

The Forest

within the Context of Sustainable Development
Teaching material for teachers and students

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The Forest Law Enforcement and Governance (FLEG) II European Neighbourhood and Partnership Instrument (ENPI) East Countries Program supports participating countries' forest governance. At the regional level, the Program aims to implement the 2005 St. Petersburg FLEG Ministerial Declaration and support countries to commit to a time-bound action plan; at the national level the Program will review or revise forest sector policies and legal and administrative structures; and improve knowledge of and support for sustainable forest management and good forest governance in the participating countries, and at the sub-national (local) level the Program will test and demonstrate best practices for sustainable forest management and the feasibility of improved forest governance practices at the field-level on a pilot basis. Participating countries include Armenia, Azerbaijan, Belarus, Georgia, Moldova, Russia, and Ukraine. The Program is funded by the European Union.

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www.panda.org

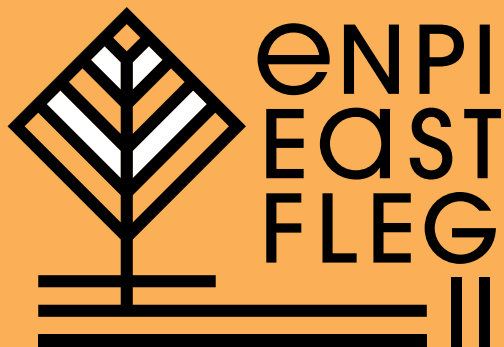
1 The International Bank for Reconstruction and Development (IBRD)

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EUROPEAN NEIGHBORHOOD
AND PARTNERSHIP INSTRUMENT
EAST COUNTRIES FOREST LAW
ENFORCEMENT AND GOVERNANCE
II PROGRAM



The Program is funded by the European Union and implemented by the World Bank in partnership with WWF and IUCN.

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Foreword

This publication is mainly addressed to the students from the high schools and colleges specialising in forestry, ecology, environment protection and engineering, who want to know more about the role of the forests, their benefits and functions, as well as basic notions regarding their sustainable management.

The material may be considered as being complementary to the school curriculum, having as its main aim the development of a forestry consciousness and awareness in approaching the forest in terms of a sustainable management.

The main objective of this material is to develop the young people as ambassadors of the forest, regardless of the professional context they will be part of after graduating from high school.

The forest also holds other functions than the economic one (i.e. providing the wood resources) and ensures a series of services that are of utmost importance from a social, economic and environmental point of view. In order to maintain all these benefits, it is important to apply a responsible management of the forestry resources, which takes into account its three basic components: the social component, the economic one and the environmental one. Moreover, it is

required to involve all stakeholders in the process of forestry management, in order to increase the awareness level of its beneficiaries and in order to make them more responsible in their attitude towards forests.

Through the methods suggested for the interaction with the students, the material aims at creating a framework in which the youngsters could directly experiment certain phenomena, could develop their analytical and verbal skills and would become autonomous in identifying solutions for the forest. The final aim is to stimulate a change of perspective and attitude, contributing to the training of a new generation of informed and active citizens.

The material was elaborated as part of the Forest Law Enforcement and Governance Regional Program (Phase II) , through the European Neighbourhood and Partnership Instrument for East Countries, with the financial support of the European Union.

We wish good luck to the teachers and students involved in the effort of understanding better the forests of Moldova!

The ENPI FLEG II Moldova Team

List of acronyms

FAO	Food and Agriculture Organization
FSC	Forestry Stewardship Council
IPCC	Intergovernmental Panel on Climate Change
PEFC	Pan-European Forest Certification Council
HCVF	High Conservation Value Forests
RM	Republic of Moldova
UNEP	United Nations Environment Programme
WMO	World Meteorological Organization

How to use this material

This educational material is designed so that it covers the topics connected to the forest, starting with its benefits, continuing with challenges and ending with solutions. The structure of the material supports these concepts through its 5 chapters, to which a Foreword, a List of Acronyms and a Selected Bibliography are added.

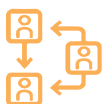
Each chapter presents to the users the following aspects, highlighted graphically in a distinctive manner:



- **The competencies** that the students will acquire after going through the chapter;



- **The main text** that supplies the chapter's theoretical content;



- **The teaching methods**, which suggests to the teachers manner of presenting the information which implies the students' involvement (through dialogue, exploration, observation, creation, formulating and expressing opinions, etc.) which become an integral part of the teaching and learning process. The aim of these methods is, on the one hand, to support the teacher, and, on the other, to create efficient and attractive learning experiences for the students.

In **designing a work session with the students** the teacher may opt to begin with the interactive teaching method and to end with going through the theoretical content (for example, Subchapter 2.1), may mix them or may begin with the theory. It is recommended to adapt to the context and to the group's needs.

In order to solidify and clarify the knowledge acquired, it is recommended to allow the required time for discussions regarding reviewing, deciphering and interpreting, discussions which represent the key for generalisation and the transfer of knowledge to practice.

In designing the material, we took into account **a set of principles** which will transpire as well in the direct interaction with the students. We consider to be important the principles of the student's autonomy, participation and learning through a direct experience. Furthermore, we integrated the principles pertaining to education for sustainable development: vision, systemic thinking, critical thinking, action orientation, solution orientation, being connected to the real lives of the communities, partnership, student-centring, which may bring changes into schools.

This material is **a resource** which may be used during extra-curricular activities, during field trips or by bringing a supplementary perspective to the classroom activity.

We wish you to go through this material with ... love for learning!



The Forest

An Overview

LEARNING OBJECTIVES

The students understand and integrate the change, over time, of the vision of society and of the experts in what the forest is concerned.

COMPETENCIES

Knowledge of the various definitions of the forest. Understanding the connection between the society's stages of development and the conception regarding the forest. Organising the evolutive conceptions regarding the forest.

The forest has been perceived, during the various development stages of the society, in various manners: from a space from procuring food (game, fruit, mushrooms, etc.) in the early stages of the civilisation, to a source of raw materials required by the wood processing industry from the technological period. Recently, against the background of environment degradation, the forest has begun to and must be perceived as a complex ecosystem, which offers services of a social, economic and environmental nature, thus requiring the application of responsible forestry management in what concerns resource harvesting.

The different manners of seeing the forest determine its definitions to evolve in time. Thus, at the beginning of the 20th century, the forest was considered a *"close association of wooden plants whose main products are wood and bark"* (N.G. Popovici, 1922) – a definition which highlighted the direct, quantifiable benefits of the forest identified at that time.

"A close association of wild wooden plants, which can, left to their own devices, reach in time a height of at least 8 metres" and "a considerable surface of land, covered by wild trees, which grow in close vicinity and whose main product is the wood or bark" is the definition proposed by M. Drăcea (1924).

Today, about a century later, we find the forest as *"an element of the geographic landscape, a functional unit of the biosphere, consisting of the community of the*

forest vegetation (where the trees and shrubs are dominating), living blankets, animals and micro-organisms, which, in their biological development, are interdependent and act on their habitat. We consider that forests are the areas covered with forest vegetation that have a surface of over 0.25 ha" (Forest Code no. 887/21.06.1996, Republic of Moldova).

Moreover, at the international level, according to the FAO's definition – *"by forest we understand any land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ"*.

One can notice that, as time went by, the concept concerning the forest has changes from that of an association of wooden plants which supplies the wooden resource (the wood and the bark) to that of a functional and dynamic unit of the biosphere within which there are intra- and inter-specific relationships being established, from animals to micro-organisms, these being situated at various levels of the food chain. The role of the forest is no longer limited to supplying wooden and non-wooden resources, but it is recognised as a shelter for complex biodiversity. The forest, with all its living components (the diversity of the living organisms) and its non-living ones (water, air, soil, rocks) is regarded as an **ecosystem** (or a **biogeocenosis**) – the complex of interdependent relationships between all these components from the point of view of the flow of substances and energy.

Relationships in nature are very complex and varied, and are especially focused on food dependency (trophic relationships).

The connection relationships between living organisms may be divided into two types:

1) Intraspecific relationships:

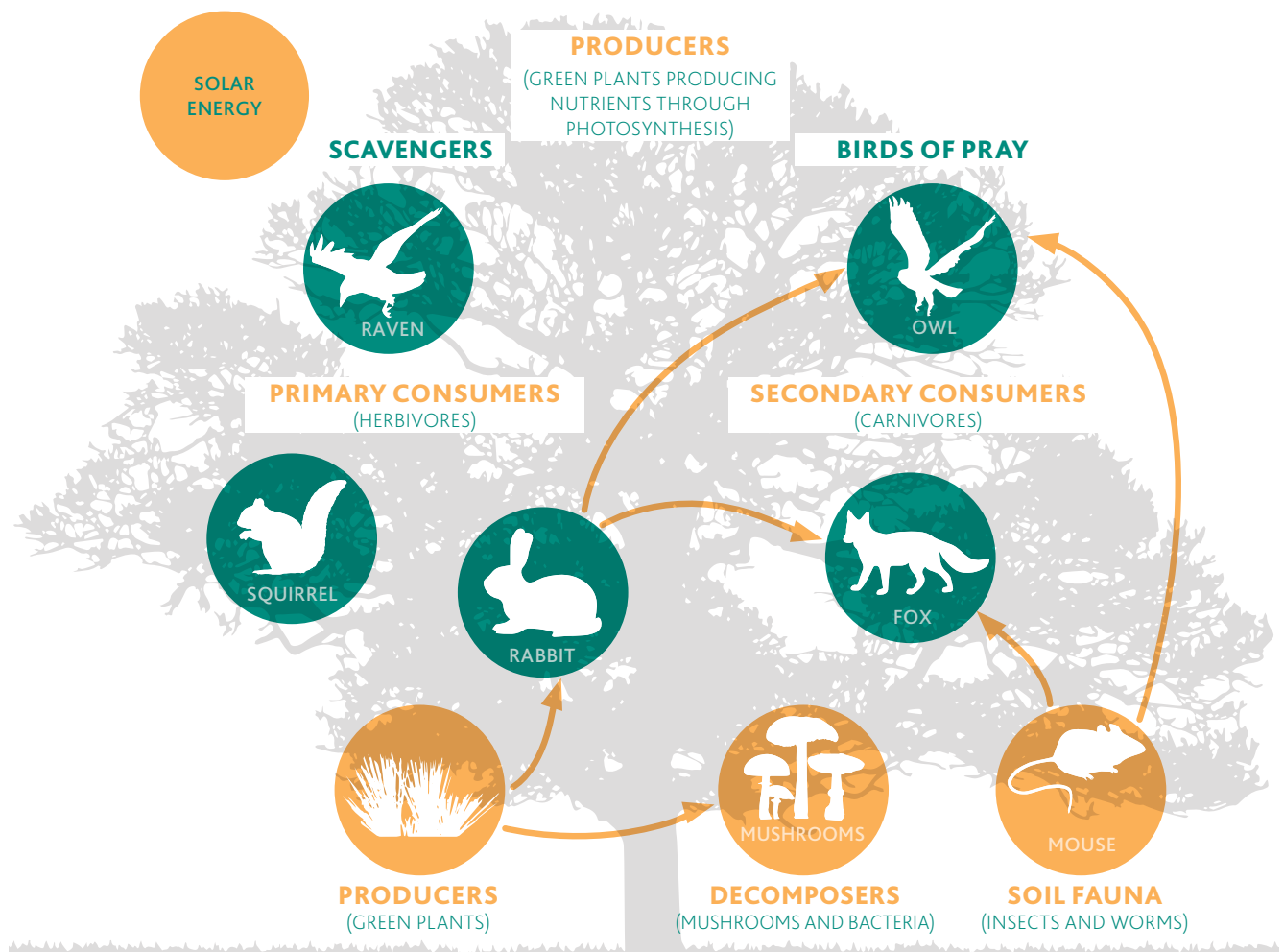
the relationship established between individuals of

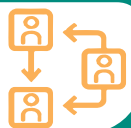
the same population: such as breeding relationships, territoriality relationships, relationships of hierarchy within groups, relationships of competition for food.

2) Interspecific relationships:

the relationship established between individuals of different species: cooperation relationships, relationships of competition for food, pray-predator relationships or feeding relationships, parasitism relationships.

Figure 1. The forest food chain





How have the people regarded the forest through time?

Required materials:

A string or adhesive tape. The cards (they can be typed on a computer and cut out, or written on adhesive post-it notes or on coloured flash cards) with the stages of the development of the society, the perception regarding the forest and the definitions of the forest in the various ages.

Content of the cards:

The stages of development of the society (3 cards): the early stages of civilization, the technologic period, the present time.

Perceptions regarding the forest (3 cards): space for procuring food (game, fruit, mushrooms, etc.), source of raw materials necessary for the wood processing industry, a complex ecosystem which offers services of a social, economic and environmental nature.

Forest definitions (3 cards):

"A close association of wild wooden plants whose main products are the wood and the bark." (1922)

"An element of the geographic landscape, a functional unit of the biosphere, consisting of the community of the forest vegetation (where the trees and shrubs are dominating), living blankets, animals and micro-organisms, which, in their biological development, are interdependent and act on their habitat. We consider forests the areas covered with forest vegetation that have a surface of over 0.25 ha." (1996)

"Any land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent or trees able to reach these thresholds in situ." (2000)

Manner of working:

On the floor you make a line out of string or adhesive paper, representing a timeline. The group agrees on which end represents the present and which the past.

The group is divided into three teams. Each team picks a card with the stage of the development of the society and places it on the timeline. Then, each group picks a card with the perceptions regarding the forest and places it on the timeline. The next stage consists in picking a definition of the forest and placing it on the timeline (there will be more definitions for the modern age).

Optional:

For a funny twist, the students can line up on the timeline according to their year of birth, taking the year 1996 as a landmark.

Discussion:

The teacher stimulates a group discussion on the evolution of the perception regarding the forest and the manner in which it is connected with the lifestyle and the human occupations from that age. Which are the main differences between perceptions/definitions? What elements of the society influence the people's conception regarding the forest? What new things does modernity bring? What do you think of the future?

THE LIFE NETWORK

A very visual method for an unusual illustration of the relationships in nature is the "Life Network" presented under "Chapter 3. The Forests and Climate Change". The teacher may apply it initially here, and then s/he can use it again in Chapter 3, with specific discussions.



2

The Benefits and Functions of **the Forest**



LEARNING OBJECTIVES

The students understand and analyse the role of the forest in today's society, from the point of view of the benefits it brings, with a focus on the Republic of Moldova.



COMPETENCIES

Knowledge of the concept of forest benefit. Recognising the benefits of the forest and classifying them according to their degree of impact upon society. Generalisation regarding the evolution of the role of the forest within society and particularisation regarding its role in the Republic of Moldova and of its contribution to the economy

Regardless of the manner in which the forest is perceived or defined, it has been proven that it fulfils an important role in the human activity. As early as the ancient times, the forest was perceived as a supplier of food or household products, as a space of refuge during the troubled times of history and, not in the least, as a space that hosted customs, traditions, and cultural activities.

Even though in many parts of the world, from the point of view of economic development, the things have changed and, apparently, the human society's dependency on the forest has decreased, in reality we have the same need of forest space as in the past. Thus, the forest remains an important supplier of raw materials for the modern society, becomes a space for refuge (leisure) with the aim of reducing the stress factors specific to the modern world and continues to represent a place hosting contemporary cultural and artistic events.

This is why, when managing these ecosystems, that are extremely important from an economic, social and environment point of view, it is tremendously important to take into account the principles underlying the application of a responsible (sustainable) management.

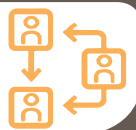
From an economic point of view, the benefits offered by the forest may be classified into two categories: direct benefits and indirect benefits.

Before detailing the direct and indirect benefits of the forest, it is important to understand the fact that these have an essential role for the smooth running of the life of local communities and of the country's economy. An eloquent example is a study (FLEG, 2014) which

confirms the high degree of dependency of the rural population on forest products. According to the study, even though the main source of income for the population from the rural environment is agriculture, from which comes 64% of the total income (for comparison, 74% of Moldova's lands are used for agricultural purposes), the forests insure up to 18% of the income for the local population (taking into consideration the fact that the forests and forestry plantations cover about 13% of the country's territory).

Knowing these benefits and their value, one can measure the forest's contribution to the economy, as well as the losses caused by the disappearance or the degradation of this ecosystem. Consequently, not only the authorities and the experts, but also every one of use can take measures in order to protect the forests and to prevent the losses (including anticipating these) by applying a sustainable management.

For the Republic of Moldova, the value of the forest's economic benefits has been calculated to approximately 28.3 million dollars per year (Popa, 2013). With the current manner of managing the forests, it is estimated that in the following 25 years the forests can generate approximately 0.6 million dollars as an added value for Moldova's economy. However, after 27 years, this income will vanish because of the decrease in the capacity of the forest ecosystems to generate direct benefits, such as wood and non-wood forestry products. This estimate does not include the extremely valuable indirect benefits of the forest, such as climate regulation, soil fixation or its beauty that generates tourism.



