Strategic part of the Integrated Multi-use Management Plan (IMMP) – Lomb Forest Cluj-Napoca draft 1

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1. INTRODUCTION

1.1. The objective of strategic plan

The aim of the Strategic part of the IMMP plan is to identify demands towards urban and peri-urban forests (UPF), potential conflicts between different ways in which the forest is used, to define strategic long-term management objectives in UPF, and to define priorities amongst management objectives and ecosystem services (ES). The strategic part also defines management guidelines that represent the basis for the definition of the operational goals and measures.

1.2. The planning process and participation

The planning process was not so extended in time, but difficult because of the complex relationships established between the local community and the Lomb forest as an ecosystem.

The preliminary stage of the strategic analysis also included the Tineretului Forest, an area in the eastern part of the city. It is a patch of forest composed out of european hornbeam and sessile oak. Due to the small size and more difficult access, this second option was later discarded.

The first part consisted of the identification and mapping of general ES. As a result of these, the first ES maps were obtained.

However after several field visits, the complexity of the area emerged and several other ES services were identified.

As a result, we consider this strategy to be only a general evaluation process. Further studies and especially time is needed to completely understand the complex relationship developed between nature and humans in the area. Considering that this is the second study involving peri-urban forest around Cluj-Napoca, this document will also highlight some general guidelines for the peri-urban green areas around Cluj.

1.3. Legal basis

The national forestry legislation provides a robust framework around the existence, continuity and sustainable development of Romanian forests. The Romanian lawmaker regulated this matter and established the basic rules according to the concepts of management, conservation and sustainable development of forests. The most important collection of forest legislation includes normative acts which have been edited starting with the 19th century and are still being applied in Romania such as: The Forest Order for Bucovina; The Normative Act issued by the Emperor Joseph II in 1786; the Romanian Forest Codices of 1881; the Romanian Forest Code from 1910; the Forest Code from 1962; the Forestry Code from 1996 and the Forest Code from 2008, that was amended and republished in 2016, 2018 and 2020.

Currently, the Forestry Code of 2008 (Law no. 46/2008) updated and republished in 2020, as well as the related legislation is the general legal framework for the protection, conservation and sustainable development of the Romanian forests. This forest law aims to set up the general framework rules for the development and sustainable management of the Romanian forests, in order to improve the environmental and living conditions, regardless of the owner of the forests.

The main objective is the protection and conservation of forests, which is reflected by the elaboration of this forest law and by the establishment of the forestry regime. This gives the legal norms that make up the forestry regime an imperative nature, at the same time defining this terminology in technical and in forestry terms.

The obligation to comply with the forestry regime is stipulated for all the forest holders, without considering the form of the property right. The new legal provisions in the field of the control and enforcement of the forestry regime are in accordance with the European regulations regarding the obligations of forest owners. The Forest Code provides that all types of activities related to the forests are to be preceded by the precautionary phase and the prevention of forest degradation and destruction, as well as the damage to the integrity of the forest fund.

A novelty that was introduced by the New Forest Code regards the development and sustainable management of forests, and the preservation of the biodiversity of forest ecosystems through sustainable management measures. The introduction of the sustainable development and forests management concept expresses the need for a new approach to the development of Romanian forests, by recognizing the importance of the forests' quality and their services, through the awareness of the benefits and of the functions they fulfil.

In the context of sustainable forest management, certain legal provisions regarding the forest management, forest biodiversity conservation, forest regeneration and protection and insurance of forests' integrity are stipulated. Also, the legislation stipulated the main principles underlying sustainable development and the management of Romanian forests, principles that have been formulated and established at a global level.

A distinct aspect regarding the legal protection of the forests is represented by the set of special rules stipulated for their defence, in which the legal norms related to the forests' protection are emphasized, a safeguard that is ensured and exercised by the forest owners, according to the legal provisions.

The forests' protection is achieved in a special way, by imposing their guardianship for forest owners, with no distinction being made between the safeguarding of public or of private property forests. It is also established that the forestry staff in the exercise of these attributions is assimilated to the staff with duties involving the exercise of public authority. At the same time, for the purpose of the forests' protection, certain obligations for the prevention and extinguishing of forest fires are stipulated on behalf of forest owners, on behalf of forest institutions (which provide the management and forest services), as well as on behalf of prefects, mayors, local and county councils and competent authorities in the field of civil protection of the environment.

Romania has a long tradition in the forestry domain being one of the richest European countries in forest resources. These forests can have a public or private ownership status and they are all managed under the Forestry Code Law (R.P. 2008).

At national level, Urban and Land planning Law no. 350/2001, and the Urban Green Spaces Law no. 24/2007, and the Forestry Code (2008) are the main regulatory documents influencing the planning of urban forests. Equally important is that it applies to all forests.

Urban forests are important elements of the green infrastructure network. Cities are changing under economic development and the planning of open spaces is increasing in complexity, with a wide range of land uses which need to be managed together. Urban forests are strategic areas providing multiple benefits for the community and enhancing the quality of life.

Forests and green spaces are essential to the urban ecosystem and can mitigate temperature, decrease pollution, soil erosion, increase aesthetics and provide a place for recreation.

