



Operational part of the Integrated Multi-use Management Plan (IMMP) – Făget Forest Cluj-Napoca

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Background

OP IMMP (operational part of integrated multi-use management plan) is a basis for management of urban forest. OP IMMP includes elements of tactical and operational plan. The framework for it is a strategic part of integrated multi-use management plan. The perimeter OP IMMP is an individually rounded area within a wider area of urban forests. OP IMMP can be the basis for the direct implementation of the planned measures, but more detailed implementation plans (projects, sketches) for carrying out the activities and objects defined in OP IMMP can be made on the basis of OP IMMP.

OP IMMP is the basis for cooperation with all stakeholders with interests in the area of urban forests. The content of the OP IMMP should therefore be presented in a comprehensible, concise and clear form.

1. INTRODUCTION

1.1 The aim and purpose of OP IMMP

The aim of OP IMMP Făget is to ensure the implementation of the strategy for the urban forest and to develop a common vision for the sustainable use of urban and peri-urban forests – UPF. As the Cluj-Napoca City hall is the owner of the entire area the strategic and the focus area are the same.

As a document the OP IMMP is designed as a basic document for Cluj-Napoca Municipality, seen as the main stakeholder in the area. Besides this and in order to ensure the long term sustainability of the UPF concept, the plan needs to address several other relevant stakeholders including the forestry authority, NGO's and educational institutions.

At the same time, according to the national regulations regarding forest management, the forest owner is obligated to have an agreement with a forestry authority regarding the management of the forest. Thereby the Cluj-Napoca Municipality has ceded the administration of the forest to the Făget-Chinteni Forest District. Therefore, to implement the Făget UPF strategy, the OP IMMP needs to be integrated into the official forestry documentations regarding the area. Furthermore, a key challenge is to relax the traditionally strong sectoral authority on the management of the forest in a way that the functionality and ecological identity of the forest is maintained but the social values of the forest are broadened. In this document, we propose a diversity of values which should be integrated into the management of the forest, in a way to fulfil a broad range of social functions while maintaining the natural and economical potential of the forest (see below). After this integration the operational plan will be considered as the basis for the management of the area, enforced by the Cluj-Napoca municipality along with the Forest District.

As the only owner in the project area, there are no additional formal stakeholders from the ownership point of view. Informally, the range of stakeholders is broad, and includes bikers, nature lovers, the people who use the forest for recreation, learning and educational or other purposes.

The operational plan is closely linked to the strategic part, basically including the measures needed in order to reach the strategic goals of the UPF:

- A nature friendly forestry for the area – recognizing that the ecosystem processes and functions have key importance in the resilience and adaptability of the system,

- Improvement of the traditional activities related to mushrooms and forest fruits – recognizing the material and cognitive connections between people and the forest,
- Control erosion and maintenance of the local climate regulating service – recognizing the regulating services of the forest,
- Develop an integrated strategy for the protection of species and habitats – recognizing that the forest is also habitat for a range of protected species and habitats,
- Develop a low impact educational infrastructure – recognizing the educational and experiential potential of the forest,
- Develop a scientific infrastructure – based on the existence of academic institutions in the town of Cluj-Napoca.

1.2 The design of the plan, obligations and validity of OP IMMP

Currently the strategic area is managed according to the forestry guidelines (“amenajament silvic”), by the Făget-Chinteni Forest District. This document forms the basis of the forest management activities and it is mandatory both for owners and for the administrators of the forest. In the case of the strategic area the forestry plan was updated in 2018 and it is valid for a period of 10 years.

The strategic area is included in the spatial planning guidelines of the Cluj-Napoca Municipality (Plan Urbanistic General – PUG) as urban area, forest designated for recreational, educational and sport activities.

As the forest management plan was updated in 2019 and the forest is designated as a recreational and educational area the forestry activities are already limited.

Considering that the forestry planning guidelines are valid for a period of 10 years, we consider that the OP IMMP should also be valid for the same timeframe.

As the only owner in the strategic area the OP IMMP is binding only for the city administration but should be viewed only as a framework that can be updated regularly if necessary. It does not create any legal obligations for the city administration but may be considered by the forestry authorities in order to bridge potential communication and vision gaps between the forestry authorities the administration and various societal demands (e.g. recreation, learning, experiential see above). There is the necessity of a close collaboration between the forestry administration and Cluj-Napoca Townhall.

OP IMMP is also the basis for the participation of the city administration in the preparation of forest management plans. OP IMMPs directly and indirectly affect the work of the forestry service. And thus should be updated in the same time as the forestry regulations.

OP IMMP is the basis for the implementation of the activities of the city administration in the UPF area. It includes guidelines for the implementation of activities, measures and facilities. As the OP IMMP cannot contain all the details for the implementation; therefore, projects that are mentioned in the OP IMMP are in line with the content of OP IMMP or can be prepared during the period of validity of OP IMMP (later, after the end of URBforDAN project).

The strategic area is spatially defined as being comprised of forestry parcels 26 and 27. The sub parcels 27A and 27E have special conservation status and should not be modified by interventions (paths).

2. THE IMPORTANCE OF URBAN FORESTS (UPF) AND BASIC MANAGEMENT CONCEPTS

2.1 Purpose of UPF

Urban and peri-urban forests (UPF) are essential in ensuring the sustainability of urban environments. The ecosystem services provided by UPF have important contribution to citizens' quality of life, so urban dwellers can enjoy a more diverse, safe and healthy city. Maintaining and even increasing the ES provided by UPF through proper management are essential in safeguarding resistance and resilience both in the present and for the future, especially in the context of global climatic change. The project area (Fäget) is a peri-urban forest with special protection functions (Functional group I), with recreational functions (Subgroup 4), being part of a much larger forested area, with complex functions. The present forest composition, structure and usage are the results of historic human-nature interaction through forestry practices and, more recently, the utilisation for recreation, due to the close vicinity of the urbanized areas and facile access. The forest provides ES from all four categories (provisioning, regulating, supporting and cultural), as they are summarized below.

The main ecosystem services addressed are presented in the following table:

Table 1. Analyzed ecosystem services

Ecosystem services			
Provisioning	Regulating	Supporting	Cultural
Timber production	Climate regulation	Nature protection/habitat for species	Recreation and tourism
Non-timber products (berries, mushrooms, medicinal and edible wild plants)	Air quality		Educational and research values
	Soil formation		Historic-cultural legacies of traditional forest management
	Protection against erosion		
	Water purification Pollination, pest control		

Provisioning ES. The main commercial product of the forest is wood. The level of intervention, quantities and methods used are regulated by an official document (Amenajament silvic) that sets goals for a period of 10 years. In the project area the last wood harvesting activities took place 12 years ago (according to official documents), and are due to begin next year. Other forest products, non-wood, are not harvested commercially, but on a small scale, by locals, for personal consumption. These products include berries, mushrooms, edible and medicinal wild plants. According to our study, these activities took place almost exclusively in the natural forest stands.

Regulating ES. Climate regulation ES is achieved by carbon sequestration, a natural output of tree growth, water retention and flow regulation. Carbon sequestration is increased in natural forest, with high diversity of tree and shrub species (more than 20 in the project area), stratified (of

different ages) and with diverse density of trees (150-800 trees ha⁻¹). Larger and mature trees tend to sequester and store more carbon than young and small trees. Flow regulation is achieved by intercepting and storing rainfall on tree leaves, which later evaporates, or reaches the ground more slowly. Trees improve rainfall infiltration and retention into soil by channelling the water around the stem and downwards by root channels into soil. The combined effect of intercepting rainfall, greater infiltration of water into soil and the speed reduction of surface water is translated into protection against erosion.

Air quality. UPF can improve air quality by air pollution removal. Tree canopy captures particulate pollutants and absorbs them through their leaves, branches and stems. Trees also absorb ozone and nitrogen oxides, deciduous species being more effective than coniferous ones. The close vicinity with a major urban centre such as Cluj-Napoca, that has a population, including the peri-urban areas, exceeding 420,000 residents, highlights the important role of Faget forest in improving the air quality for its residents.

Soil formation. Dead trees at various stages of decomposition indicate the soil formation process, as rotten wood and dead leaves are a very important first stage in this process.

Protection against erosion. The forest acts as a factor controlling erosion: the roots stabilize the soil, the trees' foliage regulate the amount and the speed of rain water reaching the soil. The erosional processes already happening have a positive outcome by exposing interesting geomorphological processes. The gully already formed may have to be controlled in the future with anti-erosional wooden structures. Sustainable forest management practices, including measures to maintain forest cover on erosion-prone soils and run-off pathways, will help control or reduce the risk of soil erosion and shallow landslides.

Water purification. Forested areas act as a filter on rainwater, removing pollutants before the water reaches rivers and streams. The presence of forests in the watershed has a direct effect on the cost of water treatment for public consumption. The project area, due to its position, impacts the quality of groundwater used by households situated downstream.

Pollination, pest control. The presence of insectivorous bats, amphibians and birds contributes to pest control in the forest ecosystems – this being also recognized by the conventional forestry literature. Furthermore, the high diversity of insect-pollinated plants contributes to the maintenance of pollinators.

Health benefits. Recent evidence shows that exposure to nature – especially woodlands – have several health benefits for people, including decrease of stress, decrease the incidence of depression and strengthening the immune system.

Supporting ES. Nature protection (biodiversity and habitats). The Faget forest project area has exceptional natural value derived from the complex ecosystem structure, with high spatial heterogeneity (horizontal and vertical) which allows a diversity of conditions regarding light and humidity, translated in a high plant species richness of more than 100 vascular species. The diversity of niches supports a high diversity of animal species, so far being identified 24 mammal species (including 6 species of bats), 38 bird species and 10 reptile and amphibian species. The diversity of invertebrate species is also high, supported also by the presence of old and dead trees, both standing and fallen. The high forest ecosystem is the result of the persistence of areas where natural processes dominate intertwined with areas with extensive human activity, such as circulation on unpaved forest roads where temporary ponds are formed, providing habitat for internationally endangered and protected amphibian species, such as the yellow bellied toad (*Bombina variegata*).