How does the forest influence our daily life?

Required materials:

Post-it adhesive notes, flipchart or blackboard, markers.

Manner of working:

The teacher prepares the cards on which s/he writes the benefits of the forests for human life (one benefit per card): oxygen production; production of water vapours in the atmosphere; supporting sloping terrains; timber; leisure space; food source; shelter and a place of refuge; fire-wood; retaining the water that flows down the hillsides; raw materials for wooden ornamental and household objects. The number of cards is equal to the number of students in the classroom, but the teacher prepares more cards with the benefits that have a major importance.

On the blackboard, flipchart or another wall-mounted support, the teacher draws a triangle pointing down. Within it, s/he draws 10 levels.

Each student draws a card with a benefit, then s/he sticks/glues it where s/he considers that its place is, from the point of view of its importance to human life, on one level of the triangle, starting with the upper part of the upside-down triangle (the most important benefits) and continuing to the point of the triangle (the lower part) with the benefits that have a relatively low importance nowadays. Each benefit corresponds to one level.

The number of cards glued, corresponding to one level, or to a benefit, respectively, is greater in the upper side of the drawing (where the basis of the upside-down triangle allows for more cards to be placed) which shows the importance that these benefits (for example, air and water) have for human life.

Discussion:

1. After placing the card, the students motivate their choice. Most likely, there are going to be different answers. In those situations, the students may agree on changing the level on which certain benefits are placed.

It is important for the teacher to point out the fact that there are no wrong answers, but rather different perceptions and certain general trends – some benefits are essential for life, others have an optional character. One can agree with the group to even erase the separating lines and to keep only two major categories of benefits.

2. After reviewing the benefits of the forest, the teacher brings into discussion the historical perspective: has the importance of these benefits changed for humans over time? What has remained as important, what diminished?

If, until now, we concentrated on the impact the forest has on the society, which is the mirrored situation – what impact do people have on the forest? How has this changed over time? Why? Refer to the previous chapter as well.

3. Can the forest be viewed also from a financial perspective, i.e. from the point of view of monetizing its benefits? Please support your answer with arguments. What have you learned about the Republic of Moldova and the role of forests in our society? How do you consider that it would be recommended to treat forests in the future? Please support your answer with arguments.



2.1. Direct Economic Benefits (Goods)



LEARNING OBJECTIVES

The students understand and explore the concept of direct economic benefits of the forest (the goods obtained from the forest) and their quantifiable and renewable character.



COMPETENCIES

Knowledge of the concept of direct economic benefit of the forest and the concept of good. Understanding of the quantifiable and renewable character of the goods obtained from the forest. Experimenting with and research of the goods from neighbouring forests from the local area.

© Gernant Magnin / WWF-Netherlands

The direct economic benefits are the measurable benefits (goods) that may be tradable and are materialized through the resources and the products obtained directly from the forest. These benefits have positive values and bring an added value to the population.

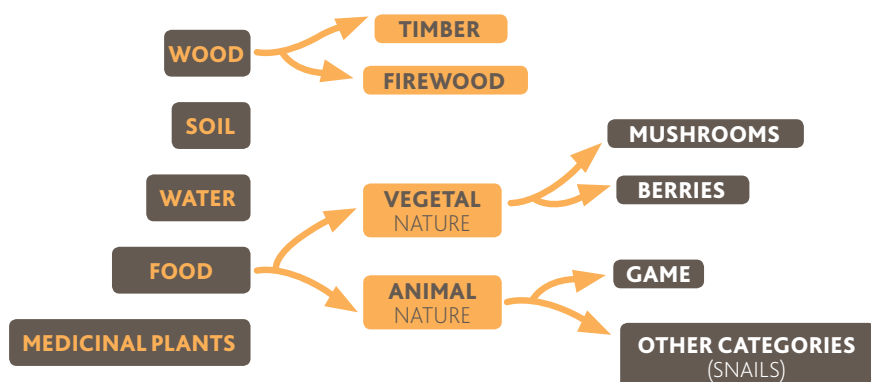
A good example is the use of wood in the local households. Thus, even though the national forestry resources are nevertheless reduced, the analysis of

wood consumption (FLEG & Moldsilva, 2011) shows that about 74% of the local communities use the wood as a primary energy source (firewood).

If, from various reasons, one can no longer take advantage of these benefits (they become inactive, exhausted, etc.), their value are no longer added to the local/national budget.

These benefits have a short term effect and generate jobs.

Categories of goods accessible in the forest:



© MOLDSILVA Agency

The goods/products of the forest are extremely important for the development of society because of their capacity of continuous regeneration, given they are responsibly managed and used. From an economic point of view, one of the main characteristics of the forest is precisely its capacity to supply resources with a renewable character. However, as we stated above, this characteristic exists as long as the collection of

resources (of raw materials) from the forest is done responsibly and fairly, as this is the basis for the concept of **responsible forest management**.

In order to apply a responsible forest management, it is required to take into account the principles underlying the sustainable management of the forests, principles that are going to be detailed below.



1 m long logs, stored in the forest, in the place where sanitation cutting took place (in order to maintain the good health of the forest). This timber is used especially as firewood for the population. (Moldsilva Agency, the State Enterprise for Silviculture Soroca, 2011). © Aurel Lozan



The goods offered by the forest (the interior/inside version)

Materials required:

Adhesive post-it notes, markets, flipchart (optional).

Manner of working:

The students receive one or two adhesive post-it-s (teacher's choice). The teacher asks the students to think of one or two things that the people can use from the forest, then to write them on the post-it note.

After they finished writing, the students stick the adhesive post-it-s on the flipchart or on the blackboard. The students can remain standing around the flipchart, and the teacher or even the students group/s the results according to categories (several answers will be similar, probably connected to wood).

The teacher initiates a discussion connected to the things we use from the forest: are these all the things we take from the forest? If not, what else is there? The teacher or the students write/s on the post-it-s and add/s the missing answers.

In the end, the flipchart will have a division on categories, like in the figure on page 15.

Discussion:

The teacher introduces the notion of direct economic benefit (a good obtained from the forest) and mentions its quantifiable character but also its inexhaustible character, given the conditions that regulate the quantities harvested. What does "quantifiable" mean? What other goods do you know? What is the difference between these goods and those coming from the forest? What does "renewable" mean? How can this concept be explained in what concerns the direct economic benefits of the forest?

The goods offered by the forest (the fieldwork/outside version)

Materials required:

A net and collection containers, a photo camera or a mobile phone with a camera, notebook and a pen or another option for taking notes.

Manner of working:

A field trip is the ideal opportunity for the identification, inventory and classification of the direct economic benefits of the forest. The students explore the forest and observe, in a direct manner, the goods offered by it.

The teacher divides the group into teams of 3 – 4 students. Each team has a number of containers for collecting samples of goods and at least a photo camera or a mobile phone with a camera. The students have 30 minutes or more, according to the schedule of the day, to explore the surroundings and to collect as many goods offered by the forest as possible – either samples, when possible (but without causing any damage), or images, with the help of the photo camera (for example, in the case of game, a trace on the ground is enough to illustrate the category). The students write down the details of the place and the manner in which they collected the images. Upon their return, every team presents the collected goods, on categories.

The teacher may organize this exploration under the form of a competition, and the winner will be the team that gathered the biggest number of different examples from each category of goods.

Warning! The teacher may organise this activity as an independent one, or may use it as an interesting manner of spending time on the road, if the group has a longer route to cover. In this case, the teacher assigns the task before leaving, and the students can collect data and samples along the way. This option, however, limits access to a variety of resources.

Discussion:

Discussions will be similar to the previous method. It is up to the teacher to present the theoretical information before or after the exploration. During the discussion it will be really easy to highlight the direct, tangible character of this category of economic goods.

Optional:

Upon return, it is recommended that the students continue their research as follows: 1. To identify the species and to catalogue them by writing their scientific names. 2. To complete the collection with information from specialised sources.

There can be organised an exhibition, as creative as possible, or a presentation with the results obtained. The pictures can be printed or projected.

2.2. Indirect Economic Benefits (Services)



LEARNING OBJECTIVES

The students understand the concept of indirect economic benefits of the forest (services offered by the forest). The students know and explore the types of services offered by the forest. The students analyse the effects of the manner of managing the forest on the forest's capacity of offering services.



COMPETENCIES

Knowledge of the concept of indirect economic benefits of the forest and the concept of service. Understanding the hard-to-quantify character of the services offered by the forest. Knowledge of the types of services, experimenting and researching them in the forests from the local area. The analysis of the effects of the manner of management on the forest's capacity to offer services and taking a stand in what concerns the recommended manner of management for the community, on long term.



© Hartmut Jungius / WWF

The indirect economic benefits of the forest (the services) are harder to quantify, as they are not tangible. The services of the forest become obvious under extreme circumstances, caused by their lack or their reduction, being most of the times recognised only when it is too late, i.e. when phenomena such as floods, excessive snow or landslides occur. Most

of the times these services offered by the forest are not perceived by the community as benefits or as components that generate jobs. Because of the continuous and unconditional character of the services offered by the forest, people consider them natural. However, if they stop existing, they cause long-term economic losses with a negative influence on the human community.

The forest supplies the following services:

- a) protects the soil against erosion and degradation;
- b) protects the running waters, ensuring a constant and clear flow, reducing the massive transport of silts;
- c) moderates the humidity and temperature extremes, lowers the wind speed;
- d) protects the permanent transport routes and the agricultural cultures against being blocked by snow and against strong winds;
- e) makes the landscape more beautiful and noble;
- f) preserves the forestry genetic fund, ensuring shelter and a source of food for many animal species that live partially, temporarily or permanently in the forest.



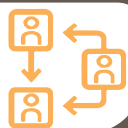
The forest vegetation maintains well the structure and the hill-like relief, does not allow soil erosion and, at the same time, ensures habitats for a biological diversity. National Park Orhei, 2014. © Aurel Lozan

a) Protecting the soil against erosion and degradation

Through the function of protection of *lands and soil* that it holds, the forest contributes to the reduction of surface runoffs, prevents the accelerated erosion of soils and relief. Thus soil fertility is preserved, the deepening of the river beds is avoided, the clogging of

artificial lakes, of the roads, is also avoided, with **major economic consequences**.

The forest not only protects the soil, but also contributes to its regeneration. Through the process of "paedogenesis", it can regenerate and value the degraded soils, producing a large volume of necromass that, through decomposition, turns into forest humus.



Soil erosion through the force of the water and the role of the forest in reducing it

Required materials:

Empty cans of milk or soda, in the shape of rectangular prisms, scissors, sand, wood, water and water recipients.

Manner of work:

Stage 1: Discuss with the students whether the water has an impact on the formation of the characteristics of the terrain and what type of changes are caused by rain, snow and rivers on the surface of the Earth. Tell the students that you will carry out an experiment, in order to explain the force exercised by the water's impact on the manner in which the terrain is formed.

Divide the students in groups of 4 or 5. Distribute enough materials to the groups, in order to carry out the experiment. Stand in a place where each student can see you and follow these steps:

- Place an empty 1-liter milk or soda box horizontally on the table (with the larger, rectangular base facing upward). Cut the upper part of the box.
- Fill the box with the sand. Raise one corner of the box with a wooden wedge. In the raised corner, form a hill made of sand.
- Slowly pour water on top and allow the students to observe. The water will make a path as it flows and will move along the sand particles.

Suggest to the students to try and find solutions for stabilising the sand, using objects around them.

Discussion:

The teacher leads the discussion towards understanding the service offered by the forest for soil protection. What risks does the soil erosion involve? Especially in what concerns the dynamic of the watercourses and of the rains? How can we stop these phenomena? What is the role of the forest within this context?

Optional:

This method can be applied both inside the classroom as well as in the forest. The teacher will bring the required materials for a field trip and will make a stop at the edge

of a watercourse. The students may observe the effects of the water on the soil both directly as well as indirectly, having thus the possibility to understand the phenomenon as a whole, with the help of the experiment.

Stage 2 (if the application takes place during the field trip): During a fieldtrip, the students can observe and compare the effects of the forest upon the soils. Ideally, students have access to two types of landscapes: covered by forest and not covered by forest. The students can be divided into two big teams, or several smaller teams. Their mission would be to observe and photograph the soil from the two types of landscape and to identify examples of erosion and of soil degradation.

Successively, each team explores both the forest and the open land. After the mutually agreed period of time, the team reunite and present their results and discuss. The discussions can continue the one from the previous stage of the method.

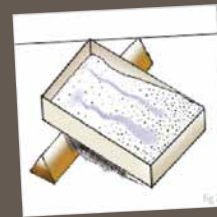
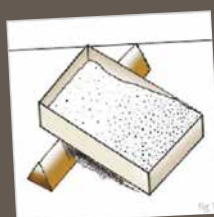
Stage 3: The teacher presents the following statements and invites the students to comment on them:

Did you know that:

- In a mature forest, soil erosion is under 2 tons/ha/year, comparatively with the fields that are not covered by forests, where, on the slopes, the erosion may reach even 1500 tons/ha/year.
- 2 cm of soil need 500 years to recover.

Discussion:

The discussion will have a comparative character. The teacher asks the students which can be an example of environmental factors which manifest themselves differently in the forest, in comparison with the terrains not covered by forest.



© WWF, Cartea Mării Negre [Black Sea Box], 2013



The banks of the river Dniester, covered with forests, are hosting numerous historical and cultural monuments. Soroca County (Moldova), Iampol County (Ukraine). © MOLDSILVA Agency

b) Protection of the running waters

From a hydrologic point of view, the forest fulfils a tremendously important role in protecting running waters and, implicitly, the communities living alongside their banks, by stabilizing their flow rates and reducing the quantity of the transported silt materials.

From this perspective, the forest ecosystem acts at the level of the canopy, at soil level and on the courses of streams and rivers.

At the level of the canopy, the forest has the function of retention, through which a certain quantity of water from precipitation (the water quantity differs according to species, age, consistency, location, etc.) is retained by the foliary apparatus (the leaves) of the trees. Thus, the volume of storm water that reaches the soil decreases; otherwise, there would be the risk of surface runoff.

At the level of the soil, the forest ecosystem is characterised by a specific structure, with a high edaphic volume, which favours storm water infiltration and reduces surface runoffs, which in turn reduces the flow rates of rivers and stabilises their regime. The contribution to the regulation of watercourses is given as well by the slower melting of the snow during warm spring days, which avoids the steep increases in the flow rates and reduces the risk of seasonal floods.

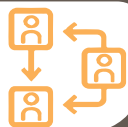
The effects of the hydrologic function of the forest

are double: on one hand it prevents flooding caused by an exaggerated increase in the water flow rates and, on the other, solves the issue of the lack of water during the times there is no storm water, because the rivers feed from the groundwater that came from infiltration. Thus, the forest has an essential role against the background of today's water crisis, which is increasingly felt, especially through the huge damages caused by flooding.

Alongside the river courses, the riparian forests (the floodplain forests) play an important role in stabilizing the riverbanks and in dissipating the energy exercised by the large flows of water resulting from storm water, i.e. they alleviate the flash flooding.

Here are some essential numbers in order to become aware of this especially important function performed by the forest, i.e. the protection of running waters:

- The trees retain in their canopy between 30 and 50% of the total of regular storm water in the temperate area.
- 1 m² of forest moss may retain about 5 litres of water.
- The forests from the temperate area have a capacity of retaining water in the soil of approximately 10000 m³ of water /year/ha, of which they consume for growth about 3000 – 4000 cubic metres of water /year/ha, and the rest is stored in the soil (groundwater) as a reserve.



The function of water retention at canopy level

Required materials:

One or two flipchart sheets (or A3 sized posters), paper clips (or any other small and at-hand objects).

Manner of work:

The flipchart sheet is placed on the ground, and the students gather around it. If the group is too big, the students may be divided into teams. The students are asked to find various ways in which to connect and place their hands, with the palms facing up, so that they would cover as much as possible of the surface from that perimeter.

When they reach a decision on their position, the paper clips are poured over the students' united hands. A part of the paper clips will stay on their palms; the others will fall on the ground. One at a

time, the students will put down their hands, similar to the leaves loaded with water when it rains. In the end, all the paper clips are going to slowly fall on the ground.

The paper clips are collected and are poured over the flipchart sheet, this time without the students.

If it is possible, the sheet of paper will be slanted.

Discussion:

The teacher initiates a discussion which will highlight the function of water retention at the canopy level. What have you observed? How did the paper clips behave? If we talk about the forest, what similarities can you find between this experiment and the behaviour of the raindrops? Which are the risks? What can we do in order to reduce them?

c) The forest's influence on the climate (the climate role of the forest)

At global level, the forests are exercising a decisive influence on the climate factors, through their manner of reducing and fixating the greenhouse gases from the atmosphere.