Urban forestry is focusing on the biodiversity and green infrastructures including an assessment of urban forests connectivity. The urban planning approach considers urban forest as part of the urban fabric and an essential element to achieve sustainable cities.

One of the designated urban green areas for a city are recreational forests, defined as forests with a specific infrastructure for recreational activities. One can also find forests planned for sanitary protection or for climate improvement purposes. Urban forest connectivity on the other hand is a topic missing from the urban planning process, while only elements of urban green infrastructures such as parks are sometimes designed to create a network and to connect with other areas.

The forest is a public property administered by the National Forest Administration Romsilva, autonomous national interest, under the authority of the state by the central public authority responsible for forestry, Forest Research and Management Institute "Marin Drăcea", and fold forestry established by the Autonomous Administration of State Protocol Patrimony.

The Forestry Code introduces the concept of forest-park. Forests-parks will be established at the request of the owner/manager of the forest, based on studies and the advisory opinion of the Technical Committee on Forestry. The arrangements allowed in forest-parks are hiking paths made from environmentally friendly materials.

It allows the construction of protection forest areas, at 50 m from the forest edge; also, the county and local roads serving recreational parks, theme parks and/or education are permitted.

1.4. Terminology

Biodiversity - The variability among living organisms from all sources, including inter alia terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part, this includes diversity within species, between species, and of ecosystems.

Conservation Status - The sum of the influence acting on a habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species.

Cost-Benefit Analysis - A technique designed to determine the economic feasibility of a project or plan by quantifying its economic costs and benefits.

Cost-Effectiveness analysis/Approach - Analysis to identify the least cost option that meets a goal.

Critical Natural Capital - That set of environmental resources which performs important environmental functions essential to human well-being, and for which no substitutes in terms of human, manufactured or other natural capital currently exist.

Cultural Ecosystem Service (CES) - All the non-material, and normally non-consumptive, outputs of ecosystems that affect physical and mental states of people. CES are primarily regarded as the physical settings, locations or situations that give rise to changes in the physical or mental states of people, and whose character are fundamentally dependent on living processes; they can involve individual species, habitats and whole ecosystems. The settings can be semi-natural as well as natural settings (i.e. can include cultural landscapes) providing they are dependent on in situ living processes.

Ecosystem - Dynamic complex of plant, animal, and micro-organisms communities and their non-living environment interacting as a functional unit. Humans may be an integral part of an ecosystem, although 'socio-ecological system' is sometimes used to denote situations in which people play a significant role, or where the character of the ecosystem is heavily influenced by human action

Ecosystem Services - The benefits - direct and indirect - that people obtain from ecosystems (MA, 2005; TEEB, 2010). The concept 'ecosystem goods and services' is synonymous with ecosystem services. The concept relates the benefits people obtain from nature to ecosystem processes and structures. In turn, ecosystem structures and processes are influenced by management in order to enhance the desired services.

Ecosystem service supply - The capacity of the ecosystem(s) to provide goods and services to people. This supply capacity does not considers the actual human demand for the services

Ecosystem service demand - The actual social need or demand for various goods and services provided by the ecosystems. When the demand is higher than the capacity of the ecosystems to supply a service it is called *unsustainable demand*. Furthermore, when the technologies employed to extract ecosystem services are destroying the natural capital the ecosystem service use is unsustainable.

Ecosystem service mismatch - The situation when the social demand and the ecosystem service supply does not match. Typically the human society does not recognize several ecosystem goods and services hence through management it erodes the ecosystems capacity to supply those goods.

Ecosystem service sinergies - The situation when several ecosystem services maniphest together. For example a forest and the nearby wood-pasture assures a wide range of ecosystem services synergistically.

Ecosystem service trade-off - When one ecosystem service type is extracted / appropriated / on the expense of other ecosystem services.

Governance - The process of formulating decisions and guiding the behaviour of humans, groups and organisations in formally, often hierarchically organised decision-making systems or in networks that cross decision-making levels and sector boundaries.

Green Infrastructure (GI) - A strategically planned network of natural and semi natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services (ES). It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings.

Human-Nature Connections (HNC) - Typologies of connections between people and nature. These were categorized in the following 5 groups: material, cognitive, emotional, experiential and philosophical. Tese were introduced in 2017.

Natural Capital - The elements of nature that directly or indirectly produce value for people, including ecosystems, species, freshwater, land, minerals, air and oceans, as well as natural processes and functions. The term is often used synonymously with natural assets, but in general implies a specific component.

Nature`s Contributions to People (NCP) - A new term (proposed in 2018) which acknowledges the range through which nature contributes to the wellbeing of people. It allows a less abstract and culturally contextualized definition of the concept of nature (contrary to the concept of ecosystem services where the term ecosystem is abstract). The recent academic literature uses the same broad categories for NCP as for ecosystem services.

Participatory Approach - Family of approaches and methods to enable people to get involved, share, enhance, and analyse their knowledge of life and conditions, to plan and to act, to monitor and evaluate.

Provisioning Services - Those material and energetic outputs from ecosystems that contribute to human well-being.

Public Good - A good where access to the good cannot be restricted.

Regulating Services - All the ways in which ecosystems and living organisms can mediate or moderate the ambient environment so that human well-being is enhanced. It therefore covers the degradation of wastes and toxic substances by exploiting living processes.