The maintenance of high functional diversity as well as high species diversity in the selected ecosystem should be key strategic component of the management of this site.

Cultural ES.

Cultural ES. The cultural ES are represented by the legacies of the past forestry management (e.g. unpaved roads, old coppice trees), the scenic beauty as well as by the use of the forest for recreation, educational and learning activities.

Participation in defining the importance/ purpose of forests. The project area is owned by the Cluj-Napoca Municipality and, according to the Romanian Forestry Law, it is administered by a Forest District (in this case the Făget-Chinteni Forest District), part of the National Forest Administration ROMSILVA, a state owned autonomous company under the authority of the Ministry for Water and Forests. The purpose of the Faget forest has been determined by its owner and the administrator, through an official document that is renewed every 10 years. The forest is defined as a recreational forest. In the present proposal we highlight that the overall values of the forest goes beyond the economic and recreational values, and includes also protection of internationally rare species, regulating and supporting ecosystem services. Therefore in order to maximize the multifunctional value of this forest, a cross sectoral governance structure is needed (see Chapter 5).

Target groups / users

The Faget UPF owner is Cluj-Napoca Municipality, which, as a local public administrator, has the main responsibility in satisfying the general interests of the citizens of Cluj-Napoca. In this document we propose that this can be more efficiently achieved if a more inclusive, participatory type of governance structure is developed (see below). The main beneficiaries are the people of Cluj-Napoca, not at all restricted to the immediate neighbourhood, who will benefit by the ES provided by the forest. Direct users of the area are the residents who practice tourism and sports. The largest group of users is composed of recreational walkers (accompanied by pet dogs or not), joggers, hikers and cyclists. Furthermore, the health benefit, educational, learning and philosophical / spiritual types of benefits of this forest for the people should also be recognized. Birdwatching is an activity that slowly gains popularity among urban dwellers, and the project area is very suitable for observing woodpeckers, small passerine birds and also raptors that nest here (ravens and buzzards).

The implementation of the OP IMMP will create the opportunity for other important target groups to use the forest, as follows:

Educational institutions (kindergartens, schools, universities) will use the project area and the informative/educational infrastructure for young generation education activities in and with nature: open -air classes, tours, lectures.

Scientific community can and should be involved in research and educational activities, with students, using the forest as a natural laboratory for understanding complex processes.

Local NGO's (environmental, educational, tourist) have the opportunity to use the informational and educational infrastructure to implement their activities.

Other institutions (formal, informal) with potential interest in the sustainable use of the forest, such as arts, open events and others.

In order to maintain the multiple types of benefits, there is a need for rethinking the ways how the society is involved in the use of this forest (i.e. the problem of social fit) addressed below in Chapter 5. Also, maintaining key ecosystem features of the forest (which also assures their scenic beauty, besides the ecosystem functions) should be recognized.

2.2 Fundamental concepts and management objectives

The project area is completely covered by forest (natural, plantation, regeneration), with only small patches of shrub. Our goal is to maintain the current land use and to implement forest management practices targeted towards maintaining biodiversity and forest structure and functions.

Basic guidelines for the management of forest stands (in short and general terms)

The current function of the forest is for recreational purposes, and it is planned to be managed accordingly, meaning that the wood management activities aim to lower the trees density and, most importantly, to cut and remove dead, twisted and broken trees, both young and old. This operational plan seeks to harmonize the current forest management with maintaining and improving the ES of the UPF, and that requires a more nature friendly forestry approach and the maintaining of a number of dead trees, both standing and fallen. The wood harvesting activities are compatible with other ES, providing that areas with high nature and/or cultural values are managed accordingly, and a nature friendly forestry is implemented (see Cap.4). Although the project area is heterogeneous in terms of age and tree composition (native trees, natural regeneration, non-native tree plantation), the forest management should have an integrative approach on the whole area, aiming to maximize all ES and maintaining the natural, cultural and historical value of the forest. We propose forestry management measures that will create favourable ecological conditions for more plant species with edible fruits to grow (e.g. blueberry, blackberry, raspberry) in order to increase the provisioning role of the forest (see Cap. 4).

Increasing canopy cover by promoting large, dense canopy, tall (at least 30m) trees will improve regulating the stormwater flow. Tree species with deep roots are better in absorbing rainfall than those with shallow roots.

Wood production is not the main purpose of the project area, as the forest is considered to have a protection role and it is destined for recreation. The wood cuttings are planned to reduce the density of trees and to remove dead wood. The more nature friendly approach will seek to maintain dead wood in the forest and to promote forestry practices that mimic natural process. The conifer plantation has not reached the exploitation age, but thinning interventions are planned. We propose the removal of the introduced, cultivated species (Douglas fir), with the exception of several mature individuals, and the promotion of the regeneration of the natural fundamental type of forest, with autochthonous species.

Nature friendly forestry practices help maintain and increase biodiversity. Dead or hollow trees provide nesting sites for birds, arboreal rodents such as dormice, bats and also for a whole array of invertebrates. Temporal ponds will be maintained along active and deserted dirt roads within the forest, as habitats for amphibians.

3. STATE OF FORESTS AND FOREST USE

3.1 State of forests and forest management

Forest area

The project area is a 40-ha area of the forest “Făget” (hereafter Făget), which is the largest forest in the close vicinity of Cluj-Napoca. Făget is situated in the south-eastern part of the city (Figure 1) and is one of the getaway areas in the proximity of Cluj-Napoca. It has always been a popular retreat and

classic destination for people wanting to escape the city during weekends. During the last centuries the area has always been forested, as it can be seen on old maps of the region.

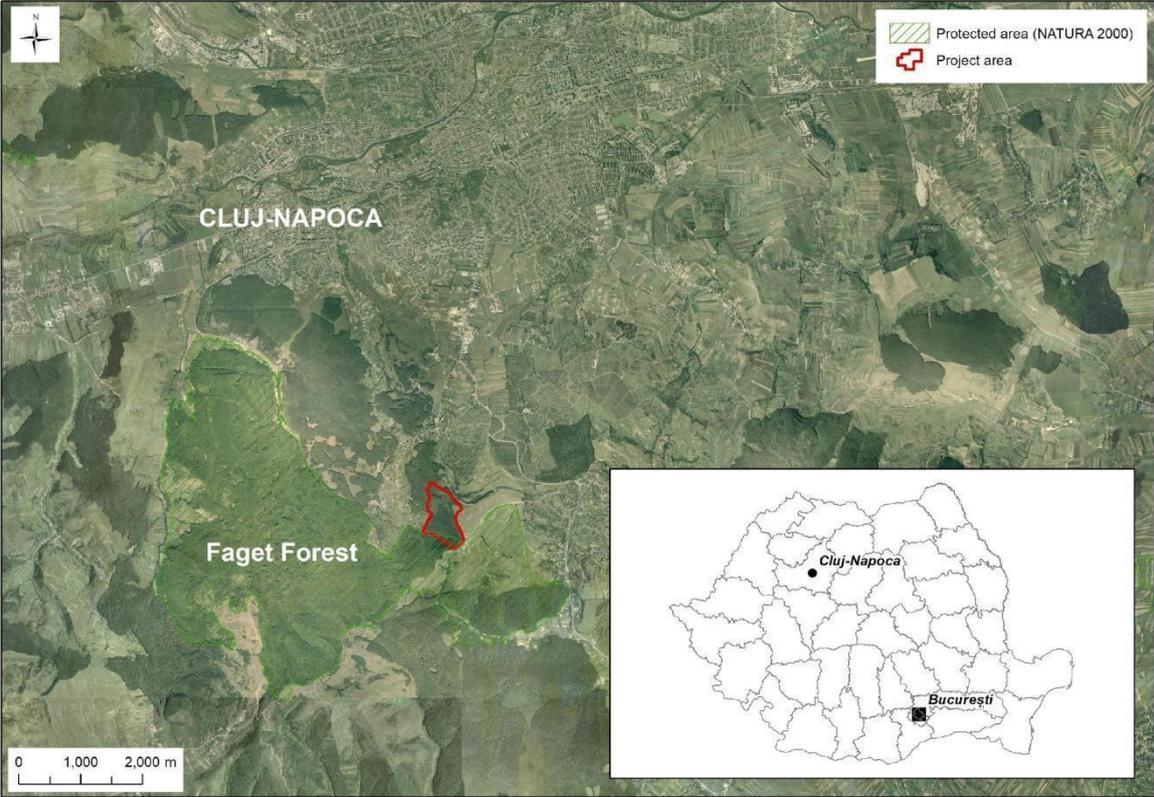


Figure 1. Location of the project area

The Ownership of forests

The forest in the project area is owned by the Cluj-Napoca city City Hall (Figure 2), which is an important factor in the general implementation of the Operational Plan.

