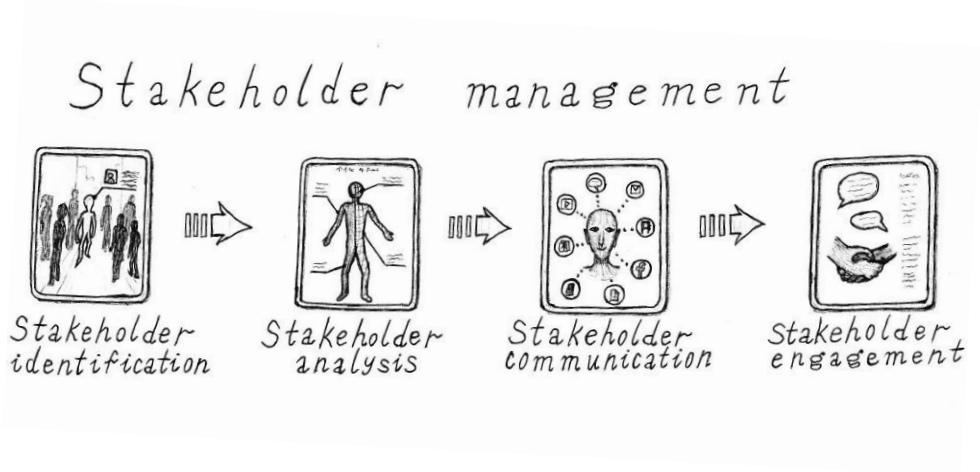


Figure 9. Four steps of stakeholder management process.

Beekeepers are one of the stakeholders of the Codru forest in the Republic of Moldova interested in its preservation, as the forest ecosystem provides "nectar gathering grounds" for their bees.

In the first step of stakeholder management process, we need to identify all possible stakeholders of our policy proposal and strategy in order to take them through stakeholder analysis afterwards. In relation to our forest ecosystem, we may conclude the stakeholder identification step with a long list of many diverse economic agents. This list may include:

- State agencies and legislative authorities, such as the Ministry of the Environment in the country and its specialised agencies responsible for forest conservation and management on a national level;
- Administrative staff and rangers of a protected area, if there is one allocated within the forest;
- Logging and timber selling companies, whose business depends on cutting trees in the forest and selling timber on local and/or international market;
- Farmers, beekeepers, artisans, hunters, and other members of local communities from the villages near the forest, who continuously benefit from the forest ecosystem services and rely on them for wellbeing and welfare;
- Visitors from other parts of the country and international tourists coming to the forest for eco-tourism and recreation;
- Scientific institutions and individual researchers using the forest ecosystem for field studies in Biology, Ecology, Genetics, Medicine, and other domains;
- Educational institutions that make use of the forest as a "living classroom";
- Local, national, and international environmental organisations that are concerned about the state of the forest and nature conservation there.

Different stakeholders usually have different interests, attitudes, positions, and influence with regard to a situation, policy, or project

Each of these stakeholders has certain interest and stake in our forest, the land it covers, the natural resources it provides, and the ecosystem services it delivers. In addition, every stakeholder has specific attitude towards the current state of the forest, as well as concrete position on how its territory and ecosystem should be managed. Furthermore, different individuals, groups, organisations, companies, and state authorities have different levels of power and influence over the present situation and any changes in it. Due to these differences in interests, attitudes, positions, and influence over the forest ecosystem, some stakeholders may be in conflict with each other, while others may collaborate and forge alliances to push forward their common agenda. Finally yet importantly, while some stakeholders may be winning from the present situation and therefore oppose any changes in forest use and management practices, others may be losing in terms of wellbeing or welfare or both and hence demand changes to existing practices.

Indeed, relations of stakeholders with a forest ecosystem and between each other can get very complex and confusing, like a tangled ball of thread. This complexity is likely to slow down or even halt our progress in implementing the desired policy proposal and forest management strategy. However, the second step of stakeholder management, stakeholder analysis, and its output called stakeholder register can help us untangle such a ball of interrelations both for the current situation in the forest and for our proposal and strategy.

Stakeholder analysis is a technique of assessing a policy or project in terms of its stakeholders and their relations, interests, needs, attitude, etc.

Stakeholder analysis is a technique of assessing a situation, policy, or project and potential changes to it in relation to all involved and relevant stakeholders. The information resulting from such an analysis can be used to determine how the interests and needs of these stakeholders should be addressed within a proposal, policy, strategy, or project, as well as how each stakeholder could be engaged into it in the most efficient and effective manner.

In relation to our sustainable forest management initiative, stakeholder analysis helps us to identify the most interested and influential stakeholders of a forest ecosystem and the specific relations, attitude, and position of every stakeholder regarding the forest both for the baseline (status quo) situation and for any changes to it suggested by our proposal and strategy. The technique also assists us in determining winners and losers in the present situation and in any alternative scenario that we may get as an output of the IES approach and CBA. Considering all this, it is therefore a good and wise practice to conduct the stakeholder analysis at the first steps of development planning and implementing the IES approach, when we research the current state of the forest in question, and then also during the elaboration of alternative development options and the CBA-supported decision-making on which option to pursue.

In conducting stakeholder analysis, firstly, we need to review the list of all possible stakeholders of the targeted forest ecosystem and of our policy proposal and strategy for it. As you already know, this list comes from the previous step in stakeholder management process, namely stakeholder identification.

It is important to document interests, needs, and their scale of all relevant stakeholders

Secondly, we need to determine and document what interests and needs each of the listed stakeholders has in the forest and possible changes to it suggested in the proposal and strategy, as well as how big these interests and needs are. For example, residents of villages situated in close proximity to the forest may be highly interested in the state and fate of its ecosystem, as they use it for gathering firewood, collecting berries, mushrooms, and medicinal plants, and coming here for recreation. Local farmers and gardeners may also feel the need in the forest due to its soil maintenance, groundwater purification, and pollination ecosystem services that increase yields on their farms, gardens, and orchards.

Assessing stakeholders' attitude and position helps in understanding why they act the way they do

Next, we need to assess the stakeholders' attitude and position towards the current state of the forest and the changes to it proposed by us. With this information, we would like to understand why stakeholders act in the way they do and what their likely reactions to our policy proposal and forest management strategy could be. To continue with the example of village residents, although they benefit from the forest and its ecosystem services and are interested in continuous flow of these services, their position on the use and management of the forest may actually be favouring certain level of deforestation. This is because local farmers may be looking at the forest as an obstacle on their way to expand their agricultural fields and pastures for their sheep and cattle. For this reason, the local community may oppose such a forest management proposal, as expanding the protected area within the forest and the territory of the forest itself with additional tree planting in the buffer zone. The latter, namely, additional afforestation, may actually be perceived as a threat of "invasion" of the state into the land property of villagers and as a risk of this land being taken from local people to serve the "unproductive" needs of "environmentalists from a city".

Stakeholder with greatest interest and strongest attitude may not have sufficient power and influence over the situation and vice versa

Another important piece of information about stakeholders that we need is the level of power and influence over forest use and management of each one of them. A stakeholder with the greatest interest and stakes in a forest ecosystem or the strongest attitude towards it may not have sufficient power and influence over the present and future situation regarding that ecosystem. For instance, community of villagers may be much interested in conservation and sustainable management of the forest nearby. However, it has little power to do anything substantial in this regard. At the same time, governmental policy makers may not care about the state and fate of that forest, but they definitely have the power to alter land use and management practices there through their policies.

Stakeholder analysis also features the description of both present and possible future state of relationships among all stakeholders

Finally yet importantly, we should try to find out more about the relationships among all listed stakeholders. Specifically, we need to know whether there are any conflicts or alliances between specific stakeholders, as well as who the winners and losers among them are in the present situation. Then, we may also need to reflect upon and describe how these relationships would develop and change under our policy proposal and forest management strategy. Going back to the village residents as an illustrative example, these people may be losers in the current unsustainable situation, when logging companies steadily cut more and more trees in the nearby forest, continuously damage the local ecosystem, and diminish the flow of its services to the locals. However, in our policy proposal and sustainable forest management strategy, where the forest is protected and the village residents are offered the opportunity to develop rural eco-tourism in the area, they may actually come out as winners.