Relational values - Proposed in 2016 it refers to a set of values which explain the local identity, attachment of people to a place and land stewardship forms. Relational values are often treated within the umbrella of 'cultural ecosystem services' although calls were made to distinguish them as separate value domains.

Resilience - A measure of an (eco)system's ability to recover and retain its structure and processes following an exogenous change or disturbance event. If a stress or disturbance does alter the ecosystem, then it should be able to bounce back quickly to resume its former ability to yield a service or utility rather than transform into a qualitatively different state that is controlled by a different set of processes. For ecosystem resilience to be defined, the ecosystem must have a degree of stability prior to the perturbation. Resilience relates to return to stability following a specified perturbation.

Resistance - The capacity of an ecosystem to with-stand the impacts of drivers without displacement from its present state.

Service-Providing Unit (SPU) - The collection of individuals from a given species and the metrics of trait attributes (e.g., abundance, phenology, distribution) that are necessary for delivery of an ecosystem service at a desired level. The SPU can be quantified in terms of metrics such as abundance, phenology and distribution.

Stakeholder - Any group, organisation or individual who can affect or is affected by the ecosystem's services".

Stakeholder Analysis - Stakeholder analysis can be defined as a process that: i) defines aspects of a social and natural phenomenon affected by a decision or action; ii) identifies individuals, groups and organisations who are affected by or can affect those parts of the phenomenon (this may include nonhuman and nonliving entities and future generations); and iii) prioritises these individuals and groups for involvement in the decision-making process.

Supporting Services - Ecological processes and functions that are necessary to produce final ecosystem services. See also 'intermediate services' and 'ecosystem functions.

Urban - Environmental condition linked to high population density, extent of land transformation, or a large energy flow from the surrounding area.

Urban forest - a forest or a collection of trees that grow within a city, town or a suburb. In a wider sense it may include any kind of woody plant vegetation growing in and around human settlements. In a narrower sense (also called forest park) it describes areas whose ecosystems are inherited from wilderness leftovers or remnants.

2. ANALYSIS OF THE STATE OF THE ART

2.1. Basic data on the strategic area

Forest area

The project area is a 95.6-ha area of the forest “Lomb”. The Lomb forest is located in the NV part of the Cluj-Napoca city (Figure 1). The forest in the project area is owned by the municipality of Cluj-Napoca, which is an important factor in the general implementation of the strategy. A small part of the forest belongs to other owners. At present the attractivity of the Lomb forest is local, serving the neighbourhood in its close vicinity. This situation also creates opportunities for developing a special forest stewardship, where the local community informally owning and using the Lomb forest is empowered for its socially, environmentally and ecologically sustainable use and care. The causes that led to this special situation of the Lomb forest are multiple:

- its remoteness and overall low accessibility;

- low level of popularization;

- the industrial appearance in the vicinity, with anesthetic farms or car depots;

- the unwelcome reception of the forest due to multiple surrounding illegally deposited wastes;

- presence of some sheepfolds accompanied by sheepdogs.

During the last centuries, the area has always been forested, as it can be seen on old maps of the region. The above causes of the social and cultural isolation of the Lomb forest can be considered (and we suggest to be considered) as opportunities for strengthening the social and ecological linkages / ties between the people inhabiting the nearby vicinity of the forest and the forest.

Although the area is not part of any designated protected area it is an important link between the Natura 2000 sites designated around Cluj-Napoca. We consider that this link is created not only by the forest but with an equally high importance also by the surrounding pastures and scrubs. Recent reviews suggest that landscapes where the forests and grasslands are near-equally represented provide the highest landscape level of biodiversity and resilience. Therefore, within this document, although we focus on the forest, we also urge the consideration of the grassland buffer around the forest for its special and complementary biodiversity and ecosystem service supplies.