The forests represent the biggest reserve of carbon from the terrestrial biosphere, namely 70% of the entire carbon that there is in the living organisms. The carbon of the forests is stored in trees, in the soil and in the forest floor. Deforestation and forest degradation lead to a reduction of the forest-covered surface and of the biomass, which translates into carbon emissions, mainly under the form of CO₂.

Forests store the biggest quantity of carbon in comparison to all other terrestrial ecosystems and precisely because of that deforestation or the unsustainable exploitation of wood has negative effects of major importance at global level.

At local level, the forest proximity has a similar

effect with the one of the sea: it reduces excessive summer heats and winter colds, reduces the temperature maximum and increases the minimum. Thus, it regulates the climate, be it daily or yearly and it makes it less excessive, more constant, more temperate (Muel, 1884).

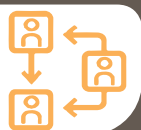
- The daily temperature variations are smaller than in the open field. The forest's influence manifests itself especially in summer time (Drăcea, 1920).
- The air in the forest is slightly wetter (differences of over 15%) because of the tree transpiration and of the storm water evaporation (xxx, 1950).
- Because of the reduced sun exposure, the average annual soil temperature is lower in the woods than in the open field. The biggest difference is during summer (Drăcea, 1920).
- The forest is an obstacle for the winds. A regime of quietness is established within the forest and to a certain degree outside it as well, in the lower levels of the atmosphere (xxx, 1950).



The forest from above, a true deposit for carbon and, at the same time, an environmental safety. Nisporeni County, 2001.

© Boris Capnin

METHODS OF WORKING WITH THE STUDENTS



The forest as an obstacle for winds

Required materials:

Sheets of paper (A4 sized or smaller, such as post-it adhesive notes), a fan or a hair dryer.

Manner of work:

The teacher places the sheets of paper on the ground, about 2 metres away from the wall. Then s/he launches the challenge – can these sheets of paper reach the wall without us touching them? S/he asks for a volunteer, who will then turn on the fan.

There is one more step – take the position of the trees in the forest. The students form a wall. Then, the volunteer turns the fan on and blows the sheets of paper towards the wall. These will stop at the group of students.

The experiment is repeated without the human wall.

Discussion:

The teacher initiates a discussion regarding the role of

the forest as an obstacle for the winds. What have you noticed? How does this phenomenon manifest itself because of the forest? What could the sheets of paper represent, in real life? What about the wall? Who and why does the forest protect from the winds? Which are the advantages for the nature, what about for the people?

The climate in the forest (outside method, fieldwork)

In the same way as in the case of the previous services, the forest's effects on the local climate are best felt in the field. Before going into the forest, the teacher asks the students to feel and, potentially, to write down the way in which they perceive the weather conditions – how hot, dry or windy it is. The students' comfort as well – how do they feel, under these circumstances? Then, as they get closer to the forest and after they go into the forest, the students continue to pay attention to the weather variables and to write down the changes.

Discussion:

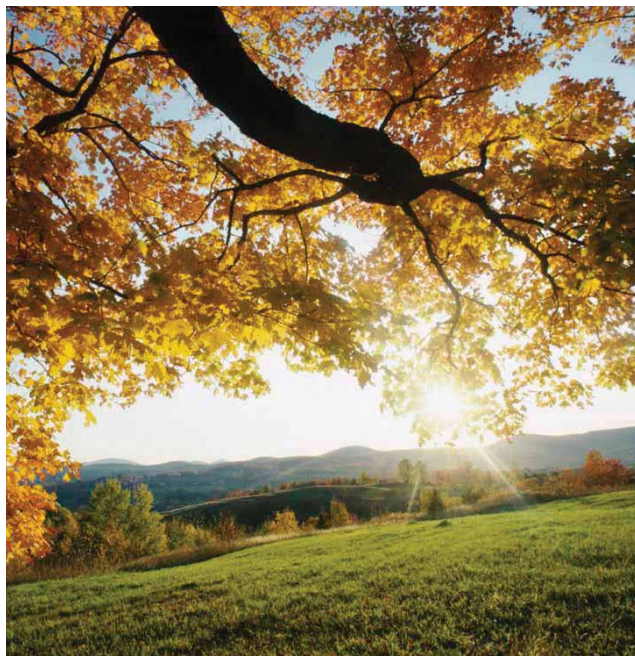
The teacher initiates a discussion about the perceived differences and the manner in which the forest influences the local climate.

d) The influence of the forest on the communities' health (the hygienic-sanitary role of forests), protecting the permanent transport routes and the agricultural crops against heavy snow and against blizzards

This beneficial influence of the forest manifests itself both directly, through the environment it creates, as well as through the resources it offers.

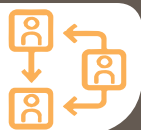
The forest purifies the atmosphere, fixates the carbon which is harmful for animals and humans and gives back the oxygen required for their breathing (Stătescu, 1884); thus, it holds the capacity to mitigate the negative effects of the large polluters.

The hygienic conditions of the big mountains covered by forests are much more favourable than those of the cities, especially of the industrial centres. The forest air is cleaner and healthier, as the smoke and dust are missing, harmful gases are missing and the pathogens are relatively poorly represented (Drăcea, 1920; xxx, 1950).



© MOLDSILVA Agency

- The forest contains numerous resources that have a sanogenous character: medicinal plants, berries, edible mushrooms, flower pollen and nectar, etc. (Zitti et al. 1964). And, given that the natural pharmacopoeia is constantly expanding, one can easily understand the importance of the medicinal vegetal treasure situated in our forestry fund (Beldeanu, 2004).
- Due to the positive influence that it has on the local climate, the forest contributes to the improvement of the vegetation conditions of neighbouring pastures, meadows and agricultural crops. Thus, the forest windbreaks, situated perpendicularly to the wind direction, radically reduce its speed. Consequently, the agricultural fields protected by tree windbreaks yield on average crops that are 25 – 30% greater on regular years; while the crop increase during droughty years reaches up to 300% (three times bigger) in comparison to the field that has no windbreaks. *"This effect is due to the fact that the windbreaks reduce evaporation and, during winter, they contribute to the more uniform spreading of snow on the field, which is no longer carried by the wind, but rather kept in the field."* (Rădulescu, 1956)
- Through the mechanical action of the roots used to fixate the trees in the soil, the forests ensure as well the stability of the hillsides, especially those that are very steep, which, corroborated with the other functions mentioned above (retention, watercourse regularization) ensures the security of the public interest or personal structures, such as access ways, houses, constructions, dams, etc.
- The thick foliage of the forest acts as a protective screen and mitigates the noise (reduces noise pollution), ensuring a balance of the human body with its surrounding environment.



The book with the forest's healing recipes

Required materials (optional):

Printer, A4 sized paper, a hole puncher, string, cardboard, leaves, pressed flowers, glue, markers or brushes and water colours.

Manner of work:

Individual or team research project. The final result – The Recipe Book – will belong to the entire class.

The students have the task as homework (or as class work, according to the data collection method) to collect healing recipes with forest plants (teas, tinctures, creams, etc.) or even relaxation exercises, breathing exercises, etc. The students may collect the data by interviewing their families, but also from books or the internet.

It is recommended that the recipes follow a standard format. A possible structure for the recipe:

RECIPE NAME:

BENEFICIAL ACTIONS:

REQUIRED INGREDIENTS:

MANNER OF PREPARATION:

OTHER OBSERVATIONS:

(INDICATIONS REGARDING THE PLANTS, THE STORY OF THE RECIPE, ESPECIALLY IF IT COMES FROM A FAMILY MEMBER)

At the next meeting, the students present their recipes as a PowerPoint presentation or as a printable Word document. We recommend the latter so that the sheets of paper could be collected in a Book with the forest's healing recipes. The book will consist of the perforated sheets of paper, to which covers are attached and everything is bound with string.

Discussion:

The students will specify which the advantage of using the traditional recipes is, based on forest products, in comparison to the modern/synthetic ingredients/methods.

Optional:

During this meeting, the students can also decorate the covers of the book with pressed leaves and drawings.

If possible, some easy recipes may be cooked; for instance, a tea that students will drink together. Or a trip can be organised, for picking certain plants.

This method may be combined with the one from subchapter "The direct economic benefits of the forest", when the students collect goods offered by the forest.

e) It makes the landscape more beautiful and more noble – The cultural importance of the forest and its contribution to making the landscape more beautiful

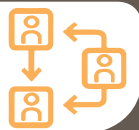
The massive deforestation that took place together with the development of human society has had and still has a negative impact on the cultural activity and on the landscape. Starting from the simple reasoning according to which touristic destinations are characterised mainly by a pleasant landscape, we understand that the most beautiful places from the point of view of their scenery are due to natural elements, among which the forest holds a very important place. There is an ancient direct connection between the man and the forest. Because of this, the majority of the leisure places, of the refuge place (in the past) or, in recent times, the places for building a house, are situated around forests. This is why "the forest is the most beautiful ornament of the Earth. It makes the greatness of the mountains and the cheerfulness of the plain. A field without trees is a dead desert, without any life, and the traveller going through such a field loses any feelings of cheerfulness and becomes silent and bored" (Simionescu și Zeicu, 1926).

Nowadays, "the forest is a sacred space, where myths are born and poetry is created, a knowledge horizon, one for returning and finding again the ages of the humanity on its way towards progress. A reason to meditate for the philosophers, a reason for inspiration for poets, a depository of the plastic perfections for artists, the forest represents a peak of the nature's creation, both at the biological level as well as at the aesthetic one" (Bândiu, 2004).

An example of this is the "Beech Festival" organised in the Natural Reserve "Plaiul Fagului". On this occasion, the traditional, cultural and touristic values are being promoted through the perspective of a natural component – namely, the forest. The key element is the beech species (*Fagus Sylvatica*), which represents a symbol for a healthy natural environment, a stable forest and a special dependency of the man on the forest and its goods. The local population, the local and central authorities, wood craftsmen, artists and many others attend this festival. There are musical competitions, art competitions and even culinary competitions (especially with forest products), which lure the public into spending memorable moments in the heart of the forest.



Exhibition of works of art and other items: pottery and wood processed by the craftsmen, food prepared by the locals, paintings drawn by children etc., at the Beech Festival. © Aurel Lozan



Exhibition „The forest inspires us“

Required materials (optional):

Photo camera, painting materials, other materials.

How to proceed:

The final aim is to make an exhibition with landscapes or details of the forest. An option is to organise a photo exhibition in the forest, then to print and show the photos inside the school. A jury could be organised as well, which would vote for the best pictures.

Another option is for the students to choose their preferred manner of expression – photography, movie, painting, collage – for participating to the exhibition. Ideally, the exhibition will also have a banner with its title and some information about what the forest is offering, including information included in this material, for informing the colleagues.

The forest, a source of inspiration for artists

The final aim is to make a collection or a database with famous artistic creations, which have the forest as their topic.

It may be a discussion in class, through which the students are encouraged to remember works of art that have the forest as their topic – literature (fiction or poetry), paintings, movies, music, etc.

Another option is to complete a research, whose results are presented in class. The students' findings may be combined with the exhibition above.

Landart (the art of the land)

Required materials:

The natural elements collected from the forest (leaves, cones, branches, fruit, stones, etc.).

How to proceed:

Either in the forest or in the classroom, the students (the entire group or divided in teams) make a big-sized drawing (of any shape they want) from natural elements, collected from the forest. This is a team-building exercise, one that stimulates their creativity and their awareness of nature.

In the end, it is photographed from above.

The results may be spectacular!

Optional:

Before the activity, one can research the internet with the key word "Landart", for inspiration.



© makeabeautifulplace.wordpress.com/category/land-art

f) Conservation of the genetic fund of the forest

Quite a number of times, the experts in the field of forestry have intervened in the forest regeneration process, trying to improve the natural occurrence of the tree species with superior species and, sometimes, even with new species. Meanwhile, it has been proven that, in most cases, the most viable species (and, in the long term, the most profitable ones) are those that originate locally (the native ones). They have a higher degree of adaptability to the local pedoclimatic conditions, which gives them superior stability in time and allows for the development of a viable forest ecosystem.

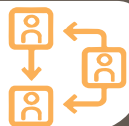
From this point of view, any natural forest that keeps not only the tree species characterised by the fundamental natural type of the forest but also the local origin of these species contributes to the conservation of the genetic fund of the forest, producing, every time when it is required, the best possible planting material required for ensuring the ecosystem's continuity.

Moreover, a forest with its local (native) species is a product of evolution, during which its biodiversity has come a long way to reach a stability and a structure perfectly adapted to the environmental conditions. The genetic pollution of the forest ecosystems with other foreign species (non-native, introduced, also called exotic) may have severe consequences, which may necessarily lead to disturbance and economic losses.



A secular oak tree (Quercus robur) estimated to be 186 year old is not only a source of seeds/acorns for reproduction, but also the holder of genetic information, which is extremely useful for maintaining the local oak tree species. Cahul County, 2011.

© Valeriu Caisin



Can any species live anywhere?

Manner of work:

The teacher introduces the concepts of local (or native) species and of introduced (foreign, or exotic, non-native) species. Then s/he makes a comparison between the introduced exotic tree species and a polar bear brought from the frozen areas of the Arctic Ocean (the Northern Hemisphere) in the Republic of Moldova.

The students identify the advantages and disadvantages that the polar bear has under the climate, geographical and social conditions of Moldova.

The polar bear, as a species adapted to very cold conditions, will be facing great difficulties, incomparable with its needs, which will have a greater impact on its health (the polar bear does not tolerate high temperatures). The polar bear will have neither the necessary food (as it is a predator, it attacks other animals, especially seals) nor the required

camouflage due to its fur in its natural environment. In the end, the polar bear will come into social conflict situations with the local population.

Discussion:

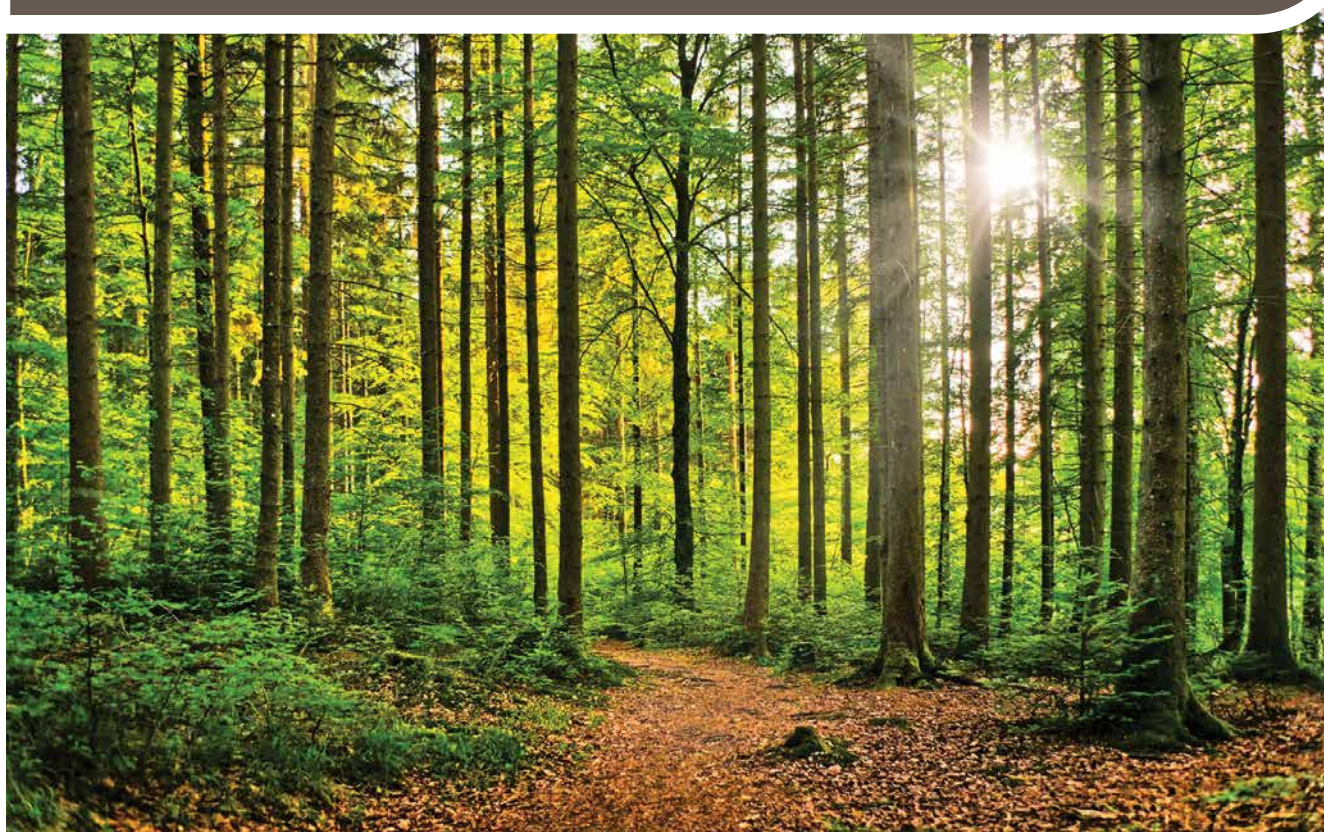
What are the differences between the two environments – the native one and the new one? Which of these two causes difficulties for the introduced species, and what type of difficulties? Are these differences valid as well in the case of the tree species?