Overall, conducting stakeholder analysis requires collection of specific data on every stakeholder listed as a result of stakeholder identification. To get these data, it is often necessary to go out into the field and ask representatives of various categories of stakeholders about their interests, needs, attitude, etc. in relation to the forest in question and our proposal for its management. These inquiries can take the form of surveys, interviews, and informal discussions.

The output of stakeholder analysis is called **stakeholder register**. This is a document that lists all relevant stakeholders of a policy, strategy, or project and that summarizes all the above-mentioned information about them. The document concludes with a reflection on how each stakeholder could affect the proposed policy or project. Stakeholder register is very useful for us in that it supports us in planning the communication of our forest management proposal to its main stakeholders and their engagement into subsequent realization of the proposal.

Maintaining Jægersborg Dyrehave in Denmark as a natural forest attracts many visitors willing to see its red deer (*Cervus elaphus*). This eco-tourism brings gains to a number of local stakeholders.

Box 7. Differences in Stakeholders' Attitude towards a Forest

Stakeholders' attitude and position towards a proposal can differ in unexpected ways

Interests, needs, attitude, and position of different stakeholders of a forest ecosystem can differ from one place to another and from one stakeholder to the other. Sometimes these differences can be quite surprising and unexpected. This is what we, the researchers at MEGA, discovered, when we conducted the economic valuation study within the project The Codru Quest in the Republic of Moldova in 2017 (see Box 3).

As part of the study, we conducted stakeholder identification and analysis of the Codru forest in the country. We also surveyed 100 respondents from the city of Chisinau located at about 49 km from the forest, and interviewed another 100 people, this time from nine villages situated at a distance of less than 5 km from the study site. All these people shared with us their interests in the Codru forest, their uses of it for getting natural resources and/or for recreational purposes, their attitude towards the current situation in the forest and the proposal for better conservation and management of its ecosystem, as well as their willingness to pay for implementing such a proposal.

While people can claim to have positive attitude towards protection of a forest, their willingness to pay may reveal the opposite

The curious discovery of these interviews was that while 93 percent of all respondents, both from the city and the villages, claimed that they had positive attitude towards expansion of existing protected areas and forests in the country and towards better conservation of biodiversity in them, the respondents' willingness-to-pay data showed the opposite picture. The mean willingness to pay for a proposal of enlarging the area of the Codru forest and the Codru Nature Reserve within it turned out to be negative. It means that people perceived the proposal as a disutility to them and were opposing its implementation. In the same manner, the mean willingness to pay for conservation of greater variety of plant species also received a negative sign.

Negative values for both attributes of the Codru forest and its conservation proposals were driven mainly by attitude and position of rural residents. The reasons behind them were related to villagers' fears that through expansion of the territory of the forest, the state would take away their land currently used for farming and grazing of their cattle. Similarly, rural stakeholders perceived conservation of greater diversity of plant species as taking away their right to collect firewood and edible and medicinal plants in the forest.

More details about the study and its results and insights can be found in the Codru Quest Final Report included in the reference list of this manual.

Sources: Iscenco et al. (2017), Iscenco et al. (2018).

Raising Awareness and Education on Forest Management

Key learning points of the chapter:

- Importance of communication with stakeholders and their education;
- Issues and challenges in communicating with stakeholders;
- The Big Five principles of effective stakeholder communication.

Previously, we explored who the main stakeholders of a policy proposal and forest management strategy could be and how we could identify and describe them with the help of stakeholder analysis. After conducting such an analysis for our forest management proposal, we will have a stakeholder register at our disposal. This document will list all relevant stakeholders for the forest in question and for our proposal. The register will also summarise the stakeholders' interests, needs, attitude, position, levels of power and influence, interrelations among each other with regard to the present state of the forest ecosystem and possible future changes to it envisioned in our proposal and strategy. In addition, the stakeholder register will indicate who among our stakeholders are possible winners and losers in both the status quo situation and in the case, when our proposal and strategy are realised. Overall, thanks to such an informative output of stakeholder analysis, we will know much on how to approach and work with the existing stakeholders of the forest ecosystem and of our initiative.

It is wise to educate stakeholders on forest ecosystem services, as this can make them aproachable and well-disposed to hearing about a policy or project

However, if we have not engaged our stakeholders in the process of planning and proposal development before, it is very likely that these people and organisations do not know anything about us, our intentions and initiative, and, generally, the value of the forest ecosystem in question and existing threats to it. Therefore, before engaging our stakeholders into the realisation of the policy proposal and strategy, we need to establish communication with them and inform them about our initiative. It is also wise preliminarily to educate these people and organisations on the importance and value of our forest ecosystem and its services. Equipped with knowledge on how valuable these services are for their wellbeing and welfare, as well as with understanding on what they would gain with sustainable forest management and lose with continuation of unsustainable practices, the stakeholders are likely to become more approachable and well-disposed to hearing about our proposal and then to collaborating with us.

Entrance path leading to the International Academy for Nature Conservation on the Island of Vilm in Germany. The Academy welcomes different stakeholders and educates them on various nature conservation themes, including forest ecosystem services.

Still, after applying all the methods and implementing all the approaches that we have examined in the earlier chapters, such as economic valuation of ecosystem services and the IES approach, we are likely to generate quite a significant amount of complex information and data. This creates a number of challenges for us, when we pursue stakeholder management and reach its third step, stakeholder communication. Namely, how can we communicate this important but complex information to our key stakeholders? How can we translate the "language" spoken by researchers into the language of rural communities, farmers, members of environmental organisations, business owners, representatives of state authorities, policy makers, and other people, who are far from environmental science? Lastly, what communication channels should we use to convey our messages and to present our forest management proposal in a transparent, understandable, convincing, and action-stimulating manner?

There are at least five general principles of how to communicate with stakeholders effectively

Certainly, there is no one-size-fits-all solution to dealing with our challenges. In every proposal, policy, strategy, or project, there may be different and unique ways to communicate with its stakeholders, raise awareness about its issues, and educate its beneficiaries about the proposed changes. Nevertheless, we can still agree on at least five general principles in terms of communicating with our stakeholders and educating them. These principles are applicable to practically any policy or project, no matter how large and complex it is. We can call them **The Big Five of Effective Stakeholder Communication**.

Principle #1: Focus project communication on each category of stakeholders and adapt messages to its characteristics and needs

The first principle from the Big Five states that we need to focus our communication tactics individually on each category of our key stakeholders and to adapt our messages to its specific characteristics and needs. This means that we may have one general message that we want to communicate from our perspective; however, we should tailor this message to the specific interests, needs, attitude, position, and levels of power and influence of every stakeholder relevant to the forest ecosystem in question and to the changes proposed for it. As you can see, the output of stakeholder analysis, stakeholder register, is invaluable here, as this document gives us all these specific data on our stakeholders as inputs for creating well-adapted and focused messages.

For example, it is a good, ethical, and fair tactic to communicate with local communities in the villages around our forest and to present them the value of ecosystem services in this forest and our sustainable forest management proposal for it. In formulating messages for these communities, we should stress the wellbeing and welfare gains for them, like better pollination and the resulting increase in yields on their farms, opportunities for jobs and additional revenue coming from rural eco-tourism, and other clear benefits for people living in rural areas and depending on natural ecosystems.

However, when we talk with government officials, state authorities, and policy makers that have the power to influence forest use and management practices, we may want to point out at other gains from implementing our sustainable forest management proposal. These gain can include long-term economic and social development of the region around the forest in question, rise in touristic attractiveness of this region, tax revenue from local eco-tourism, favourable public opinion towards the officials' position and decisions regarding nature conservation in general and protection of forests in particular, and additional votes for their party at the next elections.

Principle #2: Make stakeholder communication clear, attractive, and engaging through nonprofessional language, infographics, and comparisons

The second principle of effective stakeholder communication is very clear: we need to make everything very clear. Plus, attractive and engaging. Indeed, as a result of earlier research and analytical steps in preparing our policy proposal and forest management strategy, we may have complex data from econometric calculations of willingness to pay for ecosystem services, academic-style graphs and charts with probability distributions and confidence intervals, and a long list of post-CBA recommendations full of scientific jargon and terminology. However, all this valuable information is unlikely to help us gain clear understanding of the matter among our stakeholders and the support required from them. Therefore, to communicate with the key stakeholders effectively and convincingly, we may want to convert complex scientific data into short and easily “digestible” messages delivered in non-professional language, through attractive infographics, and with understandable comparisons.