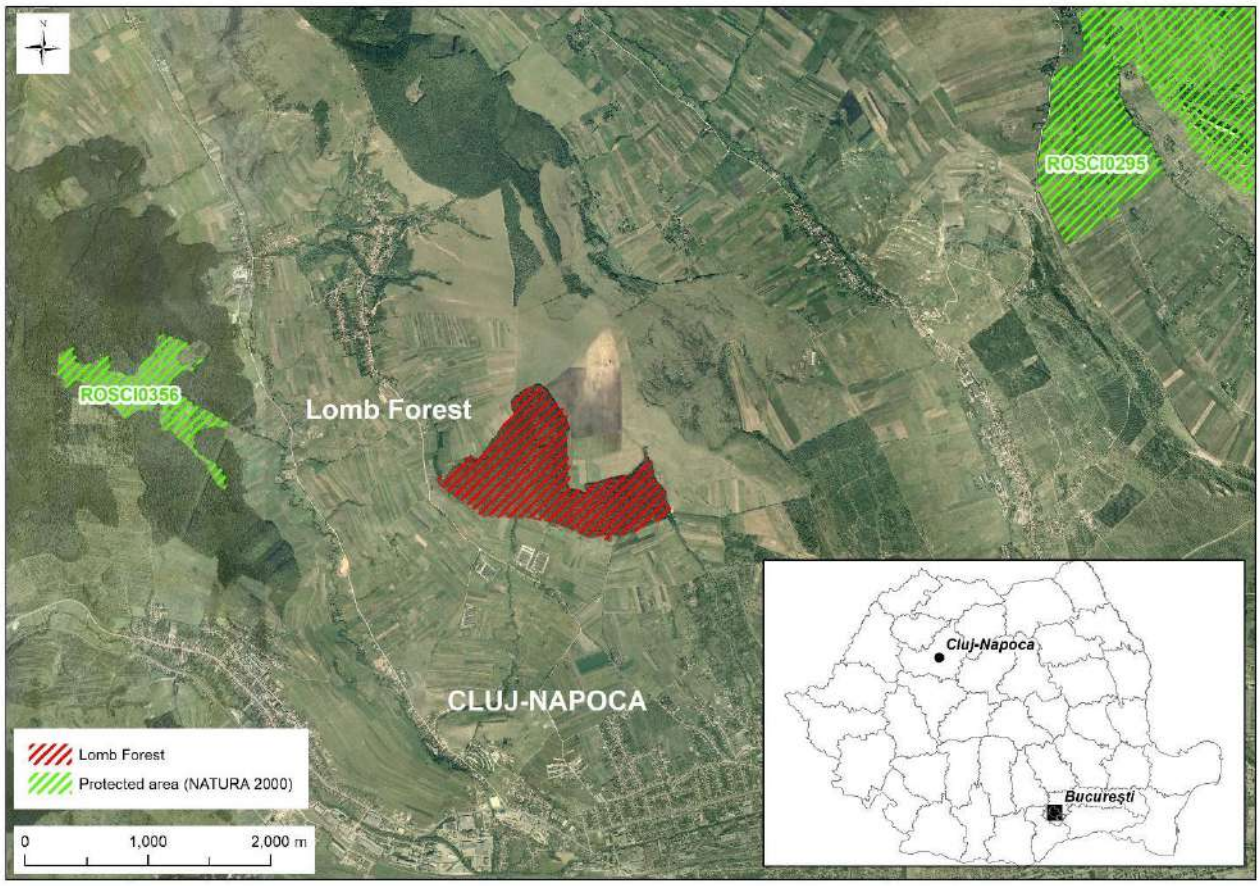

Figure 1. Location of the strategic area

The area is managed by the Cluj Forest District, which is in the close vicinity of the city of Cluj-Napoca, located in the North-Western part of Romania.

Cluj-Napoca, a city with a population of over 400,000 inhabitants, faces unprecedented expansion of the city limits and population. Within the context of urban sprawl, land is becoming an increasingly difficult resource to manage and preserve, and the local forests are no exception to the constant anthropic interference.

The forest is part of the U.P. IV Cluj-Napoca (UP-production unit), established as a result of the integration of forests owned by the Municipality of Cluj-Napoca. The total area of this UP is 202 hectares and as already mentioned it is managed by the Cluj Forest District.

The forest that is part of the U.P IV Cluj-Napoca is composed of:

- forest and areas designated to be forested - 182.8 hectares
- other areas - 19.2 hectares

Geographically U.P. IV is situated on the nort-western part of the Someșan Tableland. The Lomb area is composed mainly of quercinee species.