Do you know any other examples of introduced species and their difficulties in adapting?

Optional:

The native species from the Republic of Moldova can be reviewed, as well as the introduced species.

Furthermore, a field trip to the park can be organised, as one can often observe exotic species in the parks.



Conclusions

The services offered by the forest are exercised through the functions it holds, as there is a direct connection between the two. Thus, the functions are fulfilled simultaneously by any type of forest ecosystem, but these are also services towards the community, given that the community benefits of the function's action in a concrete manner.

We can say with certainty that, of the many functions that the forest fulfils, we understand that it does not have only the role of supplying the population with wood. To treat the forest as a mere wood provider without taking into account the importance of the other functions it fulfils leads to irreversible actions, with a negative impact on the soil, water, landscape, etc. In economic terms, on medium and long term, this translates into great economic losses, very hard to remedy. *Anyway, the effects of the services offered by the forest are, most times, 3 to 20 times higher than the value of the effect of its production function* (Giurgiu, 2004). Namely, the value of the wood harvested from a forest is smaller than

the value of the objectives secured by the forest and of the other values hosted by the forest, other than wood.

Each time we carry out works in a forest, we have the obligation to take into account the longevity of a production cycle, spanning, on average, a period of over 100 years and we must analyse the consequences of our intervention for the entire duration of the cycle.

The theoretical model highlights the economic evolution of a local community that "benefits" from the forest resources, harvested in a non-sustainable manner. Thus, it is presented the evolution in time (on the horizontal axis) of the economic benefits (on the vertical axis) supplied by such a forest. If the first period (the first 4 years), characterised through an intensive exploitation of the forest shows a substantial economic gain (in green), in the next period the community will suffer a series of **expenses for reconstruction** or **economic losses**, according to the measures adopted following the disaster perpetrated.

Represented graphically, this conclusion can be illustrated as follows

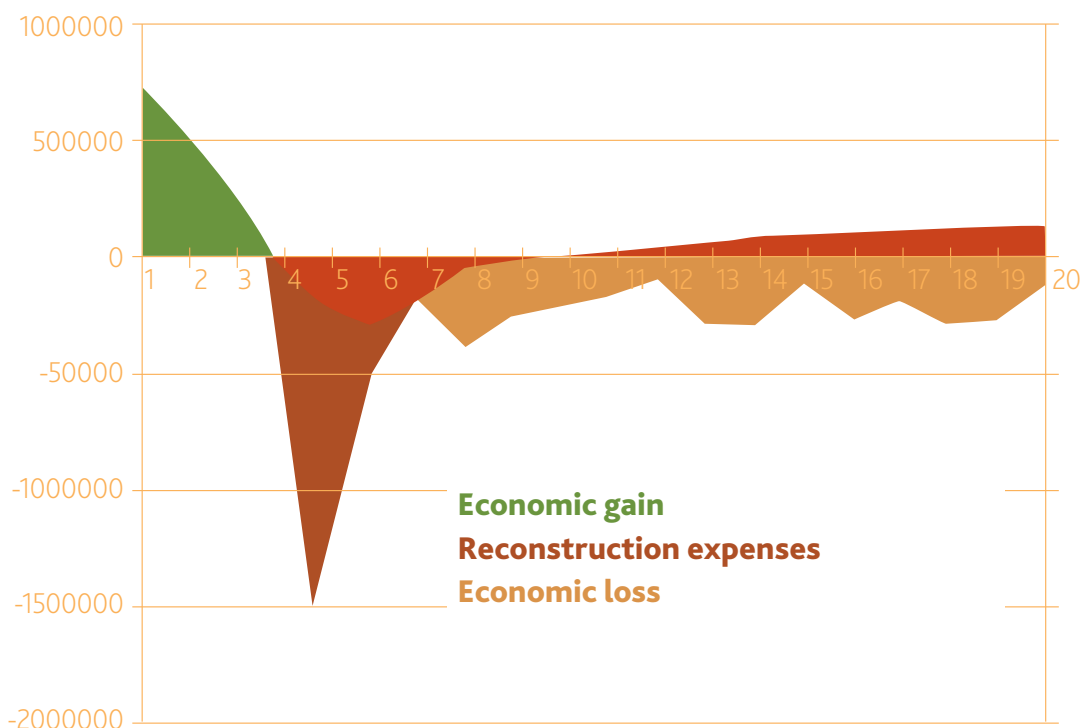


Figure 2. Theoretical model: The economic balance sheet of a radical intervention in a forest.

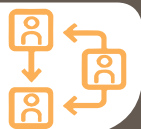
If, in the first years, there is a substantial economic input, once the wood resources are exhausted and the forest vegetation is removed, there will be unavoidable expenses (payments) and/or losses.

Reconstruction expenses (brown) appear when one wants to carry out the reforestation of the exploited surface. In this case, the cumulated costs of the ecological reconstruction are much higher than the income obtained by selling the exploited timber. Moreover, the artificially installed forest on an area that had been initially deforested will not reach the stability characterising the forests that are regenerated in a natural manner and, implicitly, the initial economic value.

Economic losses (beige) occur especially if the land use category is changed, from forest to another category (pasture, arable land, etc.) and are caused by the lack of the forest which has a role in regulating the watercourses, in preventing erosion, in reducing the wind speed, etc. By not fulfilling these functions, in time, it causes losses to the community, by increasing the flood risk, by having to transport the wood required for the households from other locations (from greater distances), by making harsher the climate conditions and by degrading the landscape.

On long term, the unsustainable exploitation of the forest resources causes economic losses, which are much greater than the income obtained from the immediate and complete exploitation of these resources.

METHOD OF
WORKING
WITH THE
STUDENTS



How do we manage the forest on long term?

Required materials:

Cards, which represent sums of money and investments.

Attention! When preparing this game, it is recommended to consult the rules of a Monopoly-type of game.

Manner of work:

The students are divided into 2 teams. Each team has to manage an imaginary forest, with each of the two scenarios: complete exploitation versus sustainable management. The first team will receive a large amount of "money" and will be tempted by the facilitator to spend them on various attractive acquisitions for their town

(highways, shopping malls, etc. – one per year); the second team will only have a limited amount of money with which they can only build a small park or a school. After a few years, the first team finds that the investments are a source of pollution and is required to invest money in depolluting actions until its budget reaches 0 or becomes negative, while the second team will have constant investments.

Discussion:

The students are stimulated to imagine what an investment programme would look like, one that would reduce to a minimum the pollution resulting from the investments of the first team.

2.3. Deadwood – a Source of Life



LEARNING OBJECTIVES

The students know the concept of deadwood. The students understand the role of deadwood in maintaining biodiversity and, implicitly, the forest's productivity. The students analyse the opportunity of keeping the deadwood in the forest by adopting adequate solutions.



COMPETENCIES

Knowledge of the concept of deadwood. Identifying deadwood and the biodiversity elements that it hosts. Understanding its importance for biodiversity and its role in maintaining the forests' productivity and environmental services. Proposing solutions for keeping the deadwood in the forest.



Deadwood in the strictly protected area from the Natural Reserve Codrii, Strășeni County. © Aurel Lozan

The issue of deadwood is a consequence of the forest sanitisation policy through sanitising cuttings, a policy that determined the production of major imbalances in some forest ecosystems.

The sanitation cuts are practiced in order to monetize the wood of the dead trees or of those about to die and so that a potential source for the occurrence and expansion of a number of pests is removed.

However, in reality, **deadwood is one of the most important habitats for biodiversity in Europe** – a fact that is often unknown. *Up to a third of the forest species from Europe are dependant, for their survival, on the very old trees and on deadwood* (WWF, *Deadwood living forests*, 2004). This ensures habitats, shelter and is a source of food for birds, bats and other mammals, and is particularly important for the less visible majority of the species living the forest: insects, especially beetles, mushrooms and mosses. Deadwood and the biodiversity it hosts also plays a decisive role in maintaining forest productivity and its environmental services, including forest stability and carbon storage.

Despite its enormous importance, deadwood is found today at a dangerously low level in the forests of many European countries, and especially in the Republic of Moldova. Its volume has been diminishing mainly because of inadequate managerial practices from the production (cultivated) forests and even in the protected areas. *On average, European forests have less than 5% of the deadwood that should exist under natural conditions* (WWF, *Deadwood living forests*, 2004). Harvesting from the forest the wood which is about to rot constitutes one of the biggest dangers for the survival of almost a third of the endangered species. Increasing the deadwood quantities from the production forests and ensuring natural dynamic processes in the woods situated in protected area would represent major contributions to maintaining biodiversity in Europe.

During the evolution of international and European policies, deadwood has started to be increasingly accepted as a key indicator for the degree of naturalness of forest ecosystems. Governments that recognised the need to maintain the variety of forest values and have undertaken obligations to this aim can change the complete decline of forest biodiversity occurring nowadays. This can be achieved by officially recognising the importance of deadwood



© Aurel Lozan

within the national strategies for the preservation of forest biodiversity, by monitoring deadwood, by introducing supporting legislation and increasing the public awareness connected to this subject.

In the rural communities, dried wood is targeted mainly by locals in order to meet their need for firewood especially given that, based on local customs, harvesting it is not considered to be theft. Taking into consideration the data above, we can understand how poor this practice is, both for biodiversity and for the forest, generally. Moreover, when applying the cultivating cuttings (thinnings, regeneration cuttings), this category of trees is especially targeted and represents a priority for carrying out the exploitation works, as it is considered to be an obstacle in following the work safety regulations.

Deadwood does not have a very high economic value, and sometimes its exploitation causes losses, if we take into account the cost of fuel, the wear and tear and the time invested. This is why it is required to reconsider the biodiversity value of these specimens by keeping per hectare a minimum amount of deadwood that would ensure a supplement for the forest ecosystem biodiversity.



© Paul Glendell / WWF



Deadwood – a source of life

(Place of the activity: in the field, in the forest)

Required materials (optional):

Photo cameras, sheets of paper/notebooks, writing instruments.

Manner of work:

Stage 1: Identifying examples of deadwood.

The group is divided into teams. In the area designated for the running of the application, each team has the task of identifying an example of each type of deadwood – very old trees, dead trees that are still standing and those about to dry, the trunks and branches that have fallen to the ground, the trees attacked by insects, mushrooms, decomposing organisms.

The teacher goes to every team and validates the fact that the identified elements belong to the deadwood category.

Stage 2: Identifying the biodiversity elements

The next task for the group is to identify as many organisms as possible that are hosted by the identified deadwood. The students may take pictures with these organisms, for documentation purposes, or for potential later presentations. The students write down the elements discovered, and estimate the number of species.

The teams re-unite in the big group and share their results. The task can be also organised under the form of a competition – the team who found the biggest number and the most varied types of species is the winner.

The teacher initiates a discussion concerning the role of these organisms in the forest and the general role of deadwood. Supporting information: Up to a third of the European forest species depend, for their survival, on very old trees and on deadwood. (Deadwood living forests- WWF 2004).

Stage 3: Solutions for keeping the deadwood in the forest

This can be carried out in the forest, or during the next meeting, in the classroom.

Option 1 - The group discusses the manner in which deadwood is used nowadays and possible solutions for keeping it in the forest.

Option 2 - If this stage is done in the classroom, the students may have the following task: the teams make a presentation (it can be a PowerPoint presentation or a poster) in which they include a part of the photos, the advantages of deadwood and solutions for keeping it in the forest. Each team presents their material to the entire group. The presentations can also be delivered to an extended audience, during school events or other bigger events, such as symposia, etc.

Discussion:

Wood decomposition and the participation of another biological diversity (insects, microorganisms) to decomposition. Its later participation to the circuit of the substances in nature. Its contribution to the regeneration of other saplings in the forest, naturally, viable for survival. The old trees offer shelter to other species (such as birds, bats) which participate actively to the reduction in the number of forest pests, for example.

Optional:

The teacher can introduce the Life Network (Food Network) method described under Chapter 2 – The forests and climate change. Emphasis will be laid on the decomposers and the place of the deadwood in the food chain.

3. The Forests *and Climate Change*



LEARNING OBJECTIVES

The students know the definition of climate change and the causes of the phenomenon. The students understand the forests' role in the planet's climate change processes.



COMPETENCIES

Knowledge of the definition of climate change. Knowledge and capacity of listing the main greenhouse gases. Understanding the principle of greenhouse effect. Understanding the reduced contribution of wood used as fuel to the greenhouse effect. Understanding the role of the forest in the climate change processes and, implicitly, of the photosynthesis in the carbon storage process. Exploring the effects of climate change on the local area.

The UN Convention on Climate Change (1994) defines the term *climate change* as being “**a change of climate** which is attributed directly or indirectly to **human activity that alters the composition of the global atmosphere** and which is **in addition to natural climate variability** observed over comparable time periods”.

Climate change is caused by **the greenhouse gases (GHG)** which are **gaseous constituents of the atmosphere**, both natural and anthropogenic, that **absorb and re-emit infrared radiation**.

Even though the greenhouse effect has become a subject of concern, without it life on Earth could not have been possible, because the average temperature on Earth would be of -18°C (Lashof, 1989). Solar radiation

is the only source of energy touching the Earth's surface. It is reflected by the terrestrial surface directly, as light, as well as thermal radiation. The atmosphere's permeability to thermal radiation is only partial, and thus a substantial part of it is retained under the form of heat.

The most significant impact on global warming comes from the increase in the amount of carbon dioxide and methane emitted into the atmosphere as a result of using fossil fuels. The burning of fossil fuels is responsible of the increase by 50% of the GHG in the atmosphere. Another 20% of the GHG come from the chemical industry (CFC), 15% come from practicing intensive agriculture (CO_2 , CH_4 , N_2O) and another 15% of the GHG are a result of the deforestation processes.

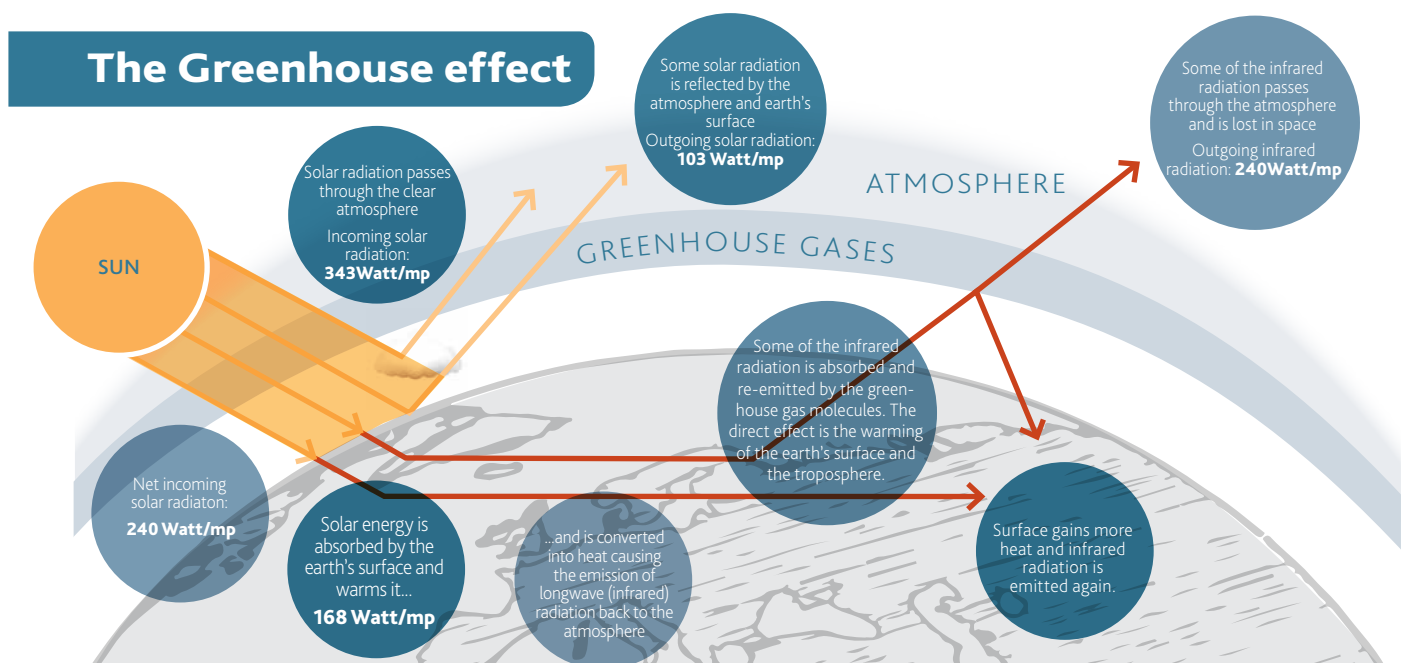


Figure 3. GREENHOUSE EFFECT (UNEP & WMO, 1996)

The role of the forest in climate change processes

According to the report of the IPCC³ experts, the current CO₂ concentration in the atmosphere is only 57% of what it would have been if the forest hadn't deposited carbon.