For instance, in communication with forest users, we may want to make a point about the benefits and socio-economic value of standing trees and of the preserved flora in a forest used and managed sustainably. To do this, we may bring a waterfall of complex scientific data from the domains of Biology, Ecology, and Environmental Economics. Unfortunately, this way of communication may turn out to be ineffective in convincing our stakeholders of the importance of protecting the forest ecosystem for them, as they will simply not understand our message. Alternatively, we may compare one hectare of the conserved forest with hundreds of air conditioners as an illustration of its microclimate regulation benefits, with several water treatment plants to show the water purification service of its ecosystem, with stacks of crates of nature-based medicines as a proxy for the value of medicinal plants in the forest, and so on. Furthermore, all these comparisons can be combined into a nicely looking and clearly understandable infographic that can then be used for raising awareness and education of stakeholders on long-term value of forests and the importance of their conservation and sustainable management. In turn, this can then help us communicate the purpose, aims, and potential gains of our policy proposal and sustainable forest management strategy to the relevant and educated audience.

Public poster describing functions and benefits of flora in urban forests and parks placed in the Parukářka Park in Prague, the Czech Republic.

Still, even when we “translate” our messages from scientific estimations and academic-style data into simple-to-understand language and then beautify them with appealing infographics and comparisons, these messages may not reach their intended recipients. This can be explained by the fact that different stakeholders communicate differently. They use different channels to exchange information with other people, organisations, and the surrounding socio-economic environment. What works for reaching out to one particular stakeholder may not be effective for communicating with the other. Hence, we need to know which channels each of our stakeholder relies upon for receiving information and then make targeted use of these channels.

Principle #3: Diversify communication channels in a project and make targeted and effective use of each channel for different groups of stakeholders

This is exactly what the third principle of The Big Five is about: making effective use of communication channels specific to every key stakeholder of a proposal, policy, strategy, or project. Indeed, for conveying our messages, we should use diverse channels. The more of them we add to our communication tactics and connect with delivery of our messages, the higher the chances of these messages reaching the intended stakeholders are. Nevertheless, we should also strive to apply our communication efforts and resources in a cost-efficient way. Therefore, it is wise to consider which channels are the most appropriate for which group of stakeholders, and then use specifically these channels for each respective group. As an example, for many individuals, organisations, companies, and state authorities direct e-mail messages and tagged posts in social networks may be the most certain ways to reach them, while for other stakeholders, like village residents, farmers, and forest rangers, individual meetings and live discussions may be the most appropriate things to do in terms of effective communication and engagement.

Principle #4: Encourage stakeholders to give feedback on a project, consult with them, and listen to their opinions

Let us proceed to the fourth principle of effective communication. What do you think it is about? What would you suggest for us to do in order to communicate with our stakeholders effectively? Truly, the fourth principle states that there should be mutual exchange of information within the communication process. In other words, the flow of messages should go both ways: from us to the stakeholders and from them back to us. Otherwise, we would just have a monologue before our audience, without any engagement and feedback from the other side for us to be able to learn on whether our communication efforts are effective or not. This is not what we want. On the contrary, we want and we need feedback on our messages from the stakeholders to know how well these messages were received by them. The recipients' feedback also allows us to evaluate whether we need to adjust anything in our communication tactics and channels that we are using. Moreover, it is likely that many individuals, local communities, organisations, businesses, and state authorities from our stakeholder register know a whole lot of relevant and useful things regarding the forest ecosystem in question and possible changes to it, perhaps even many more than we know. Therefore, it is worth asking our stakeholders for feedback on our policy proposal and strategy, consulting with them, and then listening carefully to what they say or write back to us.

Such two-way communication with key stakeholders and collection of feedback from them can begin even at the research and economic valuation stages, before elaboration of policy proposal and forest management strategy. For example, while asking people about their willingness to pay for better conservation and sustainable management of the forest in question, we may also inquire our respondents about their views on the current situation in this forest and about their own visions of how the forest should be used and managed. This not only gives people an opportunity to express themselves, but also rewards them with the feeling of importance as consultants in the matter that affects their use of natural resources and ecosystem services in the forest. As a result, the stakeholders interviewed in this manner may get very active in sharing lots of useful information with us. This information may help us to understand more clearly the needs, attitude, and position of these stakeholders in relation to the status quo situation in the forest and possible changes to it, which are reflected in our proposal and strategy. In addition, the respondents' feedback may clarify the factors that influenced the expressed willingness to pay for the proposed changes in the forest ecosystem and its services. Finally yet importantly, due to our request for feedback and genuine interest in their opinion, our stakeholders may become more open and approachable to further communication with them and ultimately to their engagement into realization of the policy proposal and forest management strategy.

Principle #5: Include call to action in practically all communication with main stakeholders

Last but not least, the fifth principle of The Big Five worth following recommends us to include a **call to action** (CTA) in practically all our communication with key stakeholders. Call to action is mainly a marketing tool applied usually in the form of a word or short message, which is incorporated into larger communication instruments. The purpose of CTA is to prompt immediate response or stimulate immediate action from the targeted audience. Indeed, we do not want just to tell stories about forests and their importance and value to people, communities, organisations, companies, and state authorities. Instead, we would like them to act upon that information and knowledge. We want our stakeholders to include conservation and sustainable use of the targeted forest into their decision-making. We also want them either to consider our proposal and strategy and become involved into realizing them or to suggest an alternative plan for forest use and management. Therefore, CTA is an important element of effective communication with stakeholders and a solid and reliable bridge between that communication and the following stakeholder engagement.

A simple call to action for stakeholders within our forest management proposal can be an invitation to visit the official website dedicated to it, subscribe to our newsletter there, follow updates on our social network pages, and register for any upcoming public consultations and other events to be organised as part of our strategy and action plan. A more real-action-oriented CTA can be expressed, when stakeholders already have some information about our proposal and show sufficient interest in it. In this case, we may ask them to assist us with upcoming activities as volunteers or as contact points in their organisation or community.

Overall, in this chapter, we touched upon only a small number of principles of effective stakeholder communication. Certainly, you can find many more principles, methods, and tools in specialised literature sources. It is therefore a good idea to explore the reference list for more information on this subject.

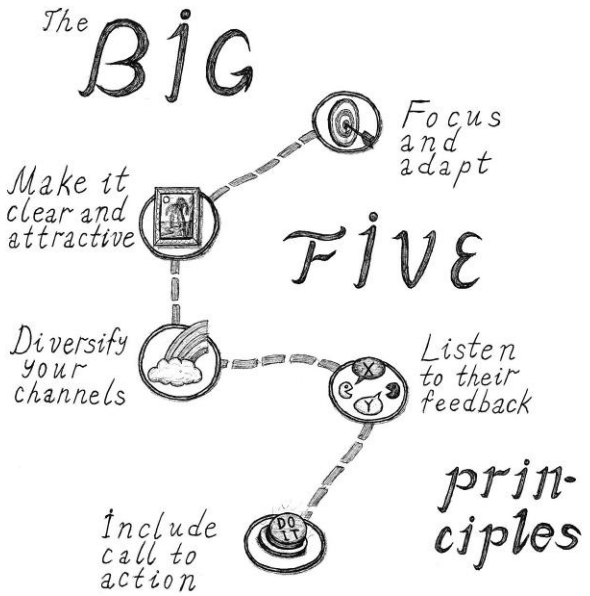


Figure 10. The Big Five general principles of effective stakeholder communication.

Box 8. Stakeholder Communication via Different Channels

In the project The Codru Quest mentioned already in a number of chapters of the manual, we, the researchers at MEGA, used a collection of methods and channels to communicate with its main stakeholders and to raise awareness about the issues facing the Codru forest in the Republic of Moldova among them (see Box 4). Some of these methods and channels were applied in combinations to groups of different individuals and organisations at once, while others were used separately for reaching out to specific categories of stakeholders. We based the choice of methods and channels on distinctive socio-economic characteristics of each stakeholder and on his/her preferred ways of exchanging information with the external environment.