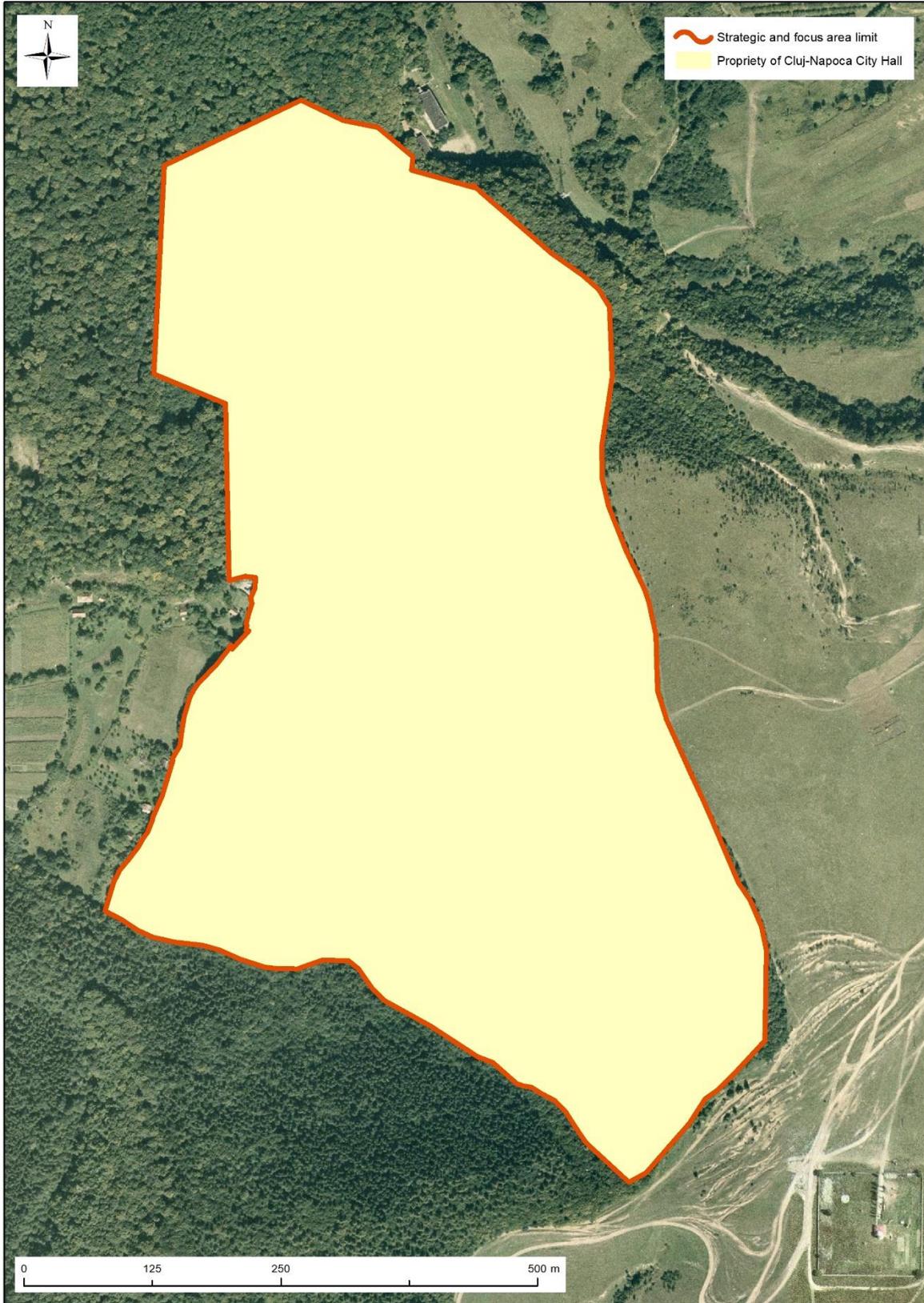


Figure 2. Land ownership in the project area

Forests, site conditions, forest types, stand types

Based on forest stands description provided by Cluj Forest District, the study area belongs to the Forest with special protection functions (Functional group I) and Forests with recreational functions (Subgroup 4).

The tree density overall ranges between cca 150-800 trees/ha while the overall diversity of the trees (i.e. in terms of species richness) is high (with about 20 tree species).

The forest has a well pronounced vertical stratification including a lot of areas with natural tree regeneration. In a large area of the forest, a well-developed forest litter is noticeable, including dead trees at various stages of decomposition which indicates the soil formation process.

The main native species to be found in the forest study area are common hornbeam (*Carpinus betulus*), the beech (*Fagus sylvatica* – the Romanian and Hungarian name of the forest comes from Beech) and into a lesser extent compared to the previous species, the oaks (*Quercus robur* and *Q. petraea*). Especially the hornbeam and beech are uniformly distributed while the oak species are present in clumps in open spaces. Furthermore, natural regeneration in the forest occurs mainly in these two species, both the beech and the hornbeam being shade tolerant. The other native species which are quite common are *Quercus robur*, *Acer pseudoplatanus* and *Tilia cordata*. The project area harbour over 15 native tree species. The non-native species are Douglas fir (*Pseudotsuga menziesii*), European larch (*Larix decidua*), Scots pine (*Pinus sylvestis*) and Norway spruce (*Picea abies*) Table 1). They are found in localized patches and occur in homogenous stands, being plantations.

Table 1. Tree species in the forest study area

No.	Tree species		Observations
	Scientific name	English common name	
1	<i>Acer campestre</i>	Field maple	
2	<i>Acer platanoides</i>	Norway maple	
3	<i>Acer pseudoplatanus</i>	Sycamore maple	
4	<i>Alnus glutinosa</i>	Black alder	
5	<i>Betula pendula</i>	Silver birch	
6	<i>Carpinus betulus</i>	Common hornbeam	
7	<i>Fagus sylvatica</i>	European beech	
8	<i>Fraxinus excelsior</i>	Common ash	
9	<i>Larix decidua</i>	European larch	
10	<i>Picea abies</i>	Norway spruce	Rare
11	<i>Pinus sylvestris</i>	Scots pine	Rare
12	<i>Populus alba</i>	White poplar	Rare
13	<i>Populus tremula</i>	Eurasian aspen	Rare
14	<i>Prunus avium</i>	Wild cherry	
15	<i>Prunus padum</i>	Bird cherry tree	Rare
16	<i>Pseudotsuga menziensis</i>	Douglas fir	
17	<i>Robinia pseudoaccacia</i>	Black locust tree	Rare
18	<i>Quercus petraea</i>	Sessile oak	
19	<i>Quercus robur</i>	English oak	
20	<i>Salix caprea</i>	Goat willow	Rare

21	<i>Salix fragilis</i>	Crack willow	Rare
22	<i>Sorbus aucuparia</i>	European rowan	Rare
23	<i>Tilia cordata</i>	Small-leaved lime	

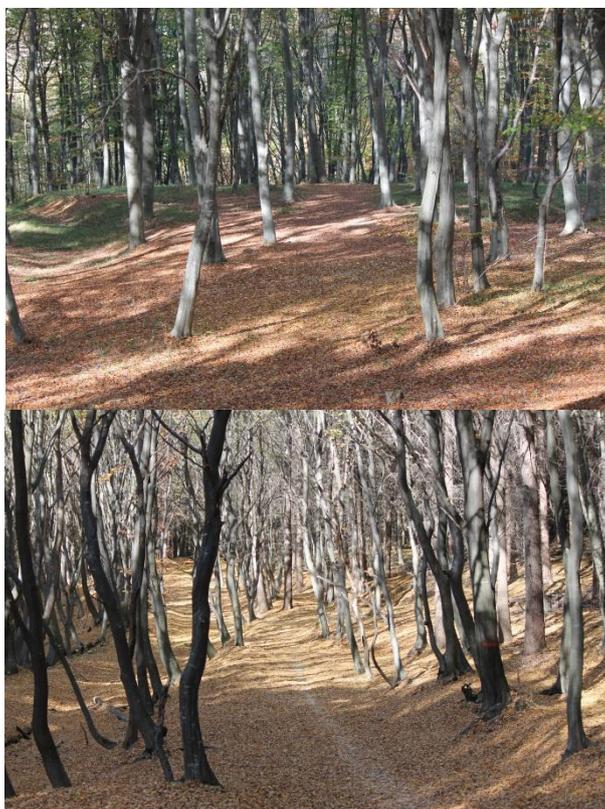


Figure 3. Photos representing the general frame of the forest in the autumn season

The total standing volume of trees in the study area is about 9,540 m³ (i.e. an average of 238.5 m³/hectare), 57.3 % belonging to native tree species, while 42.7 % to non-native tree species. In terms of standing volume per tree species, the non-native Douglas fir represents 23.4 %, followed by European larch (19.3 %). Within the native trees, the Common hornbeam (18.3 %), Sessile oak (16.7 %) and European beech (13.5 %) have the most significant weights.

Usually the average tree height is 14-19 m, reaching in the case of older specimens of non-native coniferous at 22-23 m.

Except for small areas with young forests of 15-20 years, the average age of the forest is about 40-60 years. However, old tree specimens belonging to European beech, Hornbeam, Sycamore maple and Small-leaved lime were noted in the study area. We highlight the cultural, natural and economical values of the old coppices (beech, hornbeam, lime, sycamore).

The average growing stock in the study forest is about 7.5 m³/hectare/year. The maximum growth rate, in some stands, reaches 10 m³/hectare/year in case of european larch, 5.3 m³/hectare/year for douglas fir and about 4 m³/hectare/year for common native species (common hornbeam, european beech and sessile oak) (see Figure 11).

Management

In the past, the forest was mainly managed for timber production (for firewood for household or industrial reasons). A small part of the forest (about 5 %) has been cut about 18-20 years ago, but now is naturally regenerating.

In the last 15 year, only salvage cuts have been carried out, adding only a few accidental cuttings. Thinning is proposed only for one larch and Douglas fir stand.

Therefore, non-timber products such as forest fruits and especially mushrooms are currently the main resources harvested from the forest, being a traditional practice in the area, mainly among the elderly. However, there is no control over this activity and the collected amount.

In the eastern side of the forest area, tourists still occasionally use timber from forest as firewood for local barbecue; beside this, activities near the forest are prohibited by specific regulations.

Wood production

Being defined as recreational forest, stands are not used primarily for wood production. There are only some rare cuttings designed to maintain the forest healthy. The non-native species patches have not yet reached the exploitation phase.

The mechanical devices like chainsaw are mainly used for wood harvesting and processing.

In the future perspective and according to the proposed forest strategy, the timber production activities should be harmonized with the high natural, aesthetic, historical and cultural values of the forest. This implies the development and implementation of a nature and intangible value friendly forestry for the area. Together with the stakeholders (especially forestry sector), developing a nature friendly timber production strategy for the Douglas fir and European larch plantation is needed.

Forest accessibility

For the wood harvesting and processing, skidders mechanized vehicles are mainly used.