Forests have their own carbon cycle, made, like any cycle, by carbon inputs and losses:

- **The inputs** are done almost exclusively through photosynthesis, as the carbon is in the form of

carbon dioxide and is taken from the atmosphere. On a global scale, forests recycle around 5% of the carbon dioxide from the atmosphere.

- **The outputs** are done only in three manners: respiration, burning and decomposition. The forest ecosystems' biomass has as its final destination the burning or the decomposition, and a quite small quantity remains in the ecosystem. The exploited wood, regardless of the duration it is used for, will be eventually burned or decomposed.

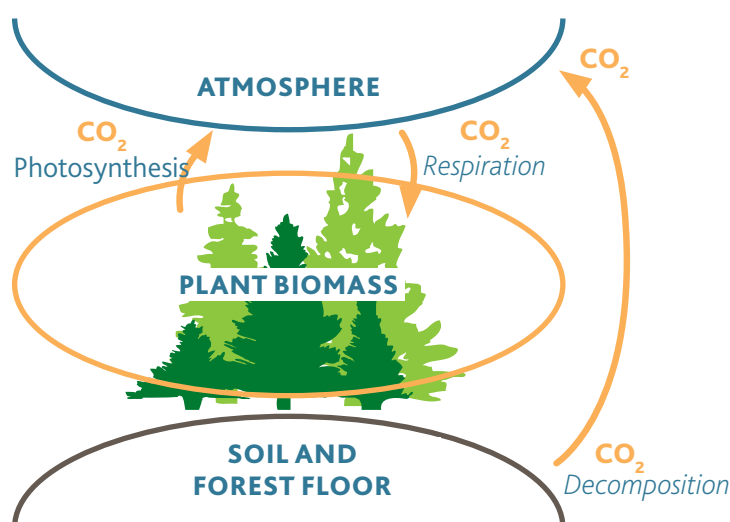


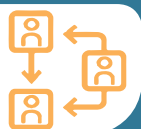
Figure 4. The carbon cycle in the forest ecosystems

According to the IPCC, **a cubic metre of wood stores a carbon quantity which is equivalent to a ton of CO₂**. In the forests that are under a normal regime of use, the duration of the storage depends on the use of the exploited wood: short of firewood and paper, longer for timber. In the natural forests, the dead trees decompose, which releases the carbon stored throughout the life of the tree, while the trees alive grow, absorbing carbon from the atmosphere. It is not very clear whether, under these conditions, the balance is even, as it has been assumed for a long time, or whether the natural forests become a resource or they capture the carbon from the atmosphere.

Recent studies have showed that the natural forests are a significant and long-term absorber of carbon (Luyssaert *et al.*, 2008; Gleixner *et al.*, 2009). According to these studies, natural or quasi-natural

forests, which represent up to 15% of the forest surface in the Nordic hemisphere, would contribute by 10% to the annual deposits of all ecosystems.

At the end of their life, the products made of wood can be recycled in most cases, thus extending their carbon storage effect, and/or can be used as neutral carbon fuels, replacing thus the fossil carbon sources. Despite a number of prejudices and opinions which are, in fact, disputed, using wood for energy production by burning it does not have a negative impact on the carbon balance (*Standing Forestry Committee*, 2010). Burning wood does not represent an entry to the carbon balance, but rather a recycling of the same carbon that has been stored for a certain period of time due to photosynthesis. Thus, the use of wood for producing energy through burning allows us to avoid the emission of greenhouse gases that would result from burning fossil fuels.



Climate change and ecosystems. The “Life Network” method, followed by group discussions

The students understand the interdependencies between plants and animals in an ecosystem and explore the manner in which the climate change could impact these interdependencies and the ecosystem as a whole.

The Life Network (The Food Chain)

Required materials:

Ball of twine, prints with different species of animals and plants (representatives of all trophic levels) - one image for each participant.

Manner of work:

Stage 1: The aim of the method is for the students to understand the role of each species in nature, of the relationships between the various species, of the fragility of the ecological balance. Each student receives an image with an animal or a plant. The teacher prepares images with producers, with herbivores, with predators and with decomposers. The students form a circle. We also need a ball of twine, whose end is held by a producer (a plant). The facilitator asks questions, which guide the running of the activity and, implicitly, the route of the twine. *Who produces primary (vegetal) matter? Who can eat this plant?* We lead the twine to the herbivore. *Who feeds on this animal?* We lead the twine through the hand of the predator. In this way we will go through every link of the food chain, and after the top predator dies (it has no natural enemies), it decomposes and re-joins the natural circuit, and the substances are absorbed from the soil by a plant, a producer. The game ends when the twine has passed through the hand of every student. The result is a food chain that resembles a spider's web. *This network ensures the balance in nature.*

The activity may stop here, and from here onward the teacher guides the discussion with questions about climate change.

Stage 2: *What would happen if the predators were to disappear?* Every predator leaves the network, lets go of the twine. The network is no as stable anymore, *What would happen if an area of the forest is deforested / if a pasture is ploughed?* The students holding pictures of trees, of grassy plants let the twine go. The network becomes increasingly instable. The game continues with the successive exclusion of the various links, until it destroys the entire network. It is worth mentioning the important role held by the decomposers; without them there would be no circuit of substances in nature. According to the number of students, one can create at the same time several networks or just a single one. We must pay attention so that each link of the food chain has food. The decomposers may follow any category, not just the top predators, because any creature, after death, is decomposed in inorganic substances that can be absorbed by plants.

If the teacher chooses to continue the activity, the discussion about the climate change starts now. The analysis can be done for each category – producers, herbivores, predators and decomposers -

- What are their living conditions? What conditions would be favourable for them?
- Of the changes already discussed (e.g. during Activity 1), which are the ones that impact on these species?
- What are the dangers to the ecosystem? What about to humans?
- How can we prevent these dangers?

Optional:

More methods can be developed including with the support of the electronic material that can be accessed at this address: <http://unesdoc.unesco.org/images/0021/002197/219752e.pdf>

Climate change was experienced in Moldova? (Community project)

Manner of work:

In teams, the students interview community members who are somewhat older, for instance their grandparents, on the topic of climate change during their lives. At the next meeting, the students present the results of the interviews and the evolution throughout time (childhood years versus the 2000s), in teams.

For a comparative study, we recommend to establish a set of common questions for all teams. Thus, one could also define the criteria based on which the comparative analysis will be carried out, as well as the presentation. **Example questions:**

- What year were you born? (in order to place the time period)
- How were the winters like in your childhood? How high was the snow? When (what period / month) did winter / snow come?
- Have you noticed any differences between the summers of your childhood and those from now? If you have, what are they?
- Is it hotter or colder now, in comparison to your childhood?
- What can you say about the extreme weather phenomena, such as hail, heatwave, flooding? Is there any difference between your childhood and now?
- Supplementary – What was the forest like in your childhood? Has anything changed since?

What do studies show about climate change and Moldova? (Group discussion)

The teacher shows the maps representing country performances connected to climate change.

(<https://germanwatch.org/en/download/8599.pdf>)

The students identify Moldova on the map and discuss its situation within the regional and global context.

4

Basic Principles regarding

the Sustainable Management of Forests





LEARNING OBJECTIVES

The students know the definition for the sustainable management of forests and its economic, social and environmental implications, at local and global level. The students know and understand the principle of the sustainable management of forests.



COMPETENCIES

Knowledge of the definitions of the sustainable management of forests, from nowadays and from the past. Knowledge of the short and medium term economic implication of the manner of managing the forest. Strengthening and understanding of the principles of the sustainable management of forests

By sustainable management of the forest we understand: *"the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems."* (Ministerial Conference on the Protection of Forests in Europe, Helsinki, 1993)

As we have also shown previously, the sustainable management actually aims at using the forest resources in the most advantageous manner possible on medium and long term, taking into account both the direct and the indirect benefits of the forest. One must not understand that such a notion diminishes the community's profit by reducing the quantity of the exploited forest resources.

In silviculture, the concept of sustainability is not a new one. At the end of the 18th century, the German silviculturist G.L. Hartig, in a wide definition of the continuity in forest management, included the idea that *"cutting from the forests should be regulated in such a way that future generations could have from them as many advantages as this generation"* – taking into account, first and foremost, that *"from the forest one would make yearly wood productions, continuous, constant and equal"*.

The income coming from the sustainable management (grey) of the forests has a constant character and acquiring it does not impact irreversibly the forest stability, maintaining at the same time active its functions and ensuring its specific benefits for human society. Additionally, the forest represents a value which, within the context of the demographic increase and of the decrease in the surface covered

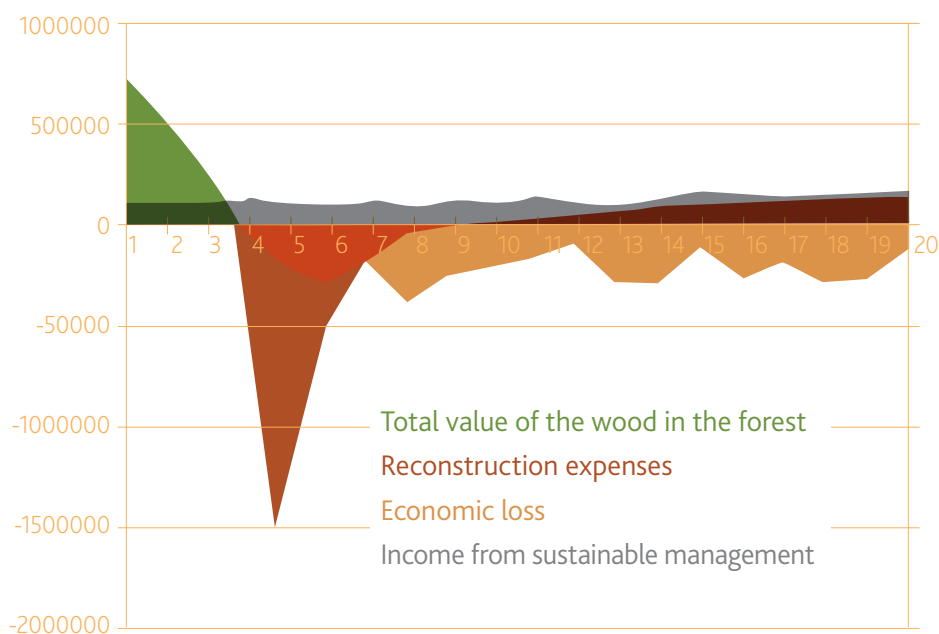


Figure 5. Theoretical model: Comparative economic situation between the sustainable and unsustainable management model

with forest vegetation at global level, generates benefits without diminishing its initial value; in most cases, it actually increases. From the point of view of their capacity to be monetised, the resources can be classified into finite resources (e.g. mineral resources) and inexhaustible resources (e.g. water, air, wind, solar radiation) which are renewable. **According to the manner in which a forest is managed, forest resources may be, in their turn, finite or inexhaustible.** If the exploitation of the forest resources is done in an unsustainable manner, then the forest's regeneration capacity is affected or even cancelled altogether, these resources turning into finite (exhaustible) resources. Applying a sustainable management ensures the constant regeneration of resources, having an inexhaustible (infinite) character.

The management in a sustainable manner of the forests requires an evaluation of the impact of the works carried out on medium and long term, which would necessarily anticipate the effects of any intervention, not just for the first years, but for the entire production cycle. This is precisely why, when one intervenes in the forest, one needs a high degree of **silvic consciousness**, because the effects of a negligent action persists for long periods of time, are major, prolonged and very hard to remedy. We do not have the possibility in one generation of silviculturists to lead an arboretum from its initial phases of seedling to that of exploitation and this is why the forest is a good that we are handed over and we must, in turn, hand over to future generations.

For the sustainable management of forests, one must take into account the principles that lie or should lie at the basis of any action of forest management

These are:

a) promoting the practices that would ensure the sustainable management of forests;

- b)** ensuring the integrity of the forest fund and the forest's permanence;
- c)** increasing the surface of the areas covered by forests
- d)** a stable forest policy on long term;
- e)** ensuring an adequate level of juridical, institutional and operational continuity in forest management;
- f)** the primacy of the silviculture's ecological objectives;
- g)** increasing silviculture's role in rural development;
- h)** promoting the fundamentally natural type of forest and ensuring the forest's biologic diversity;
- i)** harmonising the relationships between silviculture and other fields of activity;
- j)** preventing the irreversible degradation of forest, as a consequence of human action and of the destabilizing environmental factors.

It is acknowledged, at global level, that the Earth has a limited capacity of satisfying the increasing demand of natural resources coming from the socio-economic system and of absorbing the destructive effects of their use. Climate change, the phenomena of erosion and desertification, soil, air and water pollution, reduction of the surface of forest systems and of wet lands, the extinction or the endangerment of a big number of land or water plants and animals, the accelerated exhaustion of non-renewable natural resources, have started to have measurable negative effects on the socio-economic development and on the human life quality in vast areas of the planet.

At least declaratively, the principles of sustainable management have been adopted by all states that want to apply an advanced silviculture. This is why various practices are identified, that have at their basis the forest's sustainable management. At national level it is important to promote those actions that answer the national strategy for sustainable development.





1. "Hot potato" method

This is one of the simplest and most enjoyable methods of evaluating/reviewing/strengthening knowledge. It can be organised anywhere, it is quick, dynamic and can evaluate more aspects of the teaching-learning process and is perceived positively by the students.

Required materials:

A small ball, or any other object that can be easily thrown from one student to another.

Manner of work:

The teacher throws to a student a small ball, which is the "hot potato", i.e. the one who is holding it must answer quickly, otherwise s/he gets burned. After speaking, s/he throws the "potato" to another colleague of their choice. The teacher should try and involve as many students as possible in the evaluation activity, even if they won't answer to all three aspects.

The 3 aspects followed during the evaluation, usually, are the participants' state of mind, the new knowledge and the transfer of knowledge to daily life. Thus, the questions or the instructions that are addressed to the participants are formulated taking into account these aspects.

1. Evaluating the students' state of mind: Did you enjoy this meeting? How do you feel at the end of the session?
2. Evaluating the students' knowledge. Say a key word from what you've learnt new, or from what you've learnt today.
3. Evaluating the students' reaction and the potential behaviour changes: say a thing what you will do differently from now on.

2. The "hot potato" and the sustainable management of forests

For the chapter you just went through together with the students, we recommend you to use the method presented above for reviewing knowledge. The teacher asks the group questions about the theoretical notions learned. S/he allows time for 2 – 3 answers and then asks a new question, and thus reviews, one at a time, all the new elements.

Examples of questions:

What elements do you remember from the definition of forest management? When was this definition suggested? Have there been such definitions? What are the few essential elements/essential key words which express

the essence of this manner of thinking? Economic loss or gain? Does forest management concern only us? (look for answers that are connected to time – future generations – and to space – global level) Who and how could help the silviculture in order to successfully manage the forest sustainably?

The principles of sustainable management and of searching for balance

Required materials:

Cardboards / A4 sheets of paper (preferably in two different colours), markers.

Manner of work:

On four sheets of paper, the teacher writes the following terms: Forest, Community, Authorities/Laws, and Economy. Place these sheets of paper on the floor, so that they form a square.

On another ten sheets of paper of a different colour, the teacher writes the principles of the sustainable management of the forests, from a) to j). The group will be divided into smaller teams (there may be four), which receive an equal number of principles.

The activity starts with the urge: "Let's look for the most appropriate form!" The students present, in turn, one principle at a time, and put it closer or further from one of the four initial elements. The team argues their choice, and then the entire group discusses it.

Attention! The teacher will encourage the students that, along the way, to change the position of the four initial sheets of paper, as they consider fit. It is very important to understand that the position of these four sheets of paper and the manner of relating to the four fields is determined by the group's perception. For instance, there might arise an interpretation that puts the Forest in the middle and the other elements around it, in a circle or an equilateral triangle. Moreover, the initial square could be made bigger with Principle c).

Discussion:

Alongside the discussions during the activity, the teacher can ask concluding and position-taking questions: Is such management possible? Generally, and particularly, in the Republic of Moldova? Is the balance achievable? Can you illustrate? Who do you think can influence the adoption of all principles?



4.1. Republic of Moldova's Forest Fund



LEARNING OBJECTIVES

The students know and analyse the situation of the current forest fund from the Republic of Moldova and the main issues it faces. The students analyse the degree of forest coverage of the Republic of Moldova from a comparative perspective, in comparison to the other European countries. The students know and suggest possible solutions for improving the situation of the forest fund from RM, including at the level of the forest strategy.