On-line channels are suitable for communicating with urban stakeholders, who rely on internet as the primary source of information

For example, in communicating with Codru forest visitors and relevant environmental organisations from the capital city of Chisinau, we used direct e-mail messages, on-line chats, and posts in social networks. As a call to action, we directed these stakeholders to the webpage of our project, where they could learn more about the Codru forest and its ecosystem services, the threats that the forest is facing, our research results, and our public policy proposal regarding better conservation and management of this ecosystem. Additionally, we used presentations, infographics, video materials, and an on-line course to educate our urban stakeholders on the value of forest ecosystem services and the importance of conserving the Codru forest. The choice of these on-line channels rested on the fact that internet and on-line media are primary sources of information for city dwellers and organisations.

Direct meetings, consultations, and other off-line events are appropriate for reaching out to local communities and policy-makers

In our interaction with rural communities around the Codru forest, state authorities, and policy-makers, the approach was different. We knew that strictly on-line communication channels would not be effective among them, as these stakeholders either have limited access to internet (in case of village residents) or do not take on-line media seriously. Therefore, to reach rural communities, to raise awareness about the state and possible fate of the Codru forest among them, and to communicate our proposal to them, we went directly to the villages, where we held direct meetings with community members and organised public consultations with them. In relation to policy-makers, we set up individual meetings with each of them in their offices, invited them to the project launch and other relevant events, involved them in our educational workshops, and engaged these influential economic agents into public meetings together with other key stakeholders.

Sources: Iscenco et al. (2017), MEGA (2017b).

Engagement into Sustainable Forest Management

Key learning points of the chapter:

- Prioritization of stakeholders to be engaged into forest management;
- Stakeholder mapping and the Interest-influence Matrix;
- Engagement tactics for different categories of stakeholders.

In the preceding chapters of this final part, we talked about the first three steps of stakeholder management. We discussed about how to perform stakeholder identification and analysis in relation to a forest and a policy proposal for it, how to prepare stakeholder register based on our analysis, and how to use the register to design adaptive communication tactics for every relevant stakeholder. We also learnt about The Big Five principles of effective stakeholder communication, which can also be applied to raising awareness and education of our stakeholders. Now, when the relevant individuals, communities, organisations, businesses, and state authorities know about the importance and value of the forest ecosystem in question, are aware of the threats to it, and understand our proposal for sustainable management of that forest, we can focus our efforts on the fourth and final step in stakeholder management. This is when we engage our stakeholders into the implementation process of our policy proposal and strategy.

Commonly it is neither efficient nor feasible to engage all stakeholders into a policy or project

However, we cannot work with all of the individuals and organisations in our stakeholder register at once. We simply do not have sufficient resources and time to do this. Besides, trying to address the entire variety of wants and needs of all our stakeholders is inefficient and usually ends up with a large mess and confusion. Therefore, we need to choose and prioritize the most relevant stakeholders for our proposal and strategy. We also need to agree on specific engagement actions for every selected category of stakeholders. Like in the case of communication and education, some engagement activities can be implemented easily and can be applied to several stakeholder categories at once. However, other actions may require extra efforts and resources for us to invest into in order to bring on board the most difficult yet important stakeholders. The Interest-influence Matrix is a simple and reliable tool that can help us to prioritise all our stakeholders and to define engagement tactics for each of them.

Interest-influence Matrix is a technique for prioritizing stakeholders and defining engagement tactics for each one of them

Interest-influence Matrix, sometimes also referred to as Interest-power or Power-interest Matrix, is an easy-to-use stakeholder analysis and mapping technique. This technique helps one to decide which stakeholders to involve into a proposal, policy, strategy, or project and how exactly to engage each one of them. In such way, the matrix can inform us where we should direct our engagement efforts and resources to achieve maximum possible and most effective involvement, participation, and contribution of the most relevant stakeholders within our policy proposal and implementation strategy. It can also suggest us what specific engagement tactics and actions we need to apply in relation to every category of stakeholders considered.

The Interest-influence Matrix is constructed from two perpendicularly intersecting axes. One of the axes, for instance, the horizontal axis X, can denote the level of interest of a stakeholder in our forest ecosystem and the forest management proposal for it. The other axis, in our case the vertical axis Y, can indicate the level of power of a stakeholder and his/her influence over the state and fate of the forest, as well as over the implementation of our proposal. The level of interest starts from Low on the left side of the X-axis and increases to High on the right side. Similarly, the level of influence and power grows from Low at the bottom of the Y-axis to High at the top of it. This setting creates four quadrants: quadrant I with high interest and high level of influence / power, quadrant II with low interest, but still high influence / power, quadrant III with both low interest and low level of influence / power, and finally quadrant IV indicating high interest, but low influence / power. Inside each of these quadrants, we write appropriate categories of stakeholders and engagement activities specific to them.

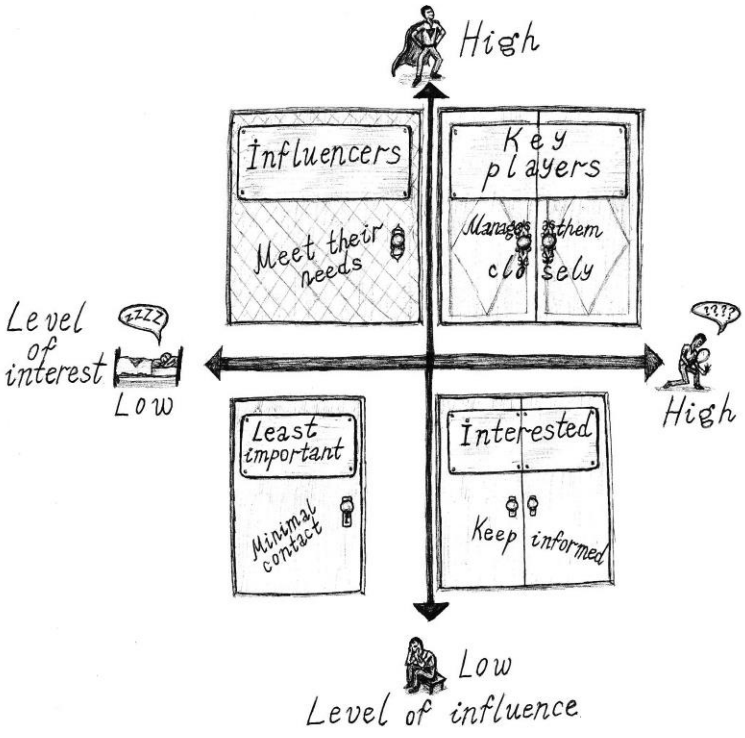


Figure 11. Most common setting of the Interest-influence Matrix.

Stakeholders with low interest and low influence should only be monitored occasionally for any increase in interest and/or influence

Let us start from the quadrant III in the lower left corner of the matrix. This is the place to put stakeholders with relatively low interest in the state and fate of the forest in question and in our proposal for it, as well as low level of influence on both how the forest is currently used and how it could be managed in the future. With all due respect to people and organizations listed in this quadrant, they are the "**bystanders**", the "**least important**" actors for us with regard to the forest management proposal. The appropriate engagement tactics here are to monitor these stakeholders occasionally for any signs of increased interest and/or level of influence and power. However, as a rule we should maintain minimal contact with these people and organisations and should not spend resources, efforts, and time on involving them into our proposal and strategy.

A common example of the "least important" stakeholder category is the general public. We simply cannot work with all people in the world or even just in our country. We do not have so many resources and so much time to engage and collaborate with all of them. Besides, many people just do not know and/or do not care about our forest, especially if they do not use it in any way. They also have practically no influence on its current state and any possible changes to its ecosystem and management. Practically, the only feasible actions we can do here is to keep informing the general public about the importance and socio-economic value of forests, their biodiversity, and ecosystem services, to keep raising awareness about the threats that forest ecosystems face, and to keep communicating about the progress of implementing our proposal and strategy to people via mass-media and social networks. We can also monitor people's reaction and feedback to our messages in order to see whether there is anyone with growing interest and/or level of influence emerging from the public.

Stakeholders with high interest but low influence should be kept completely informed about a policy or project and its implementation progress

The quadrant IV in the lower right part of the matrix is reserved for "**interested**" stakeholders, who can also be considered as "**victims**". They are characterized by low level of influence and power over the status quo situation and any future developments in the forest, but at the same time by high interest in these matters. Stakeholders here are mostly direct and indirect users of the forest ecosystem services. Their wellbeing and welfare is connected to the forest and its natural resources in one way or another, positively or, perhaps, negatively, as they might believe. Such connection makes these individuals and organisations concerned about the state and fate of the forest ecosystem with its resources and services. The appropriate engagement tactics for this group of stakeholders are to communicate with them continuously and to keep them completely informed about the state of things. Here the principles of effective communication presented earlier become very useful. In addition, it is a good idea to monitor the "victims", in case some of them become more influential and powerful and therefore more appropriate for another quadrant and engagement actions.