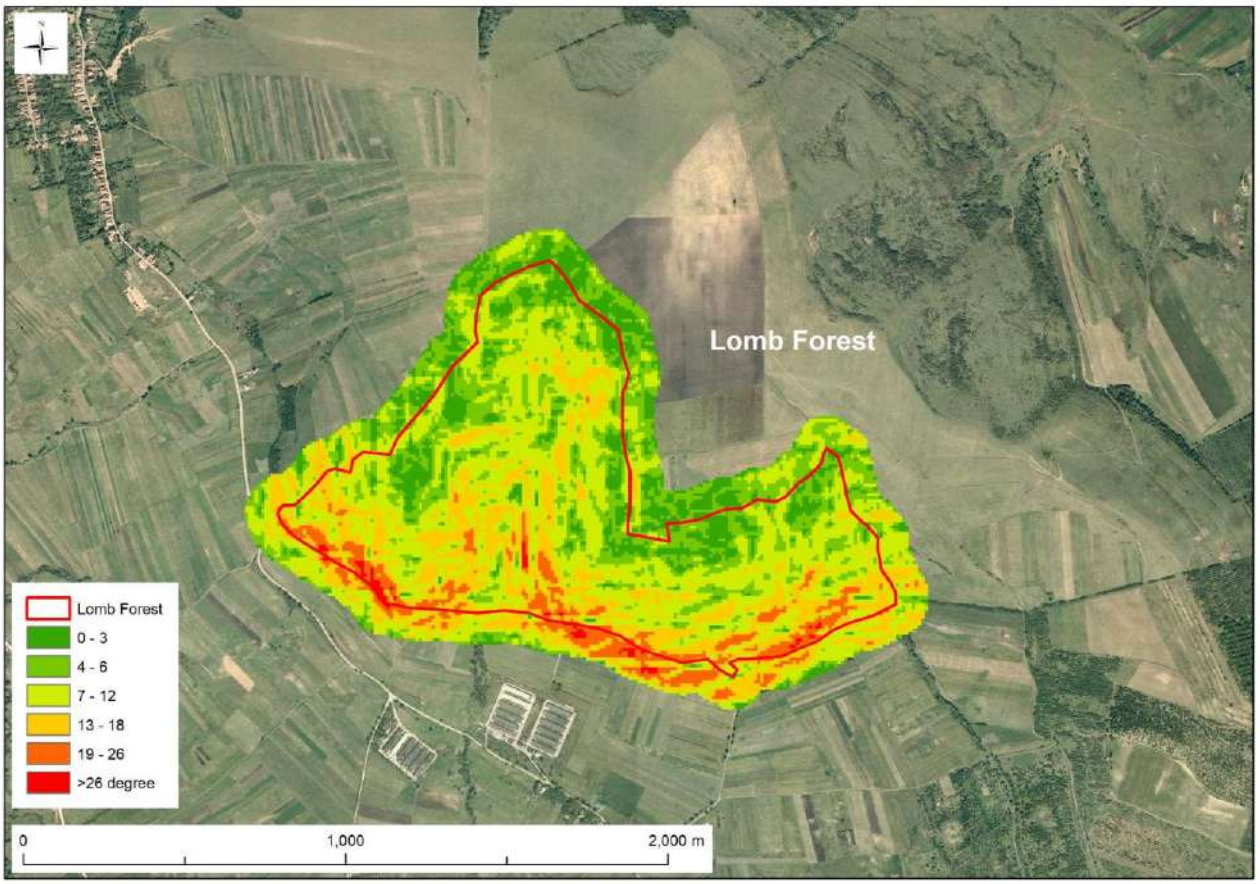

Figure 2. Slope map

Gradually, because of its vicinity to the city, the area became more and more populated and several new development areas with modern houses emerged. Now, it is considered to be a part of the city proper. The main open areas that encircle the area are used as pastures, but recently small buildings were developed. The project area consists of a sloped hillside between the elevation of 550m and 640m, with an average slope of 8 degrees, facing mainly towards west and south-west (see Figure 2).

Forests, site conditions, forest types, stand types

Based on the forest stands description provided by Cluj Forest District, the most part of the study area belongs to the *Forest with special protection functions (Functional group I)*. The overall diversity of the trees (i.e. in terms of species richness) is medium (with about 15-20 tree species) (Table 1). Higher diversity of trees could be found at the edge of the forest, but also along two valleys crossing them (Figure 3). In a large area of the forest a well-developed forest litter is noticeable, including dead trees (mainly Eurasian aspen) at various stages of decomposition, which indicates the soil formation process.

Figure 3. The shape of the forest in the north-eastern edge of the forest and in the nearby creek valley

The main native species to be found in the forest study area are Sessile oak (*Quercus petraea*) (68,9%), English oak (*Quercus robur*) (19.2 %) and Hornbeam (*Carpinus betulus*) (6,3 %). Some native species like Norway maple (*Acer platanoides*) and Silver lime (*Tilia tomentosa*) and non-native ones, like plane (*Platanus sp.*) and black pine (*Pinus nigra*), could be found in localized patches and occurs in homogenous stands, being plantations. The red oak (*Quercus rubra*) is another non-native species that could be found in this forest, but in isolation. Natural regeneration in the forest occurs mainly in case of Hornbeam, being shade tolerant (Figure 4).

Figure 4. Forest stands including plantations

Table 1. Tree species identified through the field survey in the forest study area

No.	Tree species	
	Scientific name	**English common name**
1	*Acer campestre*	Field maple
2	*Acer platanoides*	Norway maple
3	*Acer pseudoplatanus*	Sycamore maple
4	*Carpinus betulus*	Common hornbeam
5	*Fraxinus excelsior*	Common ash
6	*Pinus nigra*	Black pine
7	*Platanus sp.*	Plane
8	*Populus tremula*	Eurasian aspen
9	*Prunus avium*	Wild cherry

10	*Quercus petraea*	Sessile oak
11	*Quercus robur*	English oak
12	*Quercus rubra*	Red oak
13	*Robinia pseudoacacia*	Black locust
14	*Salix caprea*	Goat willow
15	*Tilia cordata*	Small-leaved lime
16	*Tilia tomentosa*	Silver lime

The diversity of the native trees is relatively high in ecological functional traits (i.e. insect and wind pollinated species, and species tolerating a wide range of environmental conditions - including sensitivity to light, shade and soil dryness - some including resistance to pollution). This response diversity of trees is key for the resilience of the forest, therefore we suggest maintaining it. However, there are no species with conservation concerns in this forest. As a management recommendation, we suggest the removal of black locust and black pine, because recent studies showed that these species create underground deserts due to the excessive evapotranspiration and in their increased vulnerability to climatic variations in the near future. The shrub species in the forest and on the pasture (especially *Crataegus* sp.) deserves more attention because of their biological and evolutionary significance. The woody vegetation of the surrounding forest is also worth exploring due to the possibility of finding new species of trees to complement the landscape level richness of the tree species pool.

The total standing volume of trees is about 160 m^3 /hectare. The sessile oak clearly dominates the ranking in terms of volume per tree species (89 %). The mean productivity is 1.95 m^3/ha. The most productive

species in the area are Common hornbeam (3.11 m^3/ha) followed by Sessile oak (2.28 m^3/ha). Usually the average tree height is about 15-20 m, reaching in the case of older specimens at 22-23 m.