COMPETENCIES

Knowledge of the degree of forest coverage of RM and of other European countries. Analysis of the factors that determine the degree of forest coverage and suggestion of solutions that lead to its increase for RM. Understanding the challenges brought by the important presence of the black locust tree in the forest's species makeup. The listing of solutions for this situation. Knowledge of the notion of harvesting possibility (yearly and regularly) and understanding of the factors that determine its reduction. Identification of solutions for the optimisation of harvesting possibilities. Explaining the relationship between the forest and agricultural crops and understanding the solutions for improving the current situation.

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The Republic of Moldova has a total surface of forest area of 450 thousand hectares of which the surface covered by forests is of 372.8 thousand hectares, representing 12% of the country's total surface; from this point of view, it is situated well under the European

average of 36%. Thus, securing the national forest fund and increasing it with new areas covered by forests is a vital condition for applying a responsible forest management – which corresponds to the target objective of 15% of forest coverage by the year 2020, according

SURFACE COVERED BY FORESTS IN THOUSAND HECTARES

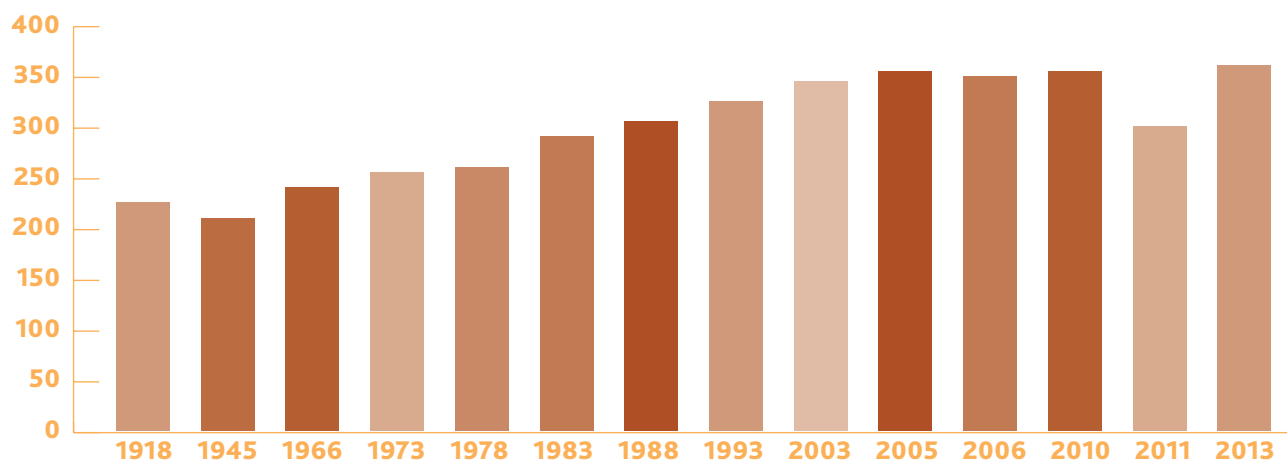


Figure 6. Evolution of surfaces covered by forest between 1918 and 2013 in the Republic of Moldova (MOLDSILVA/FLEG, 2011)

to the Strategy for the sustainable development of the national forest sector (2003). On the other hand, by making the forest permanent, one can infer the obligation of forest management in order to ensure the continuous satisfaction of the needs for forest resources without influencing the forest's functions..

Furthermore, a worrying reason is represented by the species composition of the forest, in which 131 thousand hectare (about 36.1%) are covered by black locust trees. Even though the use of the black locust tree in the planted makeup of the forest has been seen to answer a number of local social needs, on long term it was noticed that such cultures influence decisively the soil quality, the natural composition of the forest and the harvested wood.

The black locust tree is an exotic species (its origins are in North America), a hard wood that grows quickly in its young stages, which adapts very well to poor, sandy soils that lack humidity. At the same time it has a very developed root system, capable to ensure the required nutrients under the given conditions, its presence leading to a continuous depreciation of the soil.

Moreover, the black locust tree has a special capacity of sprouting, practically the vegetative propagation being the only natural manner of regeneration. Because of the well-developed root system and of its sprouting capacity, the black locust tree has an invading character in the natural forests where it is present (or introduced), eliminating the other indigenous species through the competition it exercises especially in the soil and through the intense growth of the sprouts.



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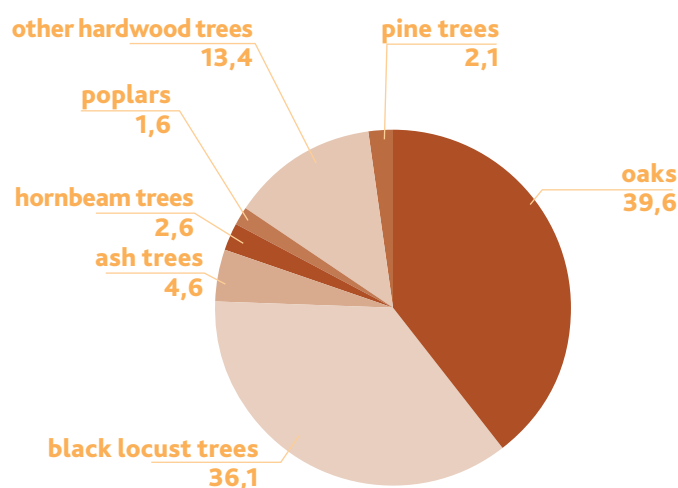


Figure 7. Distribution of main forest species

After exploiting the first generation, regeneration is done through stimulation of the sprouts, and the following cultures come from the mother roots of the first generation. Meanwhile, the qualitative and quantitative performances of the trees planted decreases, as this species cannot be replaced because of the resulting soil quality, and especially of its sprouting capacity from relatively small root fragments.

Thus, a solution that seems laudable leads in time to the permanence of an inefficient and destructive crop.

Another problem, actually predictable, taking into account the species makeup of the forest fund, is the high percentage of trees regenerated vegetatively from seedlings or sprouts, which goes up to 56.5% and which finally determines a reduction in quality and in the annual growth of wood resulting from these forests. Thus, the average yearly growth is of 3.3 m³ / year / ha, leading to a possibility of harvesting in the year 2013 of 577.4 thousand m³. The average annual growth represents the proportion between the quantity of wood accumulated from the moment of the forest settlement and its age. According to some market analyses regarding the actual wood consumption in the Republic of Moldova carried out under the FLEG project by the non-governmental organisation Silva – Mileniu for the period 2010 – 2011, the estimated consumption of firewood exceed 1 million m³ per year, thus being twice bigger than the annual authorised harvest.

Under the given conditions, the legally harvested wood, according to the calculated possibility, cannot cover completely not even the fuel requirements (energy wood) for the population, and this leads to an increase of the human pressure on the forest.

The possibility to harvest represents the volume of timber that is about to be harvested from a forest, on the basis of the forest management plan, with the aim of achieving a normal state for it. The volume of timber harvested annually means the possibility of annual harvest, and the one that is about to be harvested during a period of time – the possibility of periodic harvest. This definition is included in the Forest Code of the Republic of Moldova.

In order to solve these problems, it is important to establish and follow a forest strategy which would include:

- Promoting the generative regeneration (from seed) of the species from the fundamental natural type of forest;

- Increasing the surfaces covered by woods through forest planting and ecological reconstruction;
- Using black locust tree cultures in separate areas (but not in the natural forest) so that it would eliminate the risk of the black locust tree invading the forest,
- Superior monetization of the wood through the development of small craft industries which would determine the creation of added value for the wood resource.

For a country that has a high agricultural potential, the forest's role is also a very important one. Even though initially the forest were the first ones sacrificed for increasing the agricultural surfaces, in time it was found that these have a special role in the development of the agricultural sector. The Academy Member Gheorghe Ionescu-Șișești said *"We are today convinced that the ruin of the forests would mean the ruin of agriculture and the ruin of agriculture would mean the ruin of civilization"* (1955)

Furthermore, the forest may influence in a positive manner the agricultural production as well, and by maintaining and developing the forest belts it would contribute in a consistent manner to the development efforts in rural areas.

Forest belts are belts of forest vegetation, situated at a certain distance one from another, with the aim of protecting against the effects of damaging factors and/or for climate, economic and esthetical-sanitary improvement of fields.

From a climate point of view, these networks improve the conditions for cultivating agricultural plants during the summer droughty periods, by:

Reducing air temperature, beneficial especially in the droughty summers, when solar radiation is diminished by the trees' leaves, which use the radiation energy for transpiration.

Increasing air humidity due to the evaporation capacity of the trees' foliar mass. Through this process, the water coming from the excess precipitation during rainy periods is put back into the circuit, during droughty periods.

Reducing the direct solar radiation and of the

refracting one because of the trees' canopy which shades the neighbouring agricultural surfaces.

Reducing the wind intensity which, during droughty periods, intensifies the plant drying up process. In wintertime, the forest belts prevent the snow being moved around by the wind, and implicitly, its evacuation from the agricultural fields, ensuring water contribution to the agricultural crops when the snow melts, and protection of towns against the snowing phenomena. At the same time, strong

winds lift soil particles which can cause mechanical lesions to crops.

Moreover, given the fact that the protection forest belts are usually set up in forestless areas, these also **fulfil their specific functions**: providing firewood, depositing carbon, refuge for agricultural workers, etc.

We should also keep in mind FAO's statement according to which the existence of forest belts networks for field protection indicates the degree of development of a country's agriculture.

METHOD OF WORKING WITH THE STUDENTS



European forests mosaic

Required materials:

Activity option 1: Video projector for projecting the big-sized graph.

Activity option 2: Map of Europe, post-it notes or self-adhesive labels.

Manner of work:

The teacher will present to the students the map of Europe with the percentage of the surface covered by forests for each country. Online maps are available for the teacher, either to project them or to use them as a source for the data written on the self-adhesive notes.

Map examples:

<http://www.mapsofworld.com/europe/thematic/maps/europe-forest.jpg>

<http://goo.gl/V1kmV4>

If the option with notes with percentages is used, the students place them, in turn, on the map of Europe. The Republic of Moldova will be the last one – it can be kept for the discussion stage.

The students notice the forest's contribution and try to identify the common elements – geographical, social, and economic – that characterise each level

of forest coverage. They can work in teams, each one having a percentual level. In the end, the situation of Republic of Moldova is analysed and the hypotheses put forward before are verified.

Discussion:

In the end, the teacher may ask the group a set of questions which are related to sustainable development: What is the impact of sustainable development on the environment? What is the impact of sustainable development of the wood production? What is the impact of sustainable development on society?

Strengthening information with the help of learning anchors

As this chapter is filled with information and it is very important for the students, it is recommended to strengthen the information acquisition through "learning anchors". Just as a ship uses an anchor to fix its position, in order to fix knowledge in one's mind, one can use anchors: metaphors and similes, visual stimuli, sensorial stimuli.

For this chapter, the teacher, together with the students, can create colourful cards with key data, boards with graphics, thematic maps. These will be placed in the classroom where the teaching lessons for this material take place.

The activity can be organised in teams – each team illustrates a piece of information, on a board, and presents it to the group, thus strengthening their knowledge.



4.2. Premises for a Responsible Forest Management



LEARNING OBJECTIVES

The students understand the concepts of sustainable development, viable management, management of the quality of life and equitable management. The students analyse the advantages and disadvantages of the various management types. The students know the manner in which the stakeholders become involved in the forest management act and understand its importance.



COMPETENCIES

Knowledge of the definition and the components of sustainable development. Knowledge and understanding of the types of sustainable forest management. The capacity to make decisions regarding the most adequate type of forest management. Listing the number of ways in which the stakeholders can become involved. Taking a stand regarding their involvement.



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Sustainable development *Definition and key terms*

Applying a sustainable forest management is done by taking into consideration the three basic pillars: economic, social and environmental.

When responsible forest management is applied, the three basic components cannot be taken into account in equal measures. Depending on the local characteristics, management always favours intermediate forms: viable management, quality of life management, or equitable management.

ELEMENTS OF SUSTAINABLE MANAGEMENT

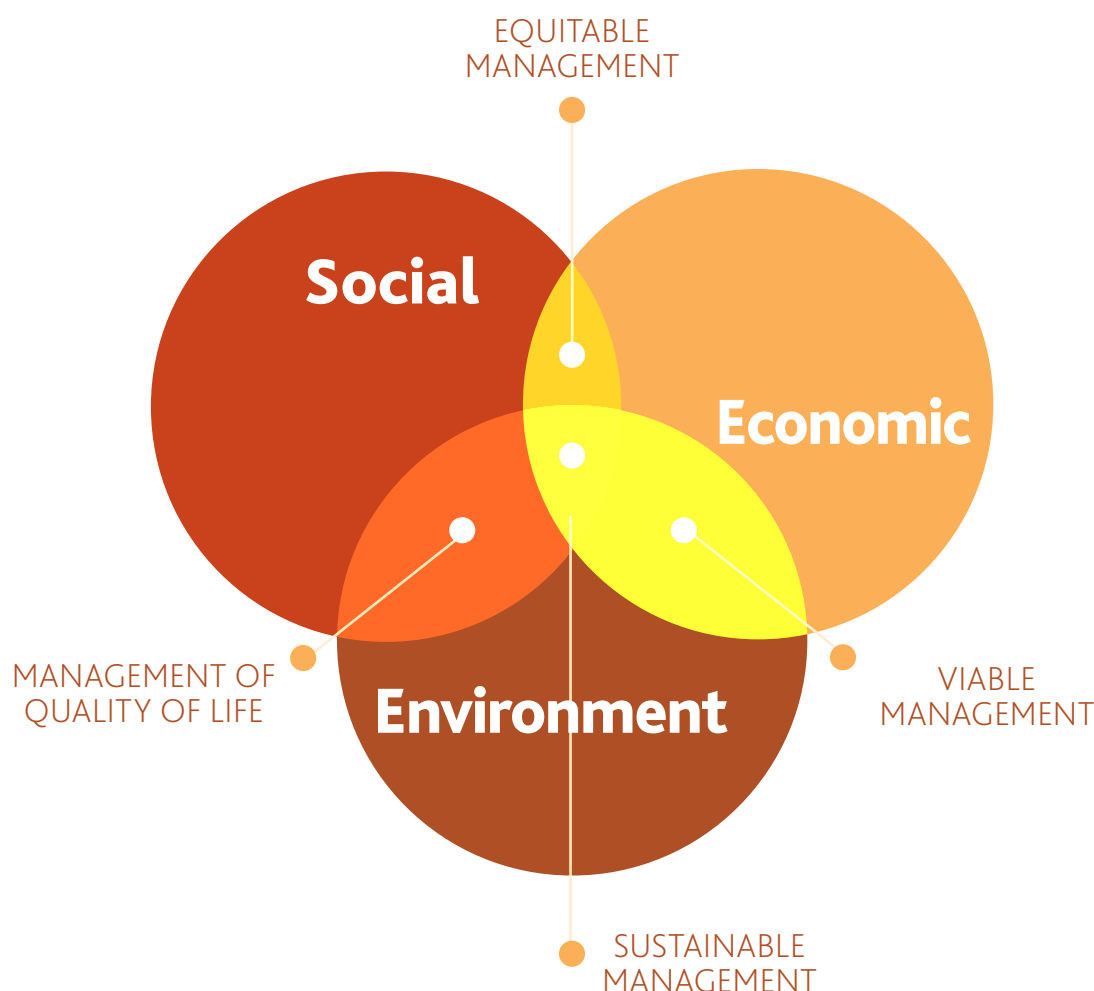


Figure 8. Elements of sustainable management

Viable management takes into account the economic and environmental aspects. Therefore it favours the most profitable exploitation of forest resources which are harvested while also considering the environmental needs of the forest.

This type of management is specific to developed or developing countries, where the environmental component plays an important role both on the authorities' agenda and the public opinion's agenda. In these countries resources are processed in a centralized, mechanized manner, by using technological lines able to replace a large number of employees.

Such management tends to eliminate a large number of employees in the forest sector and to limit the jobs in local communities that depend on the forest resource, thus leading to increased pressure on the forest or even to the migration of the local population.

The resources resulting from such management are characteristic of the consumer society and are defined especially by quantity.

Quality of life management takes into account the social and environmental aspects. This management follows the trend of exploiting forest resources in order to meet the basic needs, particularly those

of local communities. This type of management was prominent in the decades that preceded the technological boom and it is found increasingly rarer worldwide. Generally, it doesn't have a high degree of mechanization; it requires a lot of people being directly involved in the activities that define quality of life management.

Since it only partially meets the needs of local communities, this kind of management does not meet the requirements of greater urban areas that characterize developing societies.

Such management does not create the conditions necessary for economic development, but it provides a constant standard of living. A state that adopts such management cannot keep up with other states, as far as the economy is concerned.

Equitable management takes into account the economic and social aspects. It is the type of management which depletes a large amount of resources and it requires the engagement of a large number of people in the processing activities. It generally characterizes societies which aim for fast economic development without taking into account the specific environmental needs of the forest. The consequences of this type of management are negative for the environment and they can be found in many of the developed countries, which have lost a significant part of biodiversity.