Impacts, problems

In the forest there were no major impacts associated with other sources than those related to forest management. However, in the last decade, in the cold season, there have been relatively frequent reports of tree fellings or tree multiple broken branches, as a result of the abundant wet snowfalls or, less frequently, frozen rain (Figure 4). Also, in some areas, the trees show the roots exposed as a result of the historical use of the access roads by vehicles.

We highlight the huge amounts of garbage found in a dirt road pond which is between the most optimal breeding sites for amphibians from the forest, considering its depth, hydroperiod (duration) and light/temperature conditions. In the present document we propose that the damages caused by natural disturbances (e.g. weather conditions, winds, wildlife) can be highlighted, at least in some key areas of the forest (where their ecosystem and educational functions are maximized), for their value for nature as well as for their educational role. For example, the natural damages to trees trigger the hollowing process in the wood, which in turn created optimal habitats for dead wood dependent organisms. Studies shows that several dead wood dependent organisms became rare (and are actually protected) in the European Union because the natural disturbances and their important role for wildlife were cancelled and discredited. Rethinking natural disturbances as well as addressing the potentially negative human impact requires the involvement of multiple institutions.



Figure 4. Natural hazards as disturbance factors for the forest. While the trees can be perceived as damaged from an economic perspective, the dead wood created after these disturbances is key habitat for hundreds of species (fungi, animals). A holistic management strategy for this forest should therefore carefully integrate the natural disturbances with the economic and non-material benefits and interests (frozen rain, above, 02.12.2014, and wet snowfall, below, 13.12.2008)

3.2 Visits to forests and infrastructure

Visits to forest

The targeted forest is visited every year by approximately 3 thousands of people. The visits are made especially during the weekends, or holidays and especially in the hot season, or favourable weather conditions. Joggers, hikers, cyclists and recreational walkers are the main visitors of the forest. Also during the summer and the beginning of autumn, mushroom harvesters are relatively common in the area. These users are local residents who like mainly to practice sports in a nature area. Mountain biking is widely practiced in the area. However, there are no marked paths and bikes move freely within the forest sometimes disturbing the other tourists.

Based on the questionnaire survey conducted at the end of 2018, it was highlighted that the most visitors come from Cluj-Napoca city (46.5 %) and from nearby villages (up to 3 km) (33.1 %). 12% of the respondents live in the immediate proximity of Făget Forest (17 persons), while 8.5% live outside the city of Cluj-Napoca. They access the area by using the personal car, some of them by bike and a smaller proportion by using public transport. Most of the tourists are aged between 30 and 45 years (64.8 %) and are well educated (bachelor's and master's degree). Based on the questionnaire results, the forest is mainly used by joggers and hikers, followed by cyclists, tourists who want to spend time with the family, and less for educational activities (photos, bird-watching, discover nature etc.).

Already available infrastructure

In the study area, the already available infrastructure for tourists includes some unmarked bike trails and walking paths, especially along of old forest roads.



Figure 5. Existing bike tracks in the strategic and focus area

3.3 Important objects in UPF

Nature conservation

Besides its small size, the project area includes some extraordinary biodiversity hotspots. These are “wild” spots where human intervention has been limited in the last 15-20 years. The vegetation has

evolved according to natural laws, not forestry ones and as a result the limited human access, people tend to avoid these areas. They are important biodiversity hotspots and can act as retreat areas. In fact, the deer and wild boar populations use these areas as a refuge, to name only some large mammal species. Birds and other groups also use these areas, so maintaining them is of key importance. The largest wild forest area where ecosystem functions are still largely natural was identified in the western side of the forest (Figure 6).



Figure 6. "Wild" forest area in the western side of the forest

Besides these "wild" areas there are some other important keystone habitat structures, like wetlands (mainly encountered along torrent channels and forestry roads), large old trees (mainly coppiced), hollowing, or dead trees (standing or fallen). The forest site targeted for this project has several old trees that are biodiversity surrogates (one old tree can represent habitat for hundreds of invertebrate and vertebrate species). These habitats are important for amphibians and insects.

Cultural heritage

The forest targeted by the UPF project was used for timber production during centuries, and its cover was constant during this period. By itself this provides an enormous cultural and historical value for this forest. In this project we will highlight and propose the protection of ecosystem structures which were created by human actions and have high biodiversity and historical values as well.

In our study area the cultural values are closely related to the ancient coppice trees (Figure 7), as well as the high habitat value temporary ponds situated across these roads.



Figure 7. Copped old tree (Sycamore maple, above and Common hornbeam, below)

3.4 Assessment of use, changes and influencing factors

Damages, risks

Rising air temperature and changes in precipitation patterns are undeniable facts, which may have different impacts on various aspects of nature. The significant rapid increase in air temperature observed particularly in recent decades throughout the world is the most obvious evidence of climate change. Accordingly, with the global pattern, in Cluj Napoca city also a statistically significant increasing trend of the annual mean air temperature can be noticed. The temperature trend line has a steeper slope compared to the other stations from the central part of Romania, so there are clear evidence that the temperature is influenced by the effect of „urban heat island”. Also, an increasing trend of temperature is expected in the future climate scenarios. Climate change, especially global warming could modify the tree species composition, forcing some species to move to higher altitudes and alter the forest productivity and health. So the forest security should be seen as an explicit part of a coherent long-term climate-change adaptation strategy that will build more resilient forest in the future.

The proposed arrangement of the forest surely will bring benefits for the local community. On the other hand, the projected increase in number of visitors will bring additional anthropogenic pressure on the local environment. The potential threat to forest resulting from this scenario would be:

- More visitors, more noise. The higher noise levels could disturb the local animals, but also other visitors;

- More visitors will lead to more waste, because, in Romania, there is a low level of waste management culture, many people usually leave mess behind them. More waste means more sources of pollution and could make the forest less attractive (Figure 8).
- Raising the forest-fire risk resulting from the future favourable context (intensifying human activities in conjunction with global warming);
- Better access in conjunction with the tourist arrangement of the forest will lead to more visitors, coming into direct impact on local species. Direct impacts can take many forms, like:
 - intensifying of some „traditional” activities: harvesting of some species with economic value (e.g. birch sap, mushrooms, forest fruit etc.) or of spring flowers;
 - some people kill animals that are considered to be dangerous or scary (e.g. some insects, snakes, frogs), or destroy/collect some things that arouse curiosity (e.g. bird nest, frog eggs, big beetle).

The proposed arrangement works could also physically affect the local biodiversity, while rude harvesting of non-native species without a coherent strategy could affect the general biodiversity and entire landscape.

From a social side the increasing human impact – including number of visitors and the noise, pollution associated with them – can change the natural environment, decreasing the habitat quality for several organisms. For example species sensitive to noise, soil compaction and the decrease of litter amount are the first affected by these activities. These can be overcome by the formation of an institutional structure which is permanently engaged with the forest as well as with the local community.

From the environmental side, climate change, especially global warming could modify the tree species composition. Tree species sensitive to drought and high temperatures are expected to decrease in abundance, while warm dependent trees can establish. This scenario highlights the need for a pro-active management vision, which also includes interventions to maximize the forest ecosystem resilience towards climate changes.



Figure 8. Waste left behind by tourists in the forest

Issues of forest use

The significant issues of the forest use could come from increasing anthropogenic pressure on the local ecosystems by increasing number of visitors. On long-term, climate-change could significantly affect the viability of some species.

4. GUIDELINES FOR FOREST MANAGEMENT

4.1 Subordinated guidelines

The subordinated guidelines include:

- The forest management plan (parcels 26 and 27)

The forest management plan defines the area as a forest park with limited forestry interventions

- Urban planning guidelines of Cluj-Napoca

The area is defined as recreational area

- Strategic part of the Integrated Multi-use Management Plan (IMMP) – Făget Forest Cluj-Napoca

4.2 General guidelines for UPF

As defined by Law no. 46/2008 (known as the Forestry Law, Codul Silvic in romanian) and further amendments, a forest park is a forest area designated mainly for educational and recreational purposes. It is defined as being part of Group I - Forests with special protection functions, subgroup 1.4 Forests with protective functions, predominantly social, category Forest parks, recreational, thematic or educational parks.

The forests - park, recreational, thematic or educational forests, will be constituted at the request of the owner or, in the case of the forests being public state propriety, at the request of the administrators provided by law, based on specialized studies approved by the Technical Commission for Forestry Approval.

The following interventions are permitted in these forests:

- alleys of ecological materials with the width of maximum 2.0 m
- benches
- lighting
- ecological toilets
- points of visit and constructions of wood with the surface of maximum 15 m²

The extraction of trees is limited only to special interventions and forests can be planted with species that are not of the fundamental natural type, including exotic ones, instead of the extracted trees.

The interventions proposed are all limited to those already mentioned. The general guidelines of the OM IMMP will include wooden benches and tables, information panels and markings all compliant with the regulations.

4.3 Guidelines for specific forest areas (allocations)

Forest cover around 30% of the world's surface and are of key importance for biodiversity conservation, also providing critical ecosystem services (Gustafsson *et al.*, 2012). As a result there are multiple expectations that humans place on forests, with multiple associated conflicts between different stakeholder groups (Freer-Smith and Carnus, 2008). As a result, in many parts of the world this has led to the allocation of forests either for conservation purposes or for intensive production. Currently only about 11% of the total forest area is designated for conservation and only about 4% are plantations (Gustafsson *et al.*, 2012).

In this small patch of forest, there are several important elements that play a key role for the biodiversity and cultural value of the area around Cluj.

Thus, the allocations towards priority ES have shifted in the favour of Cultural ES and Supporting ES, including here also the recreational value.

4.3.1 Multifunctional forests

When discussing about the Făget Forest from a multifunctional point of view, one must not ignore the fact the strategic and focus area is part of a more extended forest patch. The ecosystem services provided by the forest are provided as a whole entity and for sure the strategic area cannot be isolated, nor should be, from the other forest area.

As thus we consider that the implementation of the project in our strategic area will in fact increase the multifunctional capacity of the entire Făget area. By focusing on educational and recreational ES, the overall interest in the area will increase for sure. In the same time supporting ES in the area will be improved to a point where they could develop into efficient conservation measures.