Based on forest stands description, a small part of about 6.5 % of the forest is young (20-35 years), otherwise the tree age exceeds 60-70 years, reaching in some stands 115 years. However, older isolated tree specimens belonging to English Oak, Sessile oak and Wild cherry could be noted in the study area.

We also highlight the cultural, natural and economical values of the old coppices (Figure 5).

Figure 5. Old oak coppice with 5 old and 1 young stem. The special feature of this tree is that the stems are individualised due to the decomposition of the old stump. Such oak trees are considered overall rare across Europe and they have high cultural and ecological values.

Management

In the past, the forest was mainly managed for timber production (for firewood or industrial reasons). The oldest coppices (see e.g. Figure 5) represents a legacy of this ancient forestry, which tends to be recognized in the European Union for its cultural and natural significance. In the last decades, only hygienic and

conservation cuttings, thinning, cleanings and small-scale plantation for completion have been carried out, adding only a few accidental cuttings. Recently, this spring (i.e. 2021), there were significant tree cuttings on plot 52 (see Table 2 for details regarding the proposed activities). Non-timber products such as forest fruits and especially mushrooms are currently the main resources harvested from the forest. However, there is no control over this activity and the collected amount.

Table 2. Proposed forestry activities (data from the Cluj-Forest District)

No.	Plot code	Surface (hectares)	Main species	Forestry interventions
1	51A	*24.9*	*Quercus petraea*	Conservation cutting (regenerating forest)
2	51B	*1.5*	*Quercus petraea*	Hygiene cuttings
3	51C	*1.4*	*Tilia tomentosa*	Completion
4	51M	*0.3*	-	-
5	52	*7.8*	*Quercus petraea*	Cleaning
6	53A	*14.0*	*Quercus petraea*	Hygiene cuttings
7	53B	*2.0*	*Quercus petraea*	Hygiene cuttings
8	53C	*2.7*	*Tilia tomentosa*	Cleaning
9	53D	*0.9*	*Carpinus betulus*	Hygiene cuttings

10	53E	*4.8*	*Quercus petraea*	Conservation cutting (regenerating forest)
11	54A	*22.5*	*Quercus petraea*	Hygiene cuttings
12	54B	*2.1*	*Carpinus betulus*	Cleaning
13	55	*10.7*	*Quercus petraea*	Hygiene cuttings

Forest accessibility

The forest is crossed by two important forest roads located in the eastern and western side. Accessibility can also be done on paths or other poorly maintained forest roads.

Impacts, problems

There were some impacts in the forest, mainly associated with other sources than those related to forest management.

In the last decade, in the cold season, there have been reports of some tree falls or multiple broken branches (mainly for softwood trees) as a result of the abundant wet snow falls or of frozen rain, the latter having a low frequency. Also, tree falls have accompanied the summer storms (Figure 6). These natural tree falls represent an opportunity for biomass formation, the increase of saproxylic biodiversity creating patches for natural regeneration and providing overall a 'wilded' patch to the forest, where the regulating and supporting ecosystem services are delivered in particular.

Figure 6. Tree felled by the storm

Sheep grazing has been practiced for many years in the eastern and northern neighbourhoods of the forest, the edge of the forest acting as a refuge for animals on hot summer days. In the last period, flocks of sheep were observed crossing the forest, a context that leads to the degradation of litter, soil and thus local biodiversity (Figure 7).

	
Flocks of sheep crossing the forest	Degradation of litter and soil along the sheep path

	
Permanent sheepfold in the southeast of the forest	Temporary sheepfold shelter in the northern part of the forest

Figure 7. Pictures showing the sheepfold activity in the Lomb Forest and neighborhood

We also highlight the huge amounts of garbage found along the forestry roads and in the bushes at the edge of the forest (Figure 8).

	

Figure 8. Waste dumped at the edge of the Lomb forest

Beside the wood production ES has been limited for the past decade, there are traces of recent cutting activities.

Gradually, because of its vicinity to the city, the area became more and more populated and several new permanent and holiday homes emerged in the southern and western border of the forest, including some access road arrangements (Figure 9).

Figure 9. New access road opened at the southern edge of the forest

In this document, we propose that the damages caused by natural disturbances (e.g. weather conditions, wildlife) be capitalized, at least in some key areas (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 triggers the hollowing process in the wood, which in turn created optimal habitats for dead wood dependent organisms (Figure 10). Studies showed 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.

	
Traces of woodpeckers activity on dead wood	Temporary shelter for mammals in the base hole of an old ash

Figure 10. Dead and hollow woods dependent organisms

The main land use is forest with only small patches of open spaces (Figure 11, Table 3). The main native species to be found are sessile oak (*Quercus petraea*), oak (Quercus robur) and hornbeam (*Carpinus betulus*). The other native species present are *Acer pseudoplatanus*, *Tilia tomentosa*, *Populus sp*. and *Salix sp*. The project area harbors over 15 native tree species. The non-native species are *Quercus rubra* and *Platanus X acerifolia*. They are found throughout the forest but mainly in parcel 53.