Although this management does take into account the economic and social aspects, if we look at things while assessing the services provided by forests, we understand that in the long term, the goal of such a process has serious consequences for both the social component as well as the economic one by leading to the devaluation or even exclusion of these services provided by the forest ecosystem. For this reason a number of countries that have gone through such a process (determined by applying equitable management), are nowadays engaged in a series of works aimed at ecological reconstruction and repopulation of habitats with a variety of species in the attempt to reduce the losses caused by the lack of environmental services. Therefore, we can safely say that a management which considers the economic and social aspects and ignores the environmental component can only be used in the short or medium term at best, unless environmental services are provided we should be aware that nature often takes its revenge.

The involvement of stakeholders in the management act

As we have seen above, the forest fulfils a number of functions and it provides some very important services especially for local communities. Therefore the management solution adopted for a particular forest must take into account the situation of the stakeholders. By stakeholders we mean all the factors (institutions, organizations, administrations, individuals, etc.) that through their actions influence the forestry activity or are directly influenced by it. The stakeholders that must be consulted belong to various fields related to the social, economic or environmental component and their contribution should be integrated into the general management plan.

The role of the stakeholders is first to highlight new values and aspects, other than the forest ones (which the silviculturist must be familiar with), to establish in a participatory manner the appropriate management measures and, last but not least, to monitor them.

It should be understood that the forest can be seen from many points of view and that it shelters other values besides the forest-related ones. For example, an archaeological site that is found in an administered forest can be identified based on information obtained from public consultations. It calls for different management measures from those established by forestry regulations, measures that ought to take into account the values housed there.

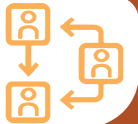
Thus, if the age of the trees and the calculated potential allows the carrying out of regenerative cuttings for the above-mentioned trees, the specific management measures would impose restrictions upon timber transport in the area of the archaeological site. Also, if following new consultations the devaluation of the initial values is ascertained, then the management measures that were first adopted are not sufficient and / or effective so they must be adapted to the needs that have been identified.

The involvement of the stakeholder in the management process is not a distinctive trait of the forestry sector, it can be found in other areas and it has gained an increasingly important role in developed countries. Moreover, the certification procedures for forest management require stakeholder consultation and transparency of the management process throughout the duration of the management.



A baby deer (*Capreolus capreolus*), a native species that adorns Moldova's landscapes. © Hartmut Jungius / WWF

METHOD OF WORKING WITH THE STUDENTS



Let's choose the most adequate type of forest management

Manner of work:

Pen, paper.

Mod de lucru:

The teacher divides the students into three groups. The three groups will each adopt one of the three management styles. Each group is asked to elaborate, on paper, a set of measures of forest management for the forests from the Republic of Moldova, taking into account the principles that lie at the basis of that particular type of management and the knowledge gained in the previous sub-chapter. The measures are going to be presented in front of the classroom, by a representative of the group.

In order to bestow more relevance and colour

to the method, it is recommended that the teacher define through a number of specific elements the forest used as a case study – information about the community, cultural-specific elements, etc.

Discussion:

The students are asked to analyse the set of measures presented by each group and to decide, with supporting arguments, which of the three types of management is more efficient for that given situation.

Activity option:

The teacher prepares a different case study for each team, which may require different types of management. Thus, the decision regarding the ideal management type may be taken within the team.

Optional:

This sub-chapter brings to the students' attention the public participation. Thus, the method can end with a public consultation simulation and with a democratic vote.



4.3. General notions regarding Forest Certification



LEARNING OBJECTIVES

The students know the concept of forest certification and the characteristics of the process. The students understand the advantages of forest certification. The students become familiar with the principles of FSC certification.



COMPETENCIES

Knowledge of the certification concept, generally, and the particularities of the concept of forest certification. Strengthening the components of the forest certification process, with an emphasis on the certification of the chain of custody. Understanding the benefits of the FSC certification and memorising at least 3 of these.

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In the production process of goods and services, regardless of the field, an evaluation mechanism created according to approved optimal standards is referred to for the quality assessment / recognition of a finished product. At the end of the evaluation process, a certificate is issued, the process being called "certification".

Compared to other certification systems, forest certification is not concerned with the recognition

of the quality of the obtained product (in this case, wood). Forest certification actually means certification of forest management, how the silviculturist decides to manage the forest.

The idea of forest management certification emerged in the context of concerns related to forest management, aligning with the global idea of systems and performance certification, applicable in the most diverse fields of activity. The certification of forest

management stems from society's concerns caused by the massive deforestation of rainforests in early '80s -'90s.

Following the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, the need for a sustainable development strategy concerning forests worldwide was identified and it required the consultation of all stakeholders.

Forest management certification is a voluntary act, this process can only be initiated at the request of the forest owner / manager and it represents the assessment the administration and management of a given forest in relation to an accredited standard. Forest management certification entails the issuance of a certificate valid for 5 years and attesting the status of an administration known to apply sustainable forest management. The certification of forest management is continued by the "chain of custody" certification, which aims to develop mechanisms for tracking wood or non-wood products that come from the certified forests, from the source all the way to the consumer (the end buyer). The goal is that the whole route of the certified wood starting from the log and passing through transport, primary processing, secondary processing, etc., can be identified and documented, so that its origin can be clearly tracked at any time.

In general, the forest management certificate includes the chain of custody certificate, through which the forest manager is responsible with ensuring the identification of certified wood until it leaves the forest. This certificate which follows the route the wood takes is especially important for scattered forest areas, where certified forests may overlap with the uncertified ones.

To ensure the traceability of timber, i.e. to certify that the finished product is wood resulting from the application of certified forest management, intermediary companies interposed between the exploitation of the wood and the manufacturing process also need to be certified - the chain of custody certification.

Chain of custody certification is a necessity for the companies who exploit, process or sell certified wood and who wish to use these products on the certified wood market.

Forest certification is just one of the indicators of sustainable forest management application. It is important to understand that sustainable management

can also be applied in uncertified forests; the lack of certification does not necessarily imply a lack of sustainable management.

There are many certification bodies worldwide but in Europe the most common of these are:

- PEFC Pan-European Forest Certification Council (PFCE) appeared in 1999, and
- FSC The Forest Stewardship Council (FSC) founded in 1993.

FSC is an independent, nongovernmental and non-profit organization registered in Mexico as a membership association (Asociación Civil). The organization has international activity and it provides services through FSC International Centre, located in Bonn, Germany, as well as through an international network of National Initiatives.

Forest management certification under the FSC system is a process by which, following an audit, an independent organization confirms that a specific forest area is managed according to an agreed standard.

FSC provides an international accreditation programme for independent certification bodies and a labelling system for forest products, which serves as a reliable guarantee that the products come from a well-managed forest in accordance with FSC standards, namely the FSC Principles and Criteria.

The standard according to which the audit is carried out is divided into 10 principles and 56 criteria. The FSC principles for the certification of forest management are:

PRINCIPLE 1: *Compliance with laws and FSC Principles*

Forest management must comply with all national laws, regulations, international treaties, conventions and agreements the country is part of, together with all FSC Principles and Criteria.

PRINCIPLE 2: *Tenure and use rights and responsibilities*

Long-term tenure and use rights of the land and forest resources must be clearly defined, documented and legally established.

PRINCIPLE 3: Indigenous peoples' rights

The legal right or those imposed through historical traditions of the local community, which owns, uses and manages the lands and the resources pertaining to those, must be upheld and mandatorily recognised.

PRINCIPLE 4: Community relations and worker's rights

Forest management must enhance or at least maintain forest workers' and local communities' social and economic well-being on long term.

PRINCIPLE 5: Multiple benefits from the forest

Forest management operations will have the aim to use efficiently the forest's multiple production and protection functions for insuring economic viability, as well as large spectrum of environmental and social advantages.

PRINCIPLE 6: Environmental impact

Forest management must conserve the biodiversity and the values that derive from it (water and soil resources, the delicate landscapes and ecosystems), and must maintain the forest's ecological functions and integrity.



© Edward Parker / WWF

PRINCIPLE 7: Management plan

There has to be drafted a management plan, adequate for the extent and intensity of the operations, periodically updated. The long term management objective and the means of reaching them will be clearly established.

PRINCIPLE 8: Monitoring and assessment

Monitoring – adequate to the extent and intensity of operations – must offer data on the state of the forest, forest production, chain of custody, activity management and their social and environmental impact.

PRINCIPLE 9: Maintenance of high conservation value forests

The management of such forests will aim to maintain or enhance the attributes which define such forests. Decisions regarding management in such areas will always be made with maximum precaution.

PRINCIPLE 10: Plantations

FSC defines plantations as being "forest areas lacking most of the principal characteristics and key elements of native ecosystems, which result from the human activities of any nature (for example: planting, sowing or various silvicultural treatments)." [FSC-STD-01-002] Plantations ensure a multitude of social and economic benefits and contribute to the satisfying the demand for forest products but, at the same time, they must integrate in the management of natural forests, to ensure the reduction of the pressure on them and to promote their restoration and conservation.

These principles cover the three aspects that are specific for sustainable management, namely the economic, social and environmental one.

An especially important principle in ensuring the forest functions and the monetization of their resources in a sustainable manner is **Principle 9 - High Conservation Value Forests..**



Reconstitution of a chain of custody

Required materials:

Printed pictures/images with elements of the chain of custody, board/flipchart/billboard.

Manner of work:

The teacher distributes to the students images with the various elements of the custody chain for finished products made of wood/cellulose. It is recommended that, for each finished product, 6 images are used (forest, timber, timber transport, factory for the pre-industrialisation of wood, a seller of finished wood products, the finished product) representing the links in the chain of custody. The number of chains of custody for which the teacher distributes images results from dividing the number of students in the class to the number of links in the chain.

The images are distributed in the classroom at random. The students recreate, one at a time, the chains of custody, sticking to the board/flipchart/billboard, while following the technological order, the images received from the teacher. At the teacher's choice, the chains of custody may begin either with the forest, either from the other end, with the finished product. Optionally, on each image, one can apply beforehand (if it is not obvious from the picture) the name of the tree whose wood is used for the selected finished product.

Discussion:

The students are asked to say which of the chains of custody presented is the most vulnerable from the point of view of the forest certification authority's control. Moreover, the teacher can ask the students to identify for each weak link in turn the authorities responsible for the compliance with the principles of sustainable management of forests.

The contest "Know and win! Not only you, but the forest as well"

Our recommendation for the teachers is to introduce methods as enjoyable and as varied as possible for the evaluation and strengthening of knowledge. For this sub-chapter a group discussion can be organised, the method of the "hot potato" (presented in the beginning of Chapter 4) can be introduced or the teacher can try a contest-type of method, inspired from the general knowledge contests.

For this, the class is divided into two teams, which will have to prove their knowledge against the clock.

The questions can be asked in several ways:

- Questions on cards. The teacher prepares as many questions as there are students (ideally), types them up, prints the sheets of paper and cuts them out. The facilitator reads the questions one at a time and the first team that answers wins one point. An alternative is that a representative of each team would answer as many questions as possible in one minute.
- Open questions. There can be team missions of the type "In one minute, list as many FSC principles as possible for the certification of forest management. Write the answers on a sheet of paper, then we will check whether they are correct or not"
- Display the pictures with the elements of the chain of custody that the students need to name in record time.
- The display of the questions and of the scenario it is open and the teachers and even students from the organising committee are invited to get involved creatively.

Optional:

This method may be used for a short period of time or it may be used in a manner in which, for intensifying its playful character, a role play is created. In the case in which the teacher chooses a setting similar to a TV show, it is recommended to have an organising committee, in which there would be students with responsibilities for time keeping, for writing down the results, for being a jury (if applicable), for preparing the space and the materials.



4.4. High Conservation Value Forests (HCVF)



LEARNING OBJECTIVES

The students know the concept of HCVF and the stages of the process of their designation. The students know and understand the details of the characteristics of the six types of HCVF.



COMPETENCIES

Knowledge of the HCVF concept. Understanding the process of designation of HCVF and of its stages. Becoming familiar with the HCVF establishment criteria and the capacity of listing at least three of these. The capacity to argue the advantages of a HCVF designation.

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Even though it is a concept mainly used especially in the voluntary certification of FSC forest management, the concept of High Conservation Value Forest (HCVF) can also be used outside the certification process, for the identification, management and monitoring of exceptional values that exist in the forest space.

These forests, because of the value they hold, fulfil an especially important role at local, national or regional level, and which, because of their importance, require the application of a specific management which may differ (but not come into contradiction) with the one allowed by the forest administration regulations.

The exceptional values held by the forest are called High Conservation Values (HCV).

By High Conservation Value Forests (HCVF) we understand those forests that hold or are constituted in values of exceptional or critical importance from the point of view of biodiversity conservation, of the socio-cultural or ecological aspects.

These are:

- **HCVF 1:**
Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (including endemic, rare, threatened or endangered species).
- **HCVF 2:**
Forest areas containing globally, regionally or nationally significant large landscape level forests, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.
- **HCVF 3:**
Forest areas that are in or contain rare, threatened or endangered ecosystems.
- **HCVF 4:**
Forest areas that provide basic services of nature in critical situations.
- **HCVF 5:**
Forest areas fundamental to meeting basic needs of local communities.
- **HCVF 6:**
Forest areas critical to local communities' traditional cultural identity.

The first three HCVF hold or are biodiversity values, HCVF 4 and 5 are forests with a socio-economic role and HCVF 6 contains cultural values.

During the process of defining the HCVFs for each individual country, the following are established:

- **the relevant values (i.e. attributes)** of the forests, such as the types of ecosystems, the species

of special interest, the forest functions, etc.;

- for each attribute, there are **thresholds** defined, i.e. the level beyond which that particular forest attribute may be considered as **a high conservation value**.

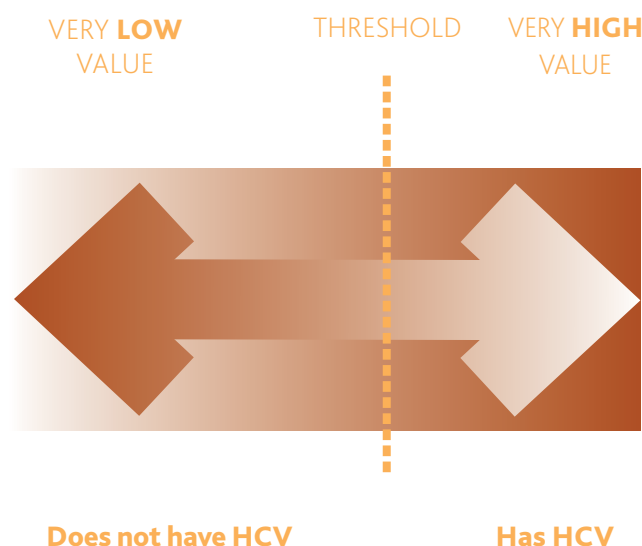


Figure 9. Establishing the threshold levels for HCV

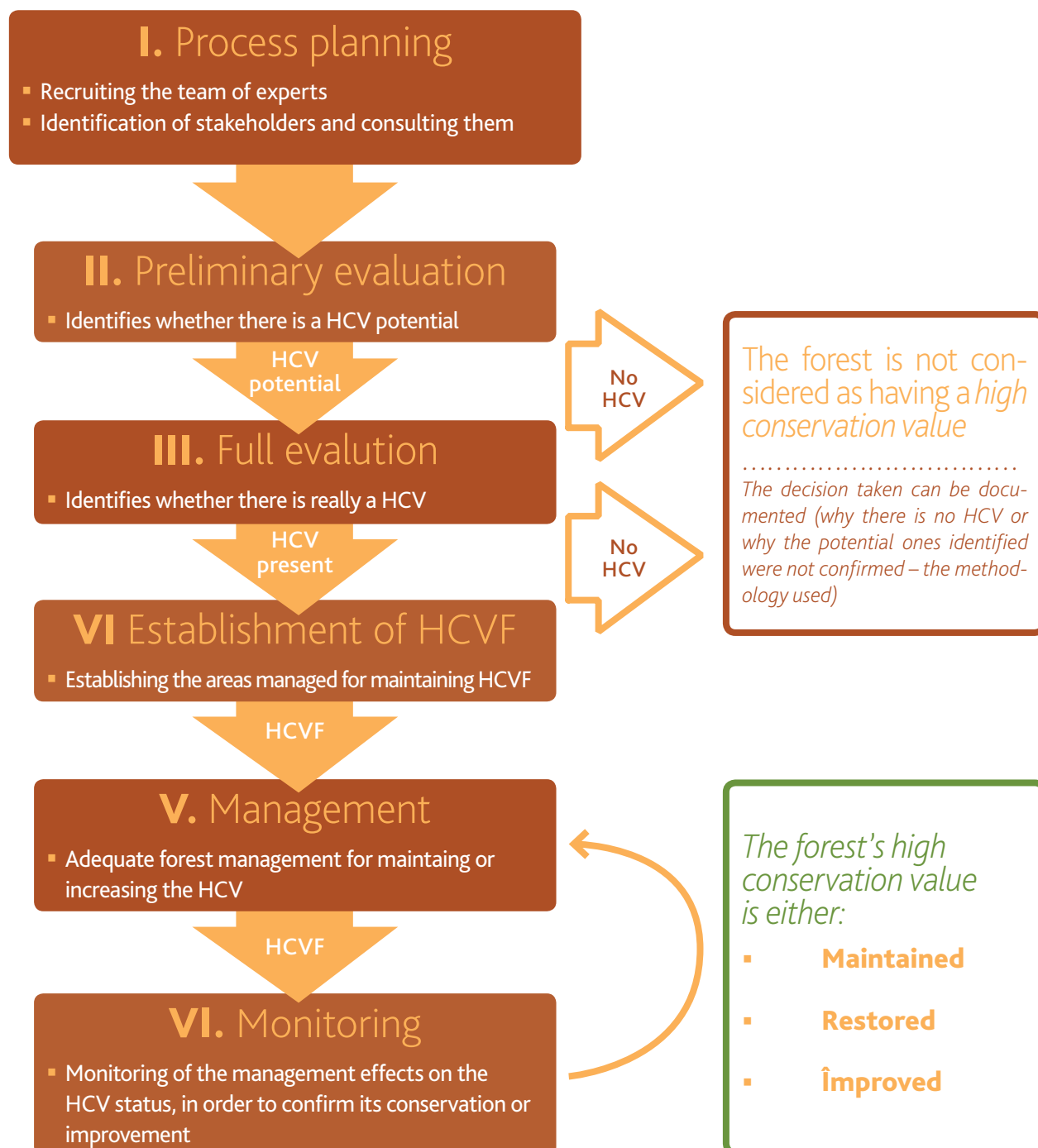
The relevant values for a certain region (country) are nominated in annexes by experts from various fields: social, cultural, environmental. Moreover, they also determine the nomination thresholds for a forest as HCVF. For instance, a beaver (*Castor fiber*) identified in a forest area does not create the premises for a HCVF nomination, but a family colony could create this premises if the species itself represents a relevant value.