Even if the strategic area is defined as a forest-park, the surrounding area is not at the moment so wood production will continue in the vicinity of the strategic area.

The point is that the strategic area is just an area where management activities will try to establish a guiding line for development but the entire Făget Forest is important as a multifunctional forest.

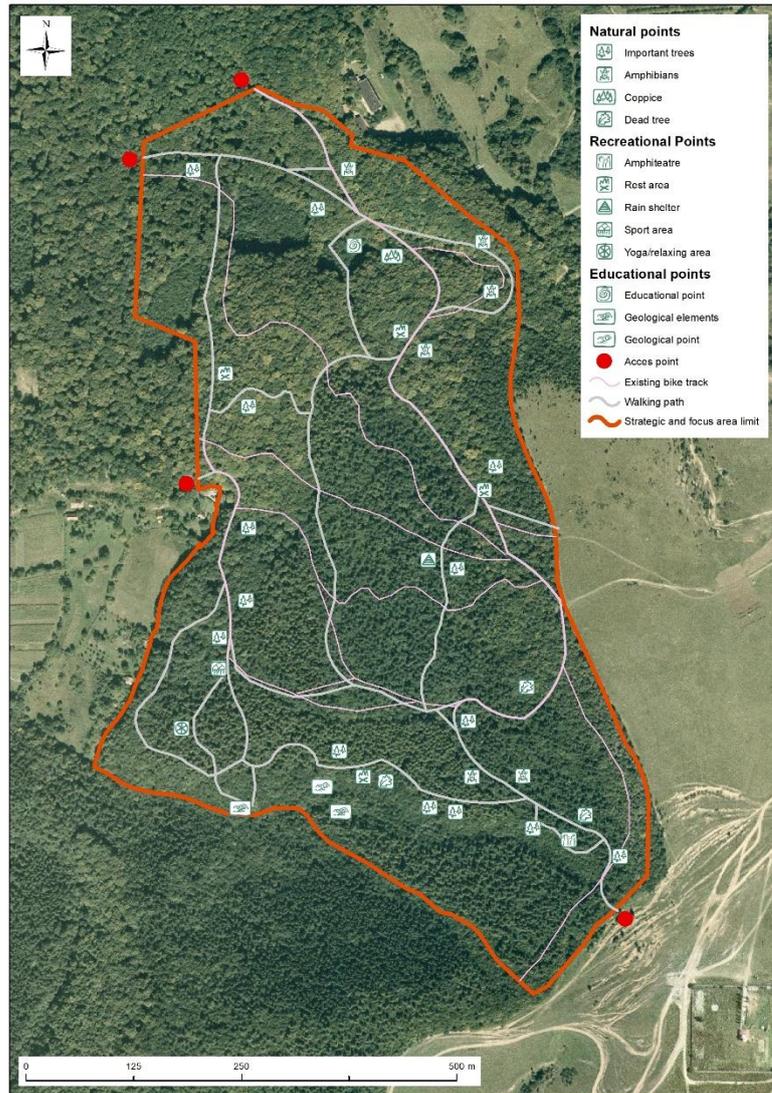


Figure 10. Allocations map

A nature friendly forestry for the area

The timber production activities should be harmonized with the high natural, aesthetic, historical and cultural values of the forest. This implies the development and implementation of a nature and intangible value friendly (ES other than provisioning) forestry for the area.

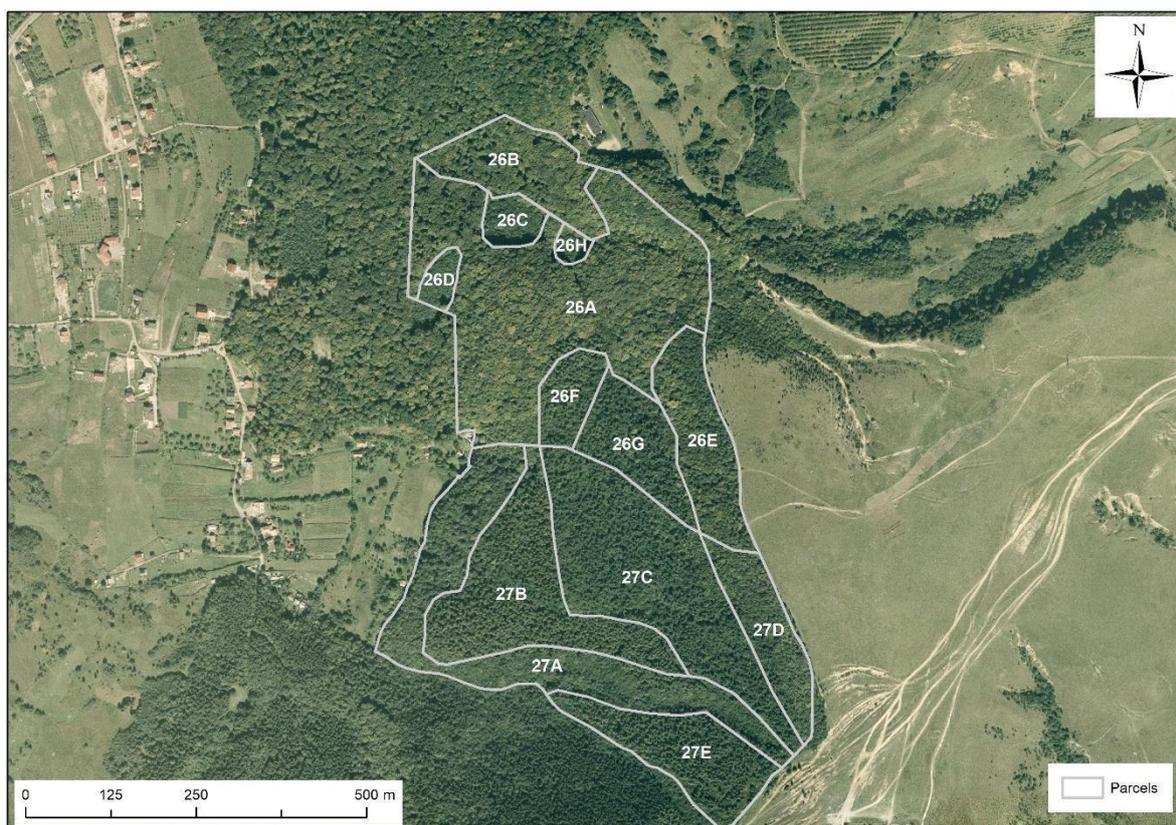


Figure 11. Forestry stands

As the forest is included in the category of forest-park, commercial wood harvesting is restricted. The only allowed interventions are limited to hygiene cuttings. In this aspect the propose that cuttings are organised as educational events where people are involved in order to better understand the forest activities.

In order not to totally eliminate the cuttings we present the following:

Table 2. Proposed forestry activities

No.	Parcel code	Main species	Forestry interventions
1	26A	<i>Fagus sylvatica</i>	Salvage cut only in case of danger for people
2	26B	<i>Fagus sylvatica</i>	Salvage cut only in case of danger for people
3	26C	<i>Quercus petraea</i>	Thinning (regenerating forest)
4	26D	<i>Quercus petraea</i>	Thinning (regenerating forest)
5	26E	<i>Quercus petraea</i>	Salvage cut only in case of danger for people
6	26F	<i>Larix sp.</i>	Salvage cut, 10 cubic meter/hectare
7	26G	<i>Douglas sp.</i>	Salvage cut, 7 cubic meter/hectare
8	26H	<i>Quercus petraea</i>	Thinning (regenerating forest)
9	27A	<i>Carpinus betulus</i>	Salvage cut only in case of danger for people
10	27B	<i>Larix sp.</i>	Salvage cut, 12 cubic meter/hectare
11	27C	<i>Douglas sp.</i>	Salvage cut, 9 cubic meter/hectare
12	27D	<i>Quercus petraea</i>	Salvage cut only in case of danger for people
13	27E	<i>Larix sp.</i>	NATURA 2000 area, Removal of excess trees

Improve the traditional activities related to mushrooms and forest fruits

Improve the practice of harvesting mushrooms and forest fruits. This practice is linked to Cultural ES. Control the amount, time and species harvested in order to maintain a high diversity of the species. Inform visitors about the mushroom species existing in the forest and their palatability. Raise awareness about the need for sustainable and responsible mushroom and wild fruit collection. Create focal points with other native species (blueberry, blackberry) that are not present in the current moment, as the main group harvested now is composed out of mushroom species.