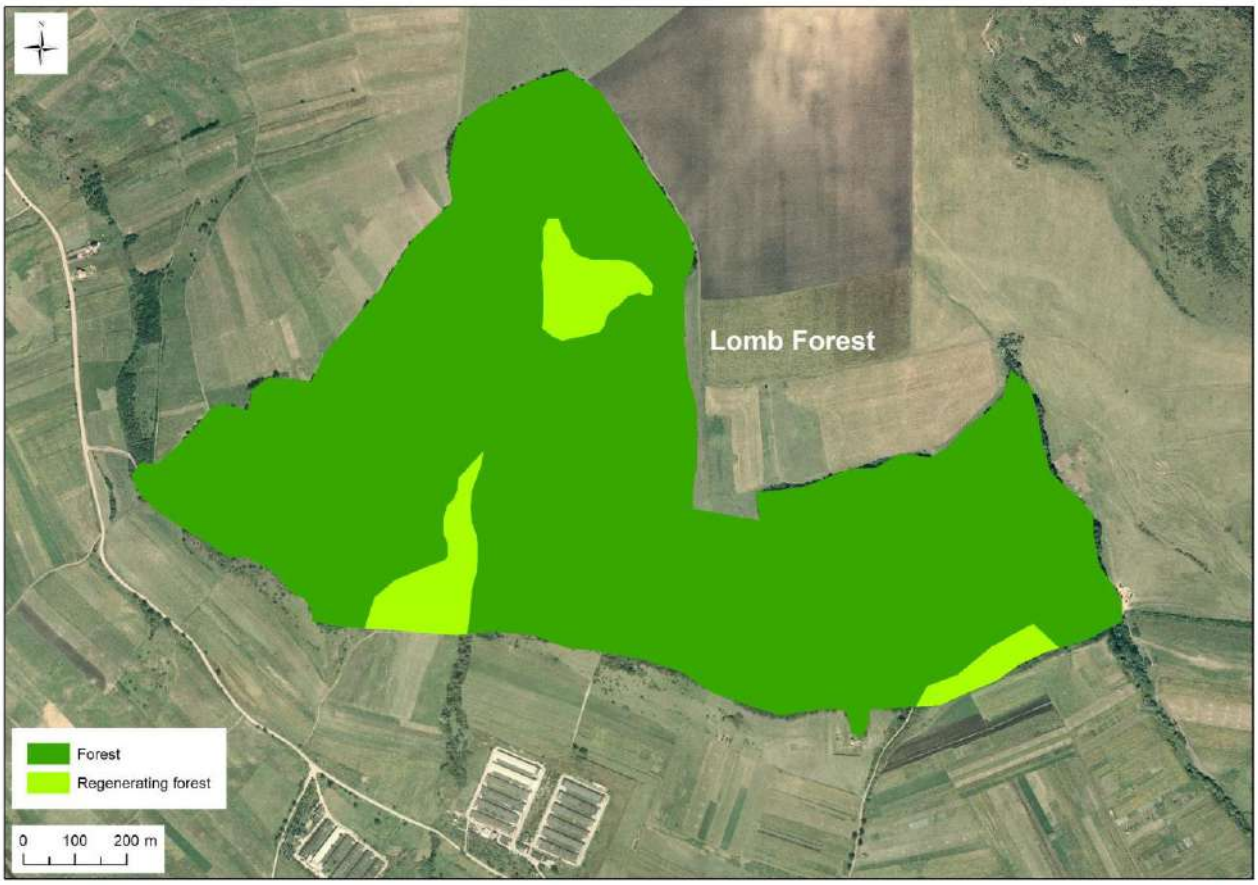

Figure 11. Land use types in the project area

Table 3. Land use types and covered area

No.	Landuse	Area (hectares)
1	Forest	105
2	Regenerating forest	4

The forest in the project area is owned by the local council of Cluj-Napoca (Figure 12), but not entirely. To the north, there is a small area that has a private owner. The local council of Cluj-Napoca is an important factor in the general implementation of the strategy. A small part of the forest has been cut in recent years and now it is naturally regenerating.