Identifying the HCVs and designating the HCVFs is a participatory process in which experts from the above-mentioned fields must be involved, as well as other types of stakeholders.

If certain categories of HCVFs can be designated on the basis of descriptive data that already exists in technical documentations, for the majority of HCVFs, however, it is required to go in the field in order to identify the values.

A schematic presentation of the full designation process of the HCVF is illustrated on the next page.

SCHEMATIC PRESENTATION OF THE FULL DESIGNATION PROCESS OF THE HCVF



HCVF 1. Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (including endemic, rare, threatened or endangered species).

Within the HCV 1 category are included the forest areas characterised by a high degree of biodiversity (including areas with high concentrations of species with a special status – endangered, threatened or endemic species) or through the presence of unusual assemblies of ecological or taxonomic groups and of exceptional seasonal concentrations.

There will be many forests containing rare or endemic species, but which are not HCVF 1 because there is no **significant concentration at global, regional or national level**.

HCVF 2. Forest areas containing globally, regionally or nationally significant large landscape level forests, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.

This HCV category has as its aim the identification of those forests which: (1) contain viable populations of the majority or even of all species which occur in their natural form and (2) whose ecological processes (e.g. the regime of natural perturbation, the forest succession, species distribution and abundance) are completely or relatively unaffected by recent human activities. Consequently, these forests must have relatively large areas (in order to meet the first criterion) and to be as little as possible affected by recent human activity, having remarkable structures from this point of view, at regional and national level (in order to meet the "significant" criterion). Such forest ecosystems are important, as they are less and less encountered and are constantly threatened at global level by human activities. Generally, such wide-spread forest areas, with natural characteristics (natural structures and compositions, vigorous populations of the component species), are already included in wide protected areas (national parks, natural parks, etc.) being, actually, one of the main reasons that lay at the basis of their designation. Consequently, most likely, in the situation in which the threshold criterion is met as well, the areas from the HCVF 2 category will overlap, at least partially,

with those from category HCVF 1.1.

The aim of a HCVF is not to remove the human from the forest (i.e. to create nature sanctuaries without human presence, to create "naturalness" without the human component), but only of ensuring a manner of management which would maintain the "naturalness" of this ecosystem. Thus, the primary aim is not the intact condition of the landscape, but its naturalness, the latter ensuring both the maintenance of ecological processes as well as the presence and continuity of its characteristic species.

HCVF 3. Forest areas that are in or contain rare, threatened or endangered ecosystems

Certain ecosystems are widely spread, while others are rare (either because of natural conditions, or because of human pressure). In order to preserve biodiversity, the continuity of all systems is required (i.e. both the wide spread one and the rare ones) on a wide enough area. In most cases, only part of the surface is included in the existent protected areas which have as their purpose the conservation of biodiversity (i.e. where the continuity of these ecosystems is ensured). Thus, in order to cover the required surface and especially the entire spreading area, it is mandatory to have a rational management of these ecosystems also outside the network of protected areas. Naturally, the conservation of rare ecosystems (regardless of the reason why they are rare) has high priority, taking into account their frailty and the big danger of extinction.

This category of HCV does not include only those forest areas that are located in/ include rare, threatened or endangered ecosystems. As we mentioned above, these forests may represent ecosystems which were wide-spread in the past but have been mostly destroyed through various human activities or ecosystems that are naturally rare (because of limiting environment conditions). This category includes as well the ecosystems which host rare associations of species that, taken separately, are generally wide spread. The Generic Guide (Jennings et al. 2003) recommends that natural forest ecosystems or the species assemblies that are characteristic for a region, but **are not rare or endangered, are not subject of this HCV category**.

Sometimes, the HCV 3 ecosystem covers only a small part of the surface area of a management unit

(i.e. a forest management unit) alongside another type of ecosystem. This is the case especially for the alder trees (which appear on a narrow band only at the basis of the mountain side which is populated by spruce or fir trees) but also of the bogs with forest vegetation (which appear generally incastrated in the middle of fir tree areas) and even of other ecosystems (e.g. upper altitudinal limit forest ecosystems). For an adequate management of the HCV 3 it is recommended as often as possible that the ecosystem be delimited as a separate management unit (i.e. in order to be the subject of specific and uniform measures for its continuity). In the case in which the area is too small for justifying this individualisation, the management at the level of the bigger management unit must be made in a differentiated manner, oriented with priority towards the protection of the ecosystem concerned.

HCVF 4. Forest areas that provide basic services of nature in critical situations

Just as underlined in the introductory section, all forests are important either for the products or the services they offer to the society. In certain cases, however, their environmental services for the neighbouring human communities or for investment words are critical⁷. Consequently, these services must be maintained permanently through an adequate management. The respective attribute (i.e. the desired service) may be considered as High Conservation Value if its loss has a severe and irreversible impact on the environment or on the human wellbeing (e.g. severe damages to the local community, to important infrastructure works, to soil resources, etc.). For instance, the forests from a torrential drainage basin are essential for the protection of the downstream areas and can be considered *high conservation value forests*. This category (i.e. HCVF 4) aims at identifying exactly those types of situations and to prevent the increase in the vulnerability or the risk of degradation of environment services.

HCVF 5. Forest areas fundamental to meeting basic needs of local communities⁸

All forests hold an important role in the life of the neighbouring local communities. Only under certain situations, however, **a forest is essential** for the **meeting of the basic needs of those communities**. The cases in which a forest has a high conservation value due to the environment services it provides to its neighbouring community have already been discussed under the category HCV 4. In category 5 are included those forests offering **means of subsistence / fundamental products**⁹ to the members of the community. These products may be represented by firewood (required for the warming of households and for cooking) and the timber for various constructions or for obtaining craft objects. The situations in which the community depends on other resources from the forest (fruit and mushrooms, fodder, medicinal products) are much rarer. The forests become essential when the communities concerned have no other alternatives for obtaining those products (e.g. the communities are isolated at least during certain times of the year) or the existing alternatives are not economically (financially) feasible. Only in such cases it is justified to designate these as High Conservation Value Forests according to Category 5.

It is important to remember the fact that, in order to be designated as HCVF 5 these have to have a **fundamental** role in satisfying some **basic necessities** of a certain community. As such, cannot be considered HCVF 5 those that ensure resources that can be obtained from another place or which can be replaced in a feasible manner (e.g. a forest from which firewood is harvested for a community which benefits as well from other sources of heating). In this case, the forests represent only an alternative for meeting the **basic necessities** and, as such, cannot be considered as having a critical role (i.e. they are not an indispensable resource) for the local communities concerned.

Moreover, a forest cannot be designated as HCVF 5 if the **exploitation of resources is not a sustainable**

⁷ An environmental service may be considered as „critical“ in the case in which its discontinuity is likely to cause, or it represents in itself a threat, having a severe negative impact on the wellbeing, health and survival of local communities, on the environment, on high conservation values, or regarding the functioning of the important infrastructure (e.g. roads, dams, buildings, etc.) (FSC Guidelines for High Conservation Values and Principle 9. Timothy Synnott et al., 2011, 96p.).

⁸ The local community is not to be understood in its strictly administrative meaning (i.e. it is not mandatorily identified with a whole administrative unit – village, town, city), but rather as a group of individuals using the fields in the area in a traditional manner and who have the same needs (i.e. it can be thus represented also by only a part of the population of an administrative unit, when this is grouped spatially and isolated territorially – e.g. the case of hamlets or neighbourhoods isolated for the remaining administrative unit).

⁹ If these are not replaceable (if there are no feasible alternatives) and if their loss or damage would cause severe losses to the local communities.

one, even under the conditions in which the activities are traditional and the communities concerned are dependent on these resources. Excessive exploitation of natural resources leads to the degradation of HCV and, implicitly, to the loss of the HCVF quality attributed to that particular forest (or to the exclusion of the forest from this category during the identification process).

Furthermore, we should not forget that the certification of forest management is a proof of the sustainable management of the forest concerned and thus any activity exploiting these resources (i.e. the forest) must take place according to the legal provisions. As such, no illegal activity (practiced in an excessive manner or not) must be encouraged, even if it helps **meeting the basic needs of a community**.

HCVF 6. Forest areas critical to local communities' traditional cultural identity

Alongside the cases in which the forests are essential for subsistence and survival (e.g. HCV 5) these can be of critical importance for the society and communities from the point of view of their **cultural identity**. Consequently, a forest can be designated as HCVF if it contains or ensured significant cultural values at national level or

essential values for the local community. The category HCVF 6 refers to this type of forests. So, this value is designated in order to protect the culture and traditions of local communities (i.e. their cultural identity). Such cases are the symbol forests invokes in literary works or legends, the forests in which take place traditional celebrations and customs, or those that either host or are neighbouring historical monuments, monasteries, hermitages and places of pilgrimage.

For each designated HCVF category, according to the identified value and to the needs it required, it is necessary to establish a forest management plan which would maintain or improve the value conservation conditions. For instance, for a critical seasonal use (areas used temporarily by certain species for maintaining of significant reproductive concentrations: reproduction, overwintering, nesting-resting, ecological corridors), basically, the forest management must ensure quietness during the critical periods in the perimeters in which were identified these concentrations of species that are the subject matter of the HCVF designation, even if during these periods, according to the law, one can carry out works in the forest.

METHOD OF WORKING WITH THE STUDENTS



To HCVF or not to HCVF? That is the question

Required materials:

Forest documents, articles from ecological magazines.

Manner of work:

Option 1: The teacher presents examples of high conservation value forests from the Republic of Moldova (with all their characteristics) without naming the HCVF category. The students are encouraged to decide, supported with arguments, under which HCVF category the presented forest can be placed.

Option 2: The teacher asks the students to find data (localisation, existing vegetal and animal species, microrelief) about one forest. After the data is presented in front of the classroom, the students attempt to find elements through which that forest could be declared HCVF.

Discussion:

The teacher asks the students to analyse the potential impact on the environment/society the exploitation of the presented HCVF forests. They can analyse the immediate (economic) forest and the long-term (economic, social and environmental) impact of a possible complete cutting of the exemplified HCVF forest.

5 *The European Legislative Context* in the Forestry Field





LEARNING OBJECTIVES

The students understand the implications of illegal forest logging. The students know the EU legislation concerning the fight against illegal logging and its implications for the Republic of Moldova.



COMPETENCIES

Knowledge of the spread and severity of the phenomenon of illegal forest cutting. Knowledge of the concepts of "due diligence" and of "wood traceability". Becoming familiar with the European legislation concerning the prevention and the fight against illegal logging. Identifying the manners in which the Republic of Moldova can align itself with the international efforts in the field.

The biggest problem of the forests at global level is represented by the illegal logging which leads to the disappearance of significant forest areas. Annually about 6.4 million hectares of forest disappear at global level, according to FAO.

This problem poses a significant threat to forests as it contributes to the process of deforestation and forest degradation, which is responsible for about 20 % of global CO₂ emissions, threatens biodiversity, and undermines sustainable forest management and development including the commercial viability of operators acting in accordance with applicable legislation. (Regulation (EU) No 995/2010 of the European Parliament and of the Council).

To this aim, the Regulation (EU) No 995/2010 of the European Parliament and of the Council aims at adopting a number of measures aimed to prevent and combat the trade in illegally harvested wood and the continuation of the active participation of the Union and of Member States in the implementation of global and regional resolutions and agreements on forest-related issues.

Thus, those that want to sell for the first time wood or products made of wood on the European market have the obligation of verifying and of proving the legality of its origin. Implementing a system of "due diligence", a system of measures and procedures aimed at facilitating the operator's: access to information, risk

assessment and mitigation of the risk identified of the wood originating from illegal logging.

At the level of the Republic of Moldova, for now, this regulation is applied only for the products exported to the European Union space which, in the new context, requires a clear documentation regarding their origin from the moment of wood exploitation to the one of introducing it on the European goods market. This process is called "timber traceability".

From the new perspective of the integration of Republic of Moldova into the European Union, however, applying this regulation requires a series of efficient legislative measures regarding the assurance of a legal framework for the exploitation and commercialisation of timber.

An efficient manner of ensuring timber traceability is the implementation at national level of a programme tracing the timber that would centralize both data obtained at the time when the timber is monetized as well as those mentioned when a transaction is made. Such a system offers the possibility of cross-checking of data by the authorities and not in the least by the traders, which must undertake the lawfulness of the acquired materials.

The efforts to stop illegal logging must be made at global level, in order to avoid in the future the negative consequences of the diminishing of forest areas and, implicitly, the dramatic decrease of its stabilising influence.



Regulation (EU) No 995/2010 of the European Parliament and of the Council

Required materials:

Flipchart, markers, magnets, sheets of paper.

Manner of work:

The teacher distributes to the students paragraphs of the 21 articles of the *Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market*.

On a billboard, flipchart or blackboard the teacher writes the titles of the articles of the law from which the paragraphs were extracted. Each student reads in front of the classroom the paragraph received, and after that s/he places it next to the corresponding article title (one can use magnets for placing the sheets of paper with the paragraphs from the law on the flipchart). The teacher encourages the students to speak up anytime they consider that a paragraph is not correctly associated with the article title.

The articles are also discussed in the big group, because it is possible the students are not familiar with the juridical methodology. For each article they discuss its relevance or implications for the Republic of Moldova.

Furthermore, the teacher highlights the role of legislation in ensuring a favourable framework for a sustainable forest management and can review all the topics of the guide. Equally, the teacher can approach the subject by asking students questions.

Activity option:

Another manner of going through and re-enforcing the articles of the Regulation can be the following: the students grouped in teams receive the paragraphs and choose a few that they consider being the most important. Then they prepare to argue the importance of their adoption in front of a larger group of colleagues that symbolise the authorities.

Optional:

As new juridical terms appear, they can be collected on a flipchart sheet and on the spot or in a future research, a class glossary would be put together.

The ambassadors of the forest

After going through the guide, the students are "armed" with new knowledge on the benefits and values of the forest, on the manner of long-term management, on the issues with which we are confronted and the solutions we have at hand for protecting them. Thus, the students can already become ambassadors of the forest in society.

The aim of this final activity is that of repeating and integrating all accumulated knowledge, the competencies acquired and of showing the developed attitudes.

Required materials:

Anything that can be useful for the students' presentations – projector, flipchart sheet, glue paste, coloured cards, other materials (e.g. for making a model).

Manner of work:

The students are grouped into teams and have the mission to prepare a presentation of maximum 10 minutes in which to think of a message to pass onward to an audience of their choice (local community, colleagues, authorities, the media, etc.) as "forest ambassadors".

The challenge for the students is to convey their messages in a very original manner, as professional as possible (well argues) and also of impact. It may be a movie, a speech, an exhibition, an article, a model, etc.

The students will have more time for working (a week or two). Before beginning work, the teacher can do a general review with the entire class. Then the results are presented. Ideally, the session in which the students present their results is attended by invited audience, consisting of colleagues, parents, and, why not, authorities and journalists.

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