4.3.2 Priority allocations for regulating ES

Local climate mitigation, Erosion prevention

Control erosion and maintain the climate regulating service

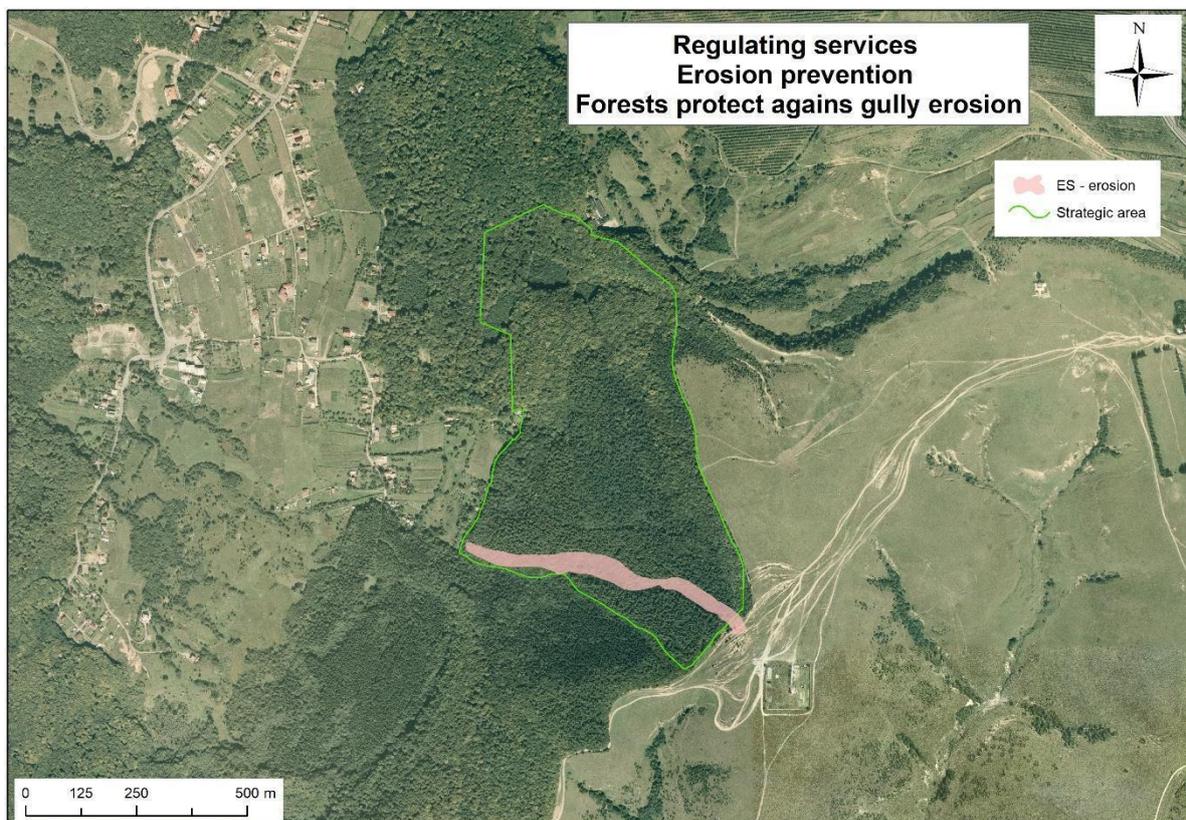


Figure 12. Allocations for regulating ES – erosion prevention

Given that the current state of the forest is exceptional, we propose that maintaining the current state would be the ideal way to maintain the forest capacity to mitigate climate change and contribute to regional climate regulation. Control the development of gully erosion by maintaining the shrub species around the gully and creating anti-erosion structures where needed (e.g. small consolidation developed from wood). This priority is linked to other priorities from the cultural ES. The gully should not be eliminated but controlled. Maintain the small ponds, wetlands that control the water regime in the area. The management practices should aim to maintain as much water as

possible in the forest, given that water scarcity will be a main social and environmental issue in Europe and in Romania as well.

The gully erosion is also important because it creates the premise of natural disturbances in the forest ecosystem. Ponds created by the gully are used by native species (wild boar) in order to clean parasites. By bathing in the mud holes, they are also creating precious ponds for amphibians, in the natural way as opposed to the same process developed through the usage of forestry roads by vehicles.

The area of the erosion prevention ES is 2.33 hectares.

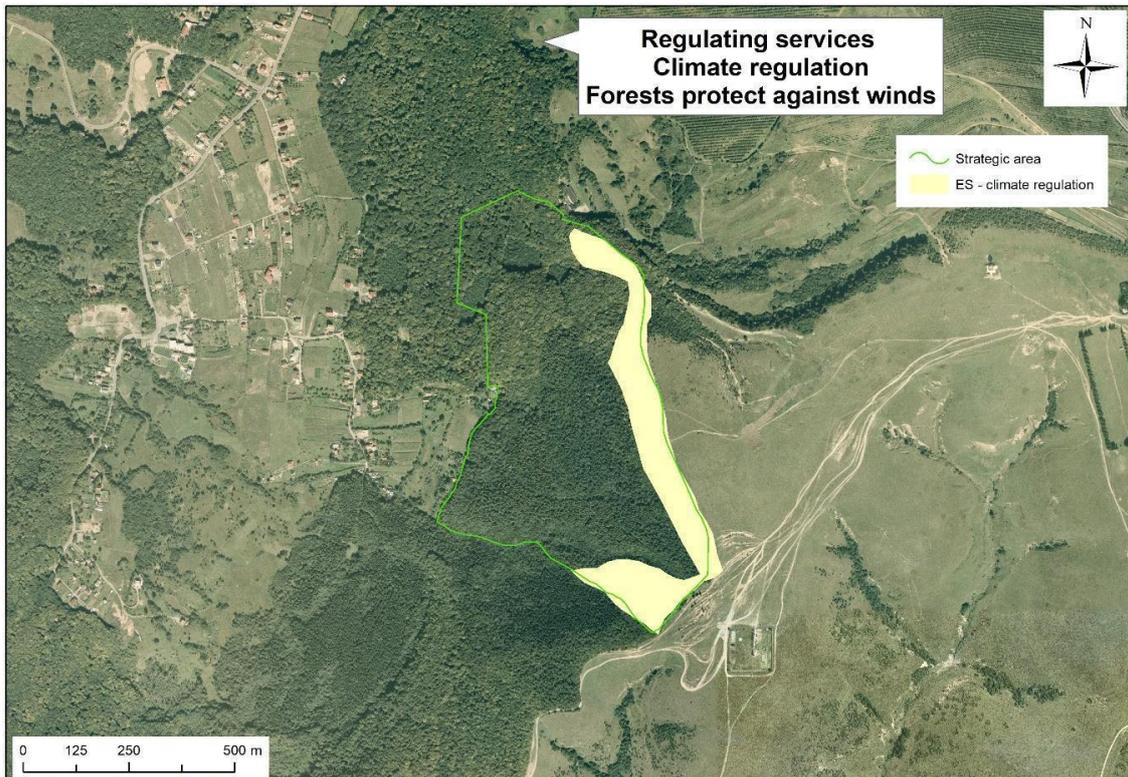


Figure 13. Allocations for regulating ES – climate regulation

The area of the climate regulation ES is 9.13 hectares.

4.3.3 Priority allocations for cultural ES

Develop a recreational infrastructure with minimal impact

The infrastructure should include:

- Walking paths with panels describing the ES, species and habitats
- Organizing events promoting the area and nature in general (nature photography contest, geocaching event). These events should also popularize ecosystem structures with high natural and cultural importance (e.g. large old trees, coppices, pollards).
- Minimal impact sports areas

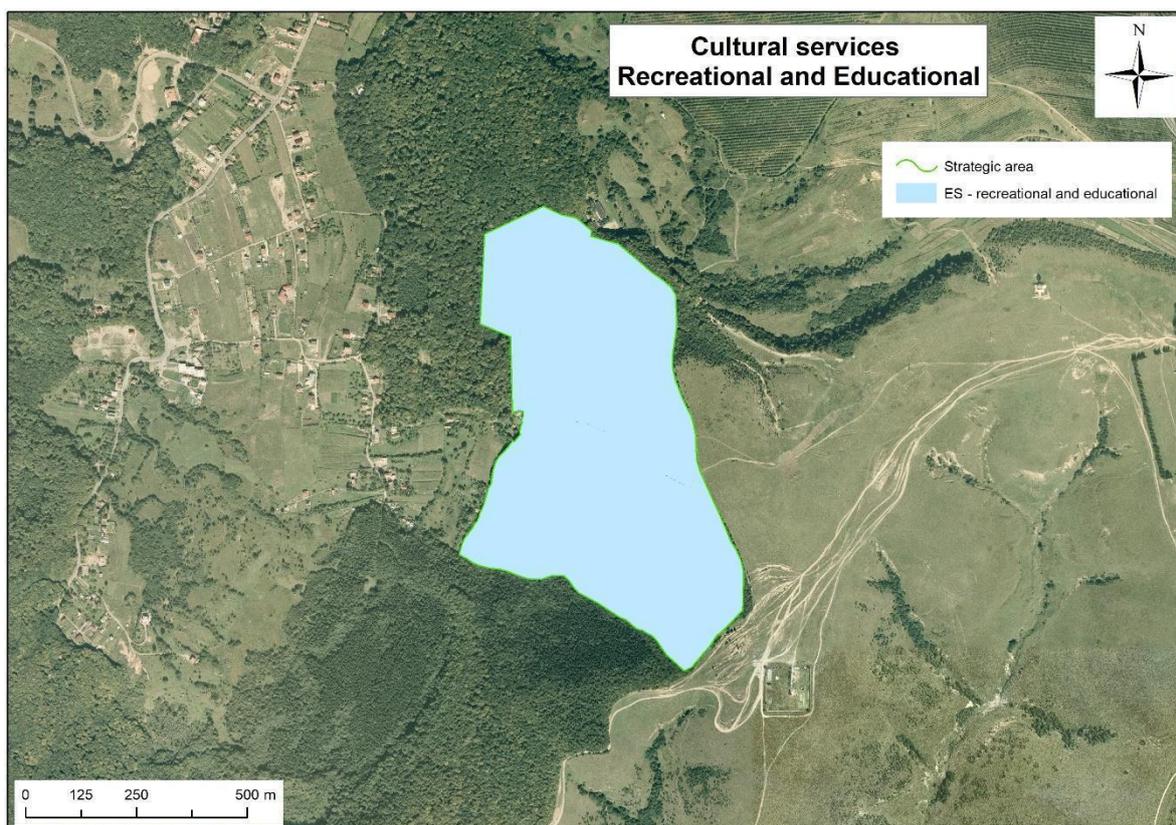


Figure 14. Allocations for recreational and educational infrastructure

Develop educational infrastructure addressing students, children and the general public

- Organizing/hosting scientific events for scientists or maybe for students/high school children in partnership with educational/scientific institutions (University). These events should also include university field courses.
- Scientific/educational information points

Developing educational focal points and scientific focal points. The educational focal points are locations where different educational activities can be carried out. Target groups are kindergarten children, high school children and students. The Educational points should be also developed to allow individual usage. The scientific focal points are designed to present more scientific facts. This information is important for students in order to be able to have a continuous time series of data about the biodiversity and ecosystem services in the area.