Tourists visiting the Muir Woods National Park in the US are important stakeholders of this Park, who are interested in the preservation of the old-growth forest of coastal redwood trees within it.

One example of the “interested” category of stakeholders can be forest visitors and eco-tourists coming from far away, like a city or even another country. These people may visit our forest occasionally or frequently, benefit from its recreational and cultural ecosystem services, and even support nature conservation here by paying visitor fees and sending donations. Visitors and eco-tourists, especially the frequent and devoted ones, are usually interested in preservation of their favourite recreational and touristic places. Therefore, they would like to be well informed about any changes and developments to them. It may not be feasible to engage all these people directly into the implementation process of our forest management proposal. Nevertheless, we should keep the interested visitors and eco-tourists fully informed about the current state of their favourite forest and the proposed changes for it. This is because these stakeholders can help advance the realization of our proposal and strategy in various indirect ways. For instance, they can sign public letters to the state authorities about protection and sustainable use of the forest, offer donations for specific biodiversity conservation activities, participate in reforestation events, and share our messages and news with their contacts, who might have greater level of influence and power than they do.

Moving to the top "level" of the Interest-influence Matrix, quadrant II in the upper left side represents the “hotspot” of “**influencers**”, sometimes also called “**irresponsible**” stakeholders. These are individuals, groups, organisations, businesses, and state authorities, who are commonly not interested in the forest ecosystem in question and our proposal and strategy for it. They may also consider the current state of the forest along with its conservation and sustainable management as being outside their obligations and responsibilities.

Stakeholders with low interest but high influence should be kept close, satisfied, and invited to key activities and events of a project

However, this category of stakeholders includes some of the most powerful and influential stakeholders from our list in the stakeholder register. In certain aspects, the state and fate of the forest in question, as well as the successful realization of our proposal and strategy, depend on their attitude, position, resources, contacts, decisions, policies, and so on. Such influential economic actors should be kept satisfied with what we propose for them and how we treat them. Furthermore, “influencers” should be kept close to us as potential supporters and enablers of changes envisioned in our forest management proposal. The effective engagement tactics for this group of stakeholders include careful monitoring and anticipation of their needs, fulfilment of their requests, and desirably involvement in key activities and events of our proposal and strategy as very important persons and organisations.

A well-known example of an “influencer” is the government. Government officials are likely not to care about a forest somewhere far away from the capital city, but they definitely have certain level of power and influence over that forest. This power can be especially strong, when the land of the forest is owned by the state. In this case, it is entirely in the government’s will to decide how to use that land and the forest ecosystem on it. Moreover, governmental regulations, policies, decisions, and laws can either protect our forest and all other forest ecosystems in the country or lead to their demise by allowing businesses operating in logging, mining, palm oil production, food production, and other domains to cut trees, alter land use, and generally pollute these ecosystems. However, if we consider that government officials care about elections (especially before actual elections) and are in need of people's votes to stay in power, then we can play this "card" in our favour. For instance, if we clearly demonstrate to the government that a significant number of voters support nature conservation and sustainable use of forests and ensure visibility of the government's decisions in relation to forest management among these voters, then we may get a powerful state-level ally helping us to implement our policy proposal and strategy for sustainable forest management.

Finally, we have arrived to quadrant I in the upper right part of the matrix. This quadrant is the most important for us, as it is the "habitat" of “**key players**” and “**change-makers**”. Stakeholders here possess both high level of interest in our forest ecosystem, its resources and services, and our proposal for its management, as well as high level of power and influence over the state and fate of the forest. “Key players” are usually the ones, who use natural resources in the forest and gain from its ecosystem services the most. They are often dependent on these resources and services, therefore having high stakes in the ways the forest is used and managed. These stakeholders can become either winners or losers as a result of the implementation of our proposal and strategy.

Stakeholders with high interest and high influence should be managed closely and thoroughly and involved in all aspects of a project

At the same time, the successful realization of our forest management proposal can be dependent on the involvement and contribution of these individuals and organisations. In many cases, we may not be able to do anything in the forest in question without their consent and permission. This can happen in a situation, when we are dealing with a privately owned forest or a forest that stands partially on private land. Hence, the proper engagement tactics for "key players" are to tend carefully to meet their needs, to involve them in all aspects of our proposal and strategy, and to manage them closely and thoroughly. Options of how to do that are many: from interactive public consultations and round tables with participation of "key players" to their direct and active engagement as proposal implementation partners, sponsors, advisers, and multiplicators.

A clear example of a "key player" in forest management is a state authority that is directly responsible for developing and managing a forest ecosystem on a state-owned land. This can be a forestry agency under the Ministry of Environment and an administrative office of a protected area or a national park subordinating to that agency. The most obvious reason why the forestry agency and the protected area or national park administration should be in the category of "key players" is that we cannot implement any changes to the forest, like reforestation of cut-down patches within it, or to its management practices, such as developing eco-tourism in the forest, without official permission of these stakeholders. Therefore, ideally, we should have already involved them into our research on the importance and socio-economic value of ecosystem services in the forest in question, application of the IES approach, elaboration of our policy proposal and implementation strategy for the forest, and communication of our common proposal to other "key players" from the Interest-influence Matrix. Further, we should continue keeping the agency and its administrative office as valuable implementation partners and enablers, addressing their needs, collaborating with them closely, coordinating our main activities with them, and appreciating their contribution and support in all our external communications and public events.

Interest-influence Matrix can be used for tailoring engagement tactics and actions to every key stakeholder in a cost-efficient way

In sum, we have prepared the Interest-influence Matrix for our proposal of sustainable forest management. We can now use it to map all our stakeholders according to their relevance to the forest in question and to our proposal for it. The matrix is also useful for determining the level of efforts we should invest into engaging each relevant stakeholder and for specifying concrete engagement tactics and actions for every key individual and organisation. To get inspiration and practical examples of these tactics and actions, we invite you to look through the reference list for additional literature sources on stakeholder engagement. We also encourage you to explore the internet for more information. Then, it is up to you to apply fitting stakeholder engagement actions in practice.

Stakeholder engagement can be implemented in creative, innovative, and effective ways by using modern information technologies and on-line tools

Box 9. Practical Application of Stakeholder Engagement

Engagement of relevant stakeholders into conservation and sustainable management of forests can be done in creative, innovative, and effective ways with the use of modern information technologies and on-line tools.

In MEGA, we have used our on-line platform called MEGA Game to connect with interested individuals and environmental organisations in Moldova and to engage them into conservation and reforestation in the Codru forest. The platform featured a series of game-like missions to be completed by its users while visiting the forest. The missions were combined into a practical quest, which gave the name to our project: The Codru Quest. The realization of the quest via the MEGA Game platform resulted in the engagement of over 60 volunteers and in planting of more than 700 trees near the Codru forest.

The Czech environmental organisation Zelený Kruh (Green Circle) has developed a website called Poslanecká Rosnička (Deputy Frog), which tracks the voting process of members of the Czech Parliament on specific environmental topics, including protection and management of forests, and then displays these data in the form of easy-to-understand visual graphs. Nowadays, this website is used by other local environmental organisations to inform civil society about the voting of parliamentary parties regarding environmental topics and at the same time execute pressure on those parties to pursue proper nature conservation and sustainable development agenda.

Another Czech environmental organisation Hnutí DUHA (Friends of the Earth in the Czech Republic) has combined a variety of on-line tools into an extensive national campaign to protect the country's forests suffering from deforestation, droughts, and infestation by the bark beetle (*Scolytinae*). Special campaign website, petition webpage, social media channels, mailing lists, newsletters, and other on-line instruments have been used to communicate key messages of the forest conservation campaign and to engage different categories of stakeholders into it. Hnutí DUHA has also applied the so-called See-Think-Do-Care framework in the form of an "engagement pyramid". Firstly, the organisation offered people to read its petition for protection of the Czech forests and to sign it. Then it invited them to participate in small conservation-related actions and/or send donations for supporting the campaign. Finally, Hnutí DUHA capitalized on previous results to engage people and organisations into volunteering for the campaign.