Both educational and recreational ES cover the entire strategic area.

4.3.4 Priority allocations for supporting ES

Develop an integrated strategy for the protection of species and habitats as they are at the base of all Ecosystem Services in the area.

Developing a Conservation Strategy for priority Habitats/Species is a key element because all the Ecosystem Services in the project area are based on the natural capital that is to be found in the forest. This strategy will address several issues of high importance:

- Conserving the small ponds created in potholes. Identify optimal disturbance regimes for maintaining these ponds and assuring that they remain optimal habitats for amphibians.



Figure 15. Allocations for nature

- Maintain the areas with high natural values (including ‘wild’ areas, where human action was prohibited at least for the past 20 years). Conserving these high biodiversity areas will assure that species will have a refugia and these can act as population sources as well. These areas also include keystone habitat structures, like wetlands, large old, hollow or dead trees (standing or fallen). These habitats play not only a key role for biodiversity but they support several other ecosystem services as well.
- Identify and actively promote whenever possible natural ecosystem processes such as tree regeneration and litter formation. This means also the identification and protection of those areas where the litter is well developed. These are key areas for soil formation and will have high educational and scientific importance.

Maintain high diversity of functional groups (i.e. insectivores, pollinators, decomposers) within the targeted system.

The area covered by this ES is 8 ha.

4.4 Forest zoning and identification of projects areas and their location

As stated in the previous sections the strategic area of the project covers approximately 40 hectares of mixed natural forest and plantations of larch and Douglas fir. The forest is defined as forest-park and in accordance to that it is designated mainly for educational and recreational purposes. It is defined as being part of Group I - Forests with special protection functions, subgroup 1.4 Forests with protective functions, predominantly social, category Forest parks, recreational, thematic or educational parks.

In accordance to this function, the operational plan is focused mainly on cultural and supporting ES.

Considering that cultural ecosystem services and supporting ecosystem services are spatially homogeneous, it is hard to define specific areas that do not overlap. As such the operational plan will include both clearly delimited spatial allocations for each ES in the form of polygons but also point key locations in the area defined as being allocated to another ES.

The zoning of the strategic area is delineating the priority activities and areas of specific interest. Basically we consider that the area can be divided into two main zones with additional points distributed between them.

The two main zones are the Educational/Recreational Zone and the Nature Conservation Zone.

Considering that we can define sub-zones and locations allocated to different land use. In practice these zones can be overlapped.

Table 3. Areas of regulation/facilities

Name	Type	Area of regulation
Recreational/educational area	A. General educational/recreational area	A. Recreational/educational use
Amphitheatre	A Recreational	A.1 Amphitheatre
Rest area	A Recreational	A.2 Rest area (4 locations)
Rain shelter	A Recreational	A.3 Rain shelter
Sport area	A Recreational	A.4 Sport area
Yoga area	A Recreational	A.5 Yoga
Educational point	A.a Educational	A.6 Educational point
Geological point	A.a Educational	A.7 Geological point
Geological elements	A.a Educational	A.8 Geological elements
Nature conservation area	B. General nature conservation area	B. Nature conservation area
Important trees	B Nature conservation	B.1 Important trees (14 trees)
Amphibians	B Nature conservation	B.2 Ponds (6 ponds)
Coppice area	B Nature conservation	B.3 Coppice
Dead tree	B Nature conservation	B.4 Dead tree

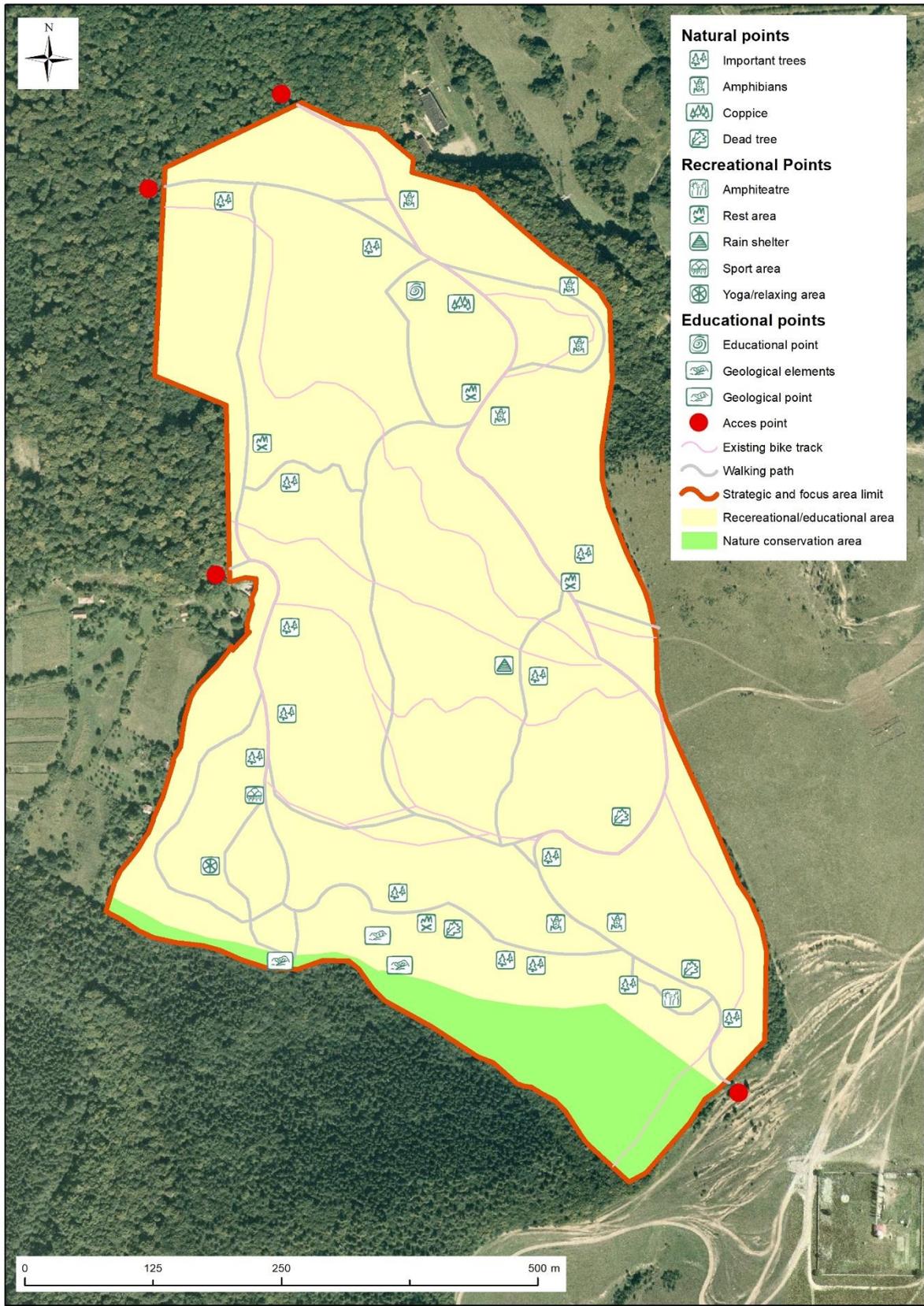


Figure 16. Forest zoning

4.5. Areas of regulation

The general areas of recreational use are to be managed from a forestry point of view as stated in section 4.3.1.

Areas of regulation are presented in the following tables:

Areas	A.1 Amphitheatre
Condition/problems	This is a natural amphitheatre area, in the upper part of the project area. It is in the vicinity of several other important points including amphibian ponds and specific trees
Target status	Works in order to develop a resting/recreational area
Purpose	Recreational area, lecture area
Priority	High
Most important ES	Recreational/Educational
Possible activities	Walking, lectures about nature
Unwanted or prohibited activities	Eating, camping, cycling
Silviculture measures	No
Measures for wood extraction	No
Infrastructure measures	Wood works in order to establish the amphitheatre; paths are already leading towards that direction (most not cover an area of more than 15 square meters)
Operational plan	Build up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	The area should be developed as a recreational area with the possibility to have lectures regarding nature

Areas	A.2 Rest area
Condition/problems	Rest areas are seen as spots where people can rest for a few minutes after walking along the paths
Target status	Works in order to develop a resting area
Purpose	Rest area
Priority	High
Most important ES	Recreational
Possible activities	Resting after walking a high slope or during sport activities
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure measures	Wood works in order to establish the benches and other facilities
Operational plan	Build up of the facilities

Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	The area should be developed as a simple rest area. There are 4 spots like this in the strategic area

Areas	A.3 Rain shelter
Condition/problems	A wooden structure is in place but it is not in a good condition
Target status	Works in order to develop a shelter area
Purpose	Rest area/Cover area in case of rain
Priority	High
Most important ES	Recreational
Possible activities	Rain shelter
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure measures	Wood works in order to build the shelter (most not cover an area of more than 15 square meters)
Operational plan	Build up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	The area should be developed as a covered shelter. Other facilities could include book shelves with books about nature

Areas	A.4 Sport area
Condition/problems	There are no facilities currently in the area. Simple wooded works are required
Target status	Works in order to develop a sport area
Purpose	Sport area where simple sport activities can be carried out
Priority	High
Most important ES	Recreational
Possible activities	Pull ups, crunches
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure measures	Simple wooden facilities

Operational plan	Build up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	The area should be developed as a sport area

Areas	A.5 Yoga platform
Condition/problems	There are no facilities currently in the area. Simple wooded works are required
Target status	Works in order to develop yoga relaxation area
Purpose	Sport area where simple yoga activities can be carried out
Priority	High
Most important ES	Recreational
Possible activities	Yoga
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure measures	Simple wooden facilities; a fitness in nature recreation point with wooden fitness equipment
Operational plan	Build-up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	The area should be developed as a flat wooden area where people can practice yoga