Sources: MEGA (2017a), Zelený kruh (2018).

With proper forest conservation and sustainable management strategy, as well as effective engagement of key stakeholders into its implementation, the deforested patches in the Codru forest in Moldova can be restored and its damaged ecosystem can be healed.

Conclusion and Summary Review

The topics of forests and their ecosystems, economic valuation of their ecosystem services, conservation of their biodiversity, and sustainable forest management are very broad. They encompass a large number of techniques, methods, approaches, and frameworks designed to incorporate the concept of forest ecosystem services into land use development and management planning with the final goal to ensure effective protection of forests and long-term sustainable use and management of their natural resources and ecosystems.

The aims of the manual were to introduce the concept of forest ecosystem services and to inspire further exploration of this subject

The contents of the present manual "Forest Ecosystem Services: Valuation, Conservation, and Sustainable Management" just barely “scratch the surface” of these topics. We purposefully did not put more information into the manual, as its aim was only to introduce the concept of forest ecosystem services and to explain its most important methods and approaches for practical application in land use planning, policy-making, and environmental project management. We also aimed at raising your interest in the topics of our publication and at inspiring you to explore more on the subject in other literature sources. If you already began searching for more in-depth publications while going through the entire manual, then perhaps we have achieved these aims.

All in all, we hope that you have enjoyed reading this manual as much as we enjoyed writing and preparing it for you. We also hope that you have learned many new, interesting, and useful things on how to research, conserve, and manage forest ecosystems, as well as how to engage relevant stakeholders into these important activities. Finally, we will be happy if one day your learning journey with our publication transforms into policy proposals and practical actions that would ensure restoration, protection, and sustainable management of forests in your country.

Speaking about the learning journey, let us review the key learning points from each of the three parts and nine chapters of the manual that we went through.

We began our exploration of the concept of forest ecosystem services with the part on Economic Valuation of Forest Ecosystem Services. There, we learnt that ecosystems are complex combinations of living organisms, non-living components, and multiple interrelations among them. We then discovered that ecosystems provide a variety of benefits to people, as well as the surrounding natural environment, and these benefits are called ecosystem services. Researchers group these services into four large categories: provisioning, regulating, cultural, and supporting ecosystem services.

After that, we understood that ecosystem services bring not only direct use benefits to people, like consumption of natural resources and recreation, but can also supply indirect use gains to people's wellbeing and welfare, such as water purification and pollination. Furthermore, some people appreciate and value natural ecosystems simply for their existence, for the possibility of other people to benefit from them in the present, as well as for future generations to be able to use those ecosystems in the future. This is how we discovered existence, bequest, and altruistic values, which are part of the category of non-use values of natural ecosystems. Altogether, the direct use, indirect use, and non-use values of ecosystem services form a framework that is called the Total Economic Value of the ecosystem providing those services.

Key learning points of Part I: Forest ecosystem and ecosystem services; Total Economic Value framework; Techniques and methods of economic valuation

Finally, in the first part, we also talked about how to estimate and demonstrate the Total Economic Value of a forest and its ecosystem services. We discovered that it could be done with different techniques, such as revealed preference and stated preference techniques, depending on where we get the input data from: either from observing of people's behaviour on real markets or from asking respondents about their economic values based on hypothetical markets. We then learnt that each type of technique has also specific methods for us to choose from. Among the "family" of revealed preference methods, we looked at hedonic pricing and travel cost; while in the category of stated preference techniques, we focused our attention on contingent valuation and choice modelling methods. In addition, we also mentioned benefit transfer as a cost-efficient way to get useful estimates of economic values of ecosystem services without conducting expensive and time-consuming primary valuation study. Overall, the results of applying any of these economic valuation techniques and methods can be very helpful in many stages of preparation and implementation of sustainable forest management proposal: from assessing what is at stake and strategic planning to communicating with relevant stakeholders and engaging them into realization of the proposal.

The second part of the manual focused on Strategic Planning of Sustainable Forest Management. Firstly, we looked at different ways in which we, humans, use and exploit forest ecosystems. We saw that many of our activities in forests and on the land they stand on threaten the health, stability, and resilience of forest ecosystems. The common human-induced threats include overconsumption of natural resources, such as timber and non-timber products, land use changes and land conversion, deforestation, waste pollution, uncontrolled hunting and poaching, disturbance of habitats, forest fires, invasive species, effects of climate change, and other ways in which people tip the fragile balance within forest ecosystems. Indeed, in spite of all the benefits that forests provide to us, we tend to exploit their ecosystems excessively and unsustainably.

Therefore, after talking about anthropogenic threats to forests and their harm on ecosystems and biodiversity there, we switched to examining how we can protect forest ecosystems effectively and manage them sustainably. Here, we learnt about the six-step framework of integrating ecosystem services into development and management planning, which was developed within the ValuES project of the organisation GIZ. The six steps of the IES framework include: 1) Defining the scope and setting the stage; 2) Screening and prioritising ecosystem services; 3) Identifying conditions, trends, and trade-offs; 4) Appraising the institutional and cultural framework; 5) Preparing better decision-making; 6) Implementing change. By following these steps, we can effectively integrate the concept of forest ecosystem services with their socio-economic values into development and management planning. In turn, this allows us to prepare and implement a strong and sound policy proposal for conservation and sustainable management of our chosen forest along with the implementation strategy for it.

Key learning points of Part II: Human-induced threats to forests; Six steps of the IES approach; Opportunity costs, Cost-benefit analysis, and net present value

However, in our strategic planning and proposal-making process, we may come up with not one policy option for sustainable forest management but a good number of them. Some of these options may be mutually exclusive, preventing us from implementing them at the same time. Moreover, not pursuing one option or the other may entail significant opportunity costs for us. To guide us in choosing the most realistic, beneficial, and cost-efficient policy option(s), we have Cost-benefit analysis at our disposal. By using economic values of forest ecosystem services, we can compare the gains coming from each alternative option now and in the future with the costs of implementing that particular alternative. Subsequently, we can choose the option(s) with the highest net present value that fits our budget, available resources, and time constraints, and then focus our efforts on making that particular proposal(s) happen. Still, besides CBA, other tools can help us make a wise choice among multiple alternatives. As an example, we mentioned multi-stakeholder analysis, which could be applied to account for ethical and moral considerations in our decision-making.

From strategic planning, we transitioned to the third and final part dedicated to Stakeholder Engagement into Sustainable Forest Management. There, we firstly learnt the definition of stakeholder, which is any individual, group, organisation, company, or public authority that may influence, be influenced by, or perceive to be influenced by a certain decision, activity, or an outcome of a proposal, policy, or project. We then presented the four steps of stakeholder management process and started talking about the first two of them: stakeholder identification and stakeholder analysis. For the analysis, we listed the key data that we need to collect about our stakeholders, namely their interests, needs, attitude, position, levels of power and influence, and their interrelations among each other. These data are usually obtained from surveys and interviews with each stakeholder.

Afterwards, we shifted our attention to the third step of stakeholder management, namely stakeholder communication. We began our discussion here with the exploration of how we could communicate with key stakeholders effectively and convincingly. We also looked at how to raise awareness about the threats faced by the forest in question and how to educate our stakeholders on ecosystem services and sustainable forest management. We then summarized our ideas and reflections in the Big Five principles of effective stakeholder communication. They are: 1) Focus communication on each stakeholder and adapt messages to his/her needs; 2) Make stakeholder communication clear, attractive, and engaging; 3) Diversify communication channels and make targeted and effective use of each channel; 4) Encourage stakeholders to give feedback, consult with them, and listen to their opinions; 5) Include call to action in practically all communication. By following these principles, we can elaborate and implement targeted and effective communication tactics for each of our key stakeholders.