Areas	A.6 Educational point
Condition/problems	There are no facilities currently in the area. Simple wooded works are required
Target status	Works in order to develop an educational point
Purpose	Educational point where groups of students/children can take lessons about nature
Priority	High
Most important ES	Educational
Possible activities	Lessons
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure	Simple wooden facilities; Thematic playground for learning in nature

measures	
Operational plan	Build-up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	

Areas	A.7 Geological point
Condition/problems	There are no facilities currently in the area. Simple wooded works are required
Target status	Works in order to develop an educational point about geology and geomorphological processes
Purpose	Geological/geomorphological info point
Priority	High
Most important ES	Educational
Possible activities	-
Unwanted or prohibited	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure measures	Simple wooden facilities; wooden platforms with a simple auditorium
Operational plan	Build-up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	The area should also include totems and other information facilities

Areas	A.8 Geological elements
Condition/problems	There are no facilities currently in the area. Only information panels are required
Target status	Simple works for the establishment of info panels
Purpose	Geological/geomorphological elements (trovanti)
Priority	High
Most important ES	Educational
Possible activities	-
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure	Simple wooden facilities; wooden platforms with a simple auditorium

measures	
Operational plan	Build-up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	The area should also include totems and other information facilities

Areas	B.1 Important trees (14 trees)
Condition/problems	There are no facilities currently in the area. Only information panels are required
Target status	Simple works for the establishment of info panels
Purpose	Add educational value to important trees in the area
Priority	High
Most important ES	Natural/Educational
Possible activities	Learning
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure measures	Simple wooden panels to be placed on trees or in their close vicinity
Operational plan	Build-up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	

Areas	B.2 Amphibian ponds (6 ponds)
Condition/problems	There are no facilities currently in the area. Only information panels are required. One of the ponds need to be enlarged. Some trees can be removed in order to allow the sunlight
Target status	Simple works for the establishment of info panels and the enlargement of one pond
Purpose	Add educational value to important ponds in the area
Priority	High
Most important ES	Natural/Educational
Possible activities	Learning
Unwanted or prohibited activities	Camping, fire, road works, drainage, deposit of wooden material
Silviculture measures	No
Measures for wood extraction	No

Infrastructure measures	Simple wooden panels to be placed on trees or in their close vicinity
Operational plan	Build-up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	

Areas	B.3 Coppice area
Condition/problems	There are no facilities currently in the area. The coppice trees must be conserved
Target status	Simple works for the establishment of info panels about how the coppice trees developed and their role
Purpose	Add educational value to coppice trees
Priority	High
Most important ES	Natural/Educational
Possible activities	Learning
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood extraction	No
Infrastructure measures	Simple wooden panels to be placed on trees or in their close vicinity
Operational plan	Build-up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	

Areas	B.4 Dead trees
Condition/problems	There are no facilities currently in the area. The dead trees must be maintained as long as there is no risk to visitors
Target status	Simple works for the establishment of info panels about the role of the dead wood in the ecosystem
Purpose	Add educational value to dead trees (standing or not)
Priority	High
Most important ES	Natural/Educational
Possible activities	Learning
Unwanted or prohibited activities	Camping
Silviculture measures	No
Measures for wood	No

extraction	
Infrastructure measures	Simple wooden panels to be placed on trees or in their close vicinity
Operational plan	Build-up of the facilities
Costs	To be detailed in the annex
Financiers	Project
Coordinators	Cluj City Hall
Stakeholders	Cluj City Hall, General public, Universities
Professional basis	-
Notes	

5. MANAGEMENT/GOVERNANCE

As mentioned above (Chapter 1), the **governance and management** of the forest targeted by this project **is strongly sectoral**: irrespective to the owner, the forest management should follow the rules, procedures and principles legally described and applied by the forestry authorities. Given that the selected forest area was proposed for the **development of a multifunctional management strategy** for enhancing and integrating multiple societal demands while **enhancing the ecosystem service delivery potential** of the forest, there should be a reconsideration of the classical governance in order to fulfil **multifunctionality demands**. This also means that the current institutions involved in the management of the forest should consider the possibility to **shift from the traditional full control type of forest management** and administration to the inclusion and consideration of **participatory type of management**. The participatory type of management means that the presenters of the society (see above, the potential interest groups with demands for various types of ecosystem services of the forest) are also considered as resources (e.g. knowledge, inspiration, volunteering) and opportunities within a forest management strategy. Scientific evidence shows that addressing the problem of **“social fit”** (i.e. enhancing multifunctionality of forest ecosystems by more effectively connecting multiple societal demands to forest ecosystem service delivery) requires the development of a **pluralistic governance system, i.e. different (traditionally sectoral) institutional structures (old and new) which are capable of integrating multiple perspectives and visions** in the management of the natural resources. The **communities of practice** represent **structured institutional spaces where presenters of different governing institutions, sectors and interest groups (research, policy, practitioners and the civil society) can interact and collaborate**. We believe that a community of practice type of engagement provides more benefits for the long term viability of the project than a classical consultative council (present in the most of protected areas). The key difference between the two is that the community of practice means also active and continuous engagement in the knowledge/innovation production and co-creation of management actions while the classical consultative council has the role of overseeing the various economic and

other types of initiatives and their engagement is also restricted in time (it happens during pre-defined meetings). The community of practice has several other benefits as well. The collaborative interactions within communities of practice allows **sharing and co-creating actionable knowledge** about multi-faced and multidimensional problems related to common topics of interest (here represented by the forest). Regarding forests, the following themes and topics can be addressed by the communities of practice: **(i) threats to forests (social, environmental), (ii) equity in access to ecosystem services, (iii) developing new tools and methods for sustainable forest management, (iv) increased communication and trust between different institutions regarding forest management, (v) fostering links between forestry, research and practice and finally (vi) fostering the development of new, genuine links between people and forest.** The communities of practice also can promote the development of a **collective identity** and an effective communication of key information. Nevertheless, the communities of practice represents proper institutional design to foster the manifestation of knowledge types which were classically “locked” within various sectors / institutions (hence bridge the knowledge-implementation gap).

5.1 Implementation/responsibility

The project implementation institution mobilised the presenters of **multiple sectors and interest groups** (Table 4) in order to achieve a more holistic perspective of ecosystem service provision and the multifunctional management of the targeted forest. The expertizes involved in this project are summarized in the Table 4 below. The partnership between these institutions created the **institutional context for emergence and implementation of a wide diversity of knowledge regarding the socio-cultural and natural values of the forest targeted by this project.** For example, the knowledge regarding the historical legacy and biodiversity values of the ancient coppice trees and the huge habitat value of the extensively used dirt road ponds for amphibians – which are still well represented in the targeted forests – within a strictly sectoral governance would be typically locked within one specific institution (i.e. university knowledge, e.g. Faculties of Biology, Ecology or Environmental Sciences). Furthermore, the NGO sector have a crucial role in identifying creative ways of engaging people with the natural environment represented by the forest, so that various types of human-nature connections can form. Within a classical sectoral governance, there is little probability that the above knowledge and activities would be transferred into real world management action to sustain these multifunctional values of the targeted forest.

Table 4 Institutions and expertizes involved in the development of the present document

Institution	Expertize
Zona Metropolitana	The leader of this project, information flow

	facilitation between officials of Cluj-Napoca and nine neighbouring communes, the initiator and implementer of several projects relevant for people and the environment
City of Cluj-Napoca	The owner of the forest
Babes-Bolyai University (Faculties of Environmental Sciences, Ecology, Biology)	Taxonomy, conservation biology, ecosystem functioning, ecosystem services assessments, environmental governance
Romsilva	Forestry authority, forest management
Somes Delivery/Atelier Mass	Creative ways to reconnect people and nature through creating favourable and nature-friendly context for educational and cultural activities
Environmental NGO`s	Bridging the decision making-science and society, educational activities in nature

5.2 Forest owners association

The situation regarding the ownership and management was presented earlier (Chapter 1).

6. CONTROL/MONITORING

The monitoring will be implemented on a volunteer basis and below we will provide key indicators of monitoring and control.

6.1 Indicators of monitoring and control

6.1.1 Ecosystem indicators

The diversity and quality of habitats, protected species and their populations, and keystone ecosystem structures, dead trees, culturally modified trees, invasive trees. The reference base for monitoring these indicators consist of a comprehensive survey of key biotic elements such as wetlands, plants, trees, amphibians, reptiles, birds and mammals. Furthermore a rich photo-documentation exist from the whole surface of the targeted forest in summer and autumn periods, this making possible the implementation of photo monitoring types of activities.

6.1.2. Ecosystem services indicators

Provisioning, regulating, cultural and supporting ecosystem services. These will be assessed either through the number of people visiting the forest for various purposes or indirectly, by assessing the structural and functional properties of ecosystems.

6.1.3. Human activity indicators

The number of people visiting the forest in different seasons, the diversity of their motivations.

The number of educational activities organized in the forest.

The number of volunteer based habitat management actions organized.

The number of indicators, educational panels, educational and other marked paths.

The activity and engagement on social media (e.g. Facebook) created for the project area.

6.1.4. Institutional indicators

A community of practice (see below) type of new institutional structure to assure that the decisions are participatory and based on the best available science.

7. COSTS AND FINANCING

There is a draft estimation of the costs and the financing sources taken in consideration, as follows:

No.	Type of costs	Estimated amount (EUR)	Source of funding	Observations
1	Technical studies for the development of the area	40.000	UrbforDan project	Feasibility study, technical project for Phase 1, feasibility study for Phase 2
2	Infrastructure investments	500.000	Local Budget, EU financing	Investments concerning Phase 2 – accessibility, info points, eco toilets, etc.
3	Administration and maintenance of the site	tbd	Local Budget, ROMSILVA	Will be determined once the investments will be realized
4	Security	tbd	Local Budget	Will be determined once the investments will be realized
5	Educational, cultural and sport activities	tbd	UrbforDan, Local Budget, EU grants, central government	Will be determined once the investments will be realized, based on an annual calendar
6	Research activities	tbd	Babes- Bolyai University, EU research grants	
7	Private sport activities	tbd	Private sponsorships	