Key learning points of Part III: Stakeholder identification and analysis; Five principles of stakeholder communication; Stakeholder engagement via the Interest-influence Matrix

Finally, in the last chapter of the manual, we raised the topic of stakeholder engagement into sustainable forest management, which is the fourth step of stakeholder management. There, we talked about the need to prioritize which stakeholders we should engage and learnt how to do it with the help of the Interest-influence Matrix. The four quadrants of the matrix serve as places, where to put stakeholders based on their levels of interest and influence, as well as indicators of how much effort to apply for engaging each one of them. The “least important” quadrant suggests us only to monitor the stakeholders listed within it and to inform them occasionally. The “interested” quadrant recommends us to communicate all the relevant information to the individuals and organisations within it continuously. The quadrant of “influencers” advises us to anticipate their needs, fulfil their requests, and generally keep the influencers satisfied. Finally, the most important quadrant for us, the one of “key players”, indicates that these are the stakeholders, whom we should manage closely and thoroughly and involve in all aspects of our initiative. With the Interest-influence Matrix at hand, we can be sure to invest our resources, efforts, and time into engaging only the most interested and influential stakeholders into our proposal.

In sum, these were the key learning points from the entire manual. We hope that you have found it interesting, informative, and useful for your professional activity and/or personal interest in conservation and sustainable management of forests. We now encourage you to channel the knowledge and tools from our publication into protecting a forest that you use and value. In this way, you will not only apply the things that you have learnt here into practice, but will also create meaningful positive change in the forest and the local community that are important to you.

MEGA best wishes to you in that needed and noble endeavour!

When forest ecosystems are sufficiently protected, used responsibly, and managed sustainably, they can develop into true Paradises on the Earth, supplying us with a variety of ecosystem services for our wellbeing and welfare on a long-term basis.

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Terminology

Attribute	Distinctive characteristic of an ecosystem and its services. For example, attributes of a forest can include size of its territory, diversity and richness of species there, recreational possibilities, and other.
Abiota	An aggregate of all non-living components of an ecosystem, such as soil, water, air, minerals, energy, etc.
Altruistic value	Component of the Total Economic Value of an ecosystem and subcategory of non-use values. Altruism is the opposite of egoism and refers to the desire of an individual to assure an improvement in the wellbeing of others. Therefore, altruistic value represents people's appreciation of an ecosystem as being important and valuable to others.
Benefit transfer	Economic valuation technique based on economic values of an ecosystem and its services that have already been obtained in one site (study site). These values are then transferred with some adjustments to another site (policy site). An illustrative example is the application of economic values from one research project concerning a forest at a particular location to another project with similar forest ecosystem at another location. Benefit transfer technique is most suitable for obtaining the necessary values without conducting entire economic valuation study from the beginning, which saves researcher's costs, efforts, and time.
Bequest value	Component of the Total Economic Value of an ecosystem and subcategory of non-use values. It represents people's appreciation of the fact that an ecosystem is preserved for future generations, so that they are able to use its ecosystem services and benefit from them in the future.
Biodiversity	Variability among living organisms from all ecosystems (terrestrial, aquatic, etc.) and ecological complexes of which the organisms are part.
Biota	Community of plants and animals within a certain region or ecosystem.
Call to action (CTA)	Marketing tool designed to prompt immediate response to a certain topic or to stimulate immediate action in relation to it from the targeted audience. The tool is usually applied as a word or short phrase incorporated into larger communication instruments. CTA is often used in advertising materials, on-line promotional resources, and sales.

Computer-assisted personal interviews (CAPI)	Interviewing technique in which interviewer talks with a respondent face-to-face, but one of them also uses an electronic device (laptop, tablet computer, or smartphone) to post or answer the questions.
Confidence interval	Statistical estimate, which indicates the level of confidence that an unknown parameter lies within the interval of the observed data.
Cost-benefit analysis (CBA)	Economic approach to estimate costs and benefits of alternative options and to determine the best one to pursue based on maximization of advantages and minimization of disadvantages. This approach is sometimes also called benefit-cost analysis (BCA). It is often applied in decision-making in project management, business investing, and public policy.
Choice experiments (CE)	Variation of choice modelling method from the family of stated preference techniques. It is based on questionnaires and interviews, where respondents observe a variety of alternative scenarios regarding an ecosystem and its services and then are asked to choose the most preferred one. In this way, people express their willingness to pay or willingness to accept compensation for possible changes in the ecosystem services in question.
Choice modelling (CM)	Method of economic valuation of ecosystem services from the family of stated preference techniques. It is based on questionnaires and interviews, where respondents indicate their choices and preferences for changes in an ecosystem and its services through a series of choice sets containing alternative scenarios, one of which is a baseline scenario. Ecosystem in choice modelling surveys is described in terms of its characteristics and the levels of change that these take. Choice modelling method can be applied to elicit both use and non-use values of ecosystem services. It also has a number of variations, such as choice experiments, contingent ranking, contingent rating, and paired comparisons.
Contingent valuation (CV)	Method of economic valuation of ecosystem services from the family of stated preference techniques. It is based on on-line questionnaires and face-to-face interviews, where respondents directly state their willingness to pay or willingness to accept compensation for a change in the provision and quality of an ecosystem service. Contingent valuation method can be applied to elicit both use and non-use values of ecosystem services.

Cost-benefit analysis (CBA)	Procedure to assess and compare benefits (gains) and costs (losses) of change(s) in provisioning of ecosystem services based on individuals' preferences in order to enhance their utility, welfare, or wellbeing. Both benefits and costs in CBA are expressed in monetary values.
Cultural services	Category of ecosystem services that stimulate the development of art, literature, science, education, social relations, etc., and generally enhance cultural, scientific, educational, and spiritual life of people.
Direct use values	Component of the Total Economic Value of an ecosystem that measures how people gain from a natural resource or ecosystem service directly. Direct use values can be for consumptive use or for recreational purposes.
Discounting	Economic method of reflecting the difference between the original economic value at present and the value expected to occur sometime in the future.
Economic valuation	Collection of scientific techniques for translating the services provided by natural ecosystems into values that can be counted (often money). Economic valuation includes many techniques, most well-known of which are stated preference techniques and revealed preference techniques.
Economic value	Monetary measure of a person's wellbeing related to the change(s) in quality or provisioning of ecosystem services. Economic value is related to the willingness to pay of that person or his/her willingness to accept compensation for this change(s).
Ecosystem	Specific community of living organisms (biota) and non-living components (abiota) that occupies a certain limited space. Within it, biota and abiota constantly interact among each other in a closed self-sufficient system through nutrient cycles and energy flows.
Ecosystem services	Benefits that people receive from natural ecosystems and that contribute to people's well-being and livelihood. Ecosystem services include four categories: provisioning, regulating, supporting, and cultural services.
Existence value	Component of the Total Economic Value of an ecosystem and subcategory of non-use values. It represents people's appreciation of mere existence of a certain ecosystem, even if people may never actually use and benefit from this ecosystem and its services.

Hedonic pricing	Method of economic valuation of ecosystem services from the family of revealed preference techniques. It is based on the fact that these services can be part of the characteristics bundle of some goods (or bads) on a real market (such as housing market), where prices for these goods are clearly observable. Hedonic pricing is most frequently used for determining value of environmental amenities that affect prices of residential property.
IES approach	Framework consisting of six practical and policy-relevant steps designed for integrating ecosystem services into development planning. It was elaborated by the German organisation GIZ within its project ValuES.
Indirect use values	Component of the Total Economic Value of an ecosystem that measures the benefits, which people receive from an ecosystem service in indirect ways.
Interest-influence Matrix	Stakeholder analysis and mapping technique designed for prioritizing stakeholders of a proposal, policy, strategy, or project and defining engagement tactics and actions for each one of them. Sometimes, it is also called Interest-power Matrix or Power-interest Matrix. The technique is often applied in project management and policy-making.
Land use	Utilisation of a piece of land by humans for certain purpose (for example, agriculture, recreation, residence, etc.).
Multi-stakeholder analysis	Analytical approach to assessment of ecosystem services and decision-making regarding their use and management, where representatives of key stakeholders are invited to discuss available options, weigh advantages and disadvantages of these options, and decide upon the one(s) to implement.
Natural resources	Components of the natural environment that have an economic or cultural value to people. Some of these components require the use of man-made resources and/or labour to alter them and make them accessible and useful to people.
Net present value (NPV)	Economic metric reflecting a comparison between all discounted flows of benefits of a project, policy, or strategy and all discounted costs related to it that are spread over many years from now and into the future. Sometimes, it is also called net present worth (NPW). The higher is NPV or NPW of a project, the more beneficial and promising it is over time.

Non-use values	Component of the Total Economic Value of an ecosystem that represents the value, which people attach to an ecosystem service without actually using it in any way, directly or indirectly, now or in the future. Non-use values are comprised of altruistic, bequest, and existence values.
Nutrient cycle	Cyclic movement and exchange of organic and inorganic matter back into the production of matter. Nutrient cycles include carbon cycle, nitrogen cycle, oxygen cycle, sulphur cycle, phosphorous cycle, water cycle, and other.
Opportunity costs	Category of economic costs that represents the value of potential benefits forgone due to the choice made between two or more mutually exclusive alternatives. Also known as alternative costs, they are the gains (financial, as well as of time, resources, etc.) of the next best alternative option that was not pursued.
Option value	Component of the Total Economic Value of an ecosystem that represents the possibility for people to use an ecosystem service and benefit from it sometime in the future.
Policy	Intent or statement by a group of people. Policy contains ideas, plans, and principles of what to do in a particular situation to achieve a certain result.
Policy maker	Person with power to influence or determine policies at local, national, or international level.
Probability distribution	Mathematical function that describes the probability of occurrence of different positive values and outcomes in a certain experiment. In other words, it is the description of a random phenomenon in terms of the probabilities of events.
Provisioning services	Category of ecosystem services that provide people with resources, materials, and final products, which are necessary for wellbeing.
R software	On-line software with language and work environment for statistical computing and graphics. It is often used in econometric analysis of data collected through economic valuation questionnaires and interviews.
Regulating services	Category of ecosystem services that regulate the natural environment and its processes for favourable and healthy living conditions.

Revealed preference (RP)	Economic valuation technique based on observations of people's behaviour and analysis of real markets to reveal how much individuals value an ecosystem service. Revealed preference techniques work especially well in eliciting use values of ecosystem services. They include such methods as travel cost and hedonic pricing.
Risk	Outcome that involves losing something of value, where probability of its occurrence is known. Risk can also be considered a consequence of certain action taken in spite of uncertainty about the outcome.
Scarcity	Limited amount and availability of a good, service, or resource that may be demanded on the market. In other words, it is a good / service / resource that has greater demand than supply.
See-Think-Do-Care	Marketing framework designed for gradual engagement of the audience into performing a certain desired action, like buying a product, and then staying committed to that action.
Species diversity	Biodiversity at the level of species of living organisms.
Species richness	Number of species within a certain sample or territory.
Stakeholder analysis	Technique of assessing a situation, policy, or project and potential changes to it in terms of all involved and relevant stakeholders and their relations, interests, needs, attitude, position, level of influence, and other criteria. Stakeholder analysis is part of a broader stakeholder management process.
Stakeholder management	Process of establishing relations with stakeholders of a policy, strategy, or project and then working with these stakeholders throughout the implementation process. Stakeholder management consists of four main steps: stakeholder identification, stakeholder analysis, stakeholder communication, and stakeholder engagement.
Stakeholder register	Document with a list of all relevant stakeholders of a proposal, policy, strategy, or project and a summary of their interests, needs, attitude, position, and levels of power and influence in relation to that policy or project. The document also includes description of how the listed stakeholders could affect the implementation process of the policy or project and its outcomes. Stakeholder register is the "product" of stakeholder analysis.

Stakeholders	Individuals or groups of people that either influence certain decisions and situations or are affected by them.
Standing	Step in a cost-benefit analysis designed to answer the question of whose benefits and costs are to count in the analysis. It involves determining specific stakeholders and the present value of their benefits and costs that should be taken into account in further steps of CBA.
Stated preference (SP)	Economic valuation technique based on people's answers to surveys and interviews to elicit their willingness to pay or willingness to accept compensation for changes in an ecosystem service. Stated preference techniques are able to elicit both use and non-use values. They include such methods as contingent valuation and choice modelling.
Status quo	Baseline or no-change scenario used in economic valuation surveys. It represents the current situation of an ecosystem and its services, where no change is made. By choosing status quo, a respondent expresses his/her preference for the "do-nothing" policy.
Supporting services	Category of ecosystem services that makes it possible for ecosystems to function properly and to provide all other ecosystem services.
Sustainability	Ability of a system to remain diverse and productive through time.
Sustainable development	Endurance of economic, political, social, cultural, and biological systems and their interactions through time.
Total economic value (TEV)	Framework designed to consider, categorise, and estimate the entire variety of economic values derived from an ecosystem and its service. The TEV framework includes use and non-use values, as well as option value, that people attach to that ecosystem.
Trade-off	Choice that involves gaining a certain quantity and quality of a particular ecosystem service, while simultaneously losing another service. In other words, trade-off is an exchange where people give up one thing in order to get another thing that they desire more.
Travel cost	Method of economic valuation of ecosystem services from the family of revealed preference techniques. It is based on complementary market goods and services, as well as the monetary equivalent of time, which are needed to reach and access a particular site for people to benefit from its ecosystem services. Travel cost method is used mostly for estimating recreational value of ecosystems in national parks.

Uncertainty	Situation with imperfect or unknown information about outcomes, their effects, and probabilities of their occurrence. Uncertainty arises in partially observable or randomly developing environments.
Use values	Component of the Total Economic Value of an ecosystem that measures the value that users of an ecosystem service put on it. Use values are comprised of direct and indirect use values.
Willingness to accept compensation (WTA)	Monetary measure of economic value that a person is willing to receive as compensation for allowing negative changes to happen to an ecosystem service or for stopping to benefit from it.
Willingness to pay (WTP)	Monetary measure of economic value that a person is willing to pay for benefiting from an ecosystem service or is willing to give up for avoiding the loss of that service.

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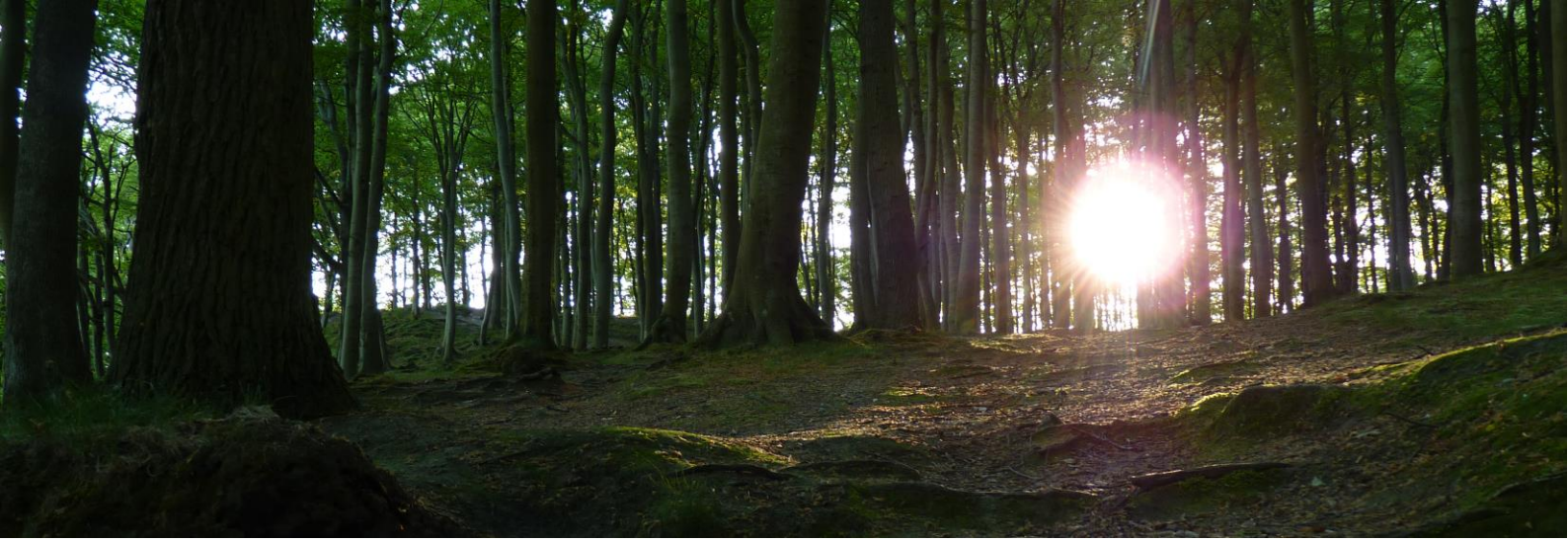

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