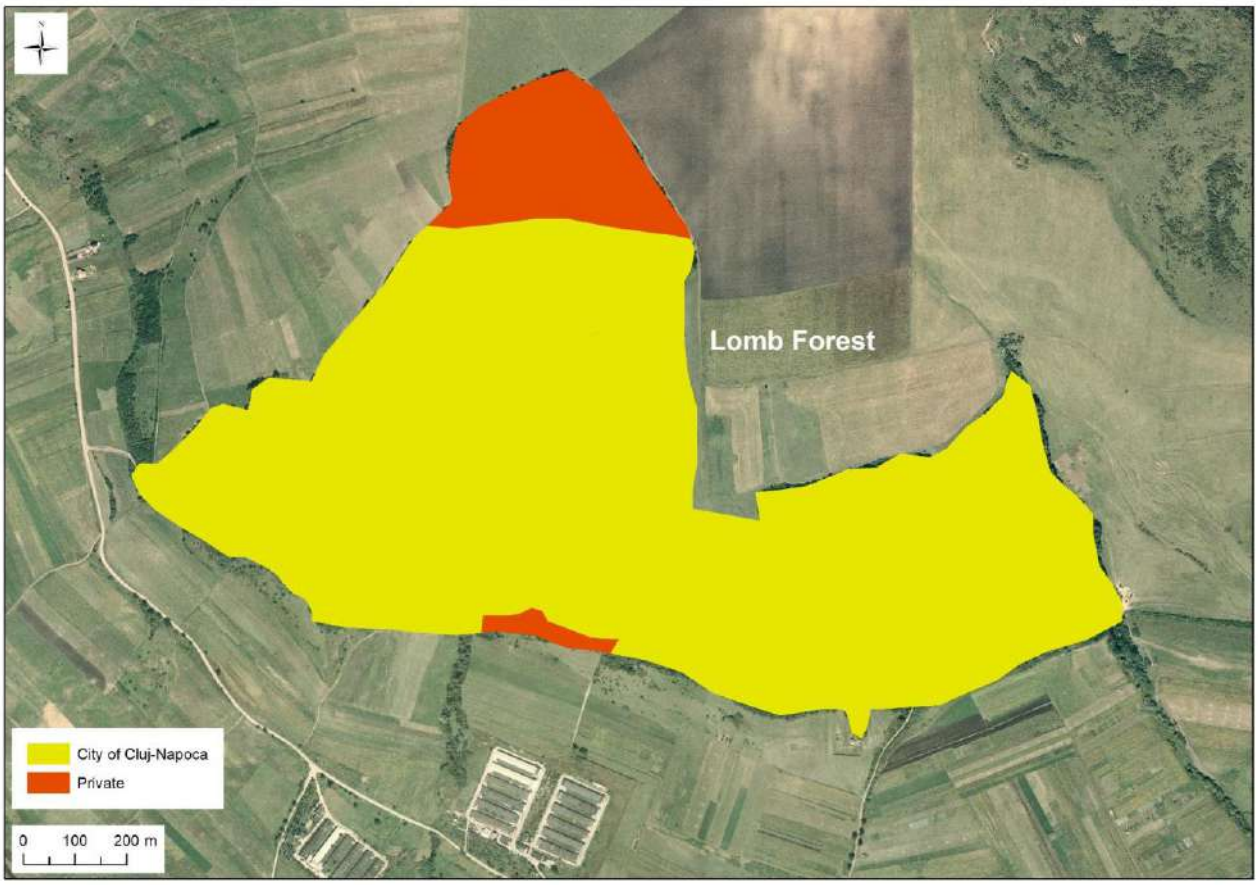

Figure 12. Land ownership

2.2. Ecosystem services in UPF

In this strategy, we aim to address all four types of ecosystem services (ES) mentioned in Table 4. In the following, we will describe these ES and highlight why they are important for our UPF. Before we address the ES, we would like to highlight the specific context and history of the UPF addressed by our project: the forested area developed as a result of centuries-long human-nature interactions, the forest being highlighted on the old maps of the region. Several and different types of ES addressed below are synergistically maintained by the extensive forestry practices as well as the nature friendly human activities (recreation) currently carried out in that forest. Therefore, in the text below we will often refer to the interconnected nature of human actions and several types of ES.

Forest grazing is now forbidden by Romanian law. Nevertheless, grazing is still practiced in the forest and we currently see the evidence of these actions. Other past human activities, however, left their legacies on the trees and can be appreciated nowadays for their cultural, aesthetic and natural values (see e.g. the coppices, Figure 5). In this context, it is worth mentioning that several species of international concern (being protected) depend on the human actions implemented in the past (e.g. traditional forestry, coppicing), as well as present (e.g. the conservation and protection of old hollow trees).

Because several ES are strongly interrelated and synergistically maintained by extensive management and human actions in this forest, the conceptual approach to address our system is integrative (rather than segregative). The spatial overlap of some ES can be - and generally is - high, several ecosystem services being present in bundles. In such a situation delineating clear spatial boundaries for

various ES within the forest area will over simplify the ES potential of this system and could result in management plans with adverse effects on some ES. Although we will provide ES maps as requested by this project, the reader should interpret them carefully. We will highlight these aspects when addressing the various types of ES below.

Provisioning ES

The broad provisioning ES type for which the forest was managed is timber (mainly firewood for households). Besides this ES the local community sometimes use the seasonally available non-timber products such as mushrooms and forest fruits.

While the above-mentioned timber and non-timber products have direct consumptive values, we would like to mention that the extensive (nature friendly) use of these resources during the past century allowed several biodiversity elements and keystone ecosystem structures to persist (these being part of the supporting ES) in the targeted forest parcel.

Within this production forest there is some plantation patch (non-native trees) for production and there are several forested areas, located mainly at the forest edge, with exceptionally high natural and cultural values with native trees characteristic for this biogeographic region (mainly *Quercus robur, Carpinus betulus)*

The key message to take home for the management strategy is to maintain the high multifunctionality of the selected forest (Figure 13 and Figure 14) by carefully identifying those ecosystem components which have high socio-cultural and natural values and maintaining these values while extracting the provisioning ES. The below figure highlights the high socio-economic and natural potential of this production forest and the shown examples point towards the need of further zoning, in order to identify those regions where special care should be allocated to not compromise the high natural and cultural values of the forest when extracting timber.

	
Plantation of Red oak, a non-native timber tree in the target area. While the economic value of this plantation is high (i.e. provisioning ES), the capacity of this patch to provide diverse ES (except for carbon sequestration as regulating ES) is relatively	Forest areas with native trees and natural regeneration in the study system. The project area has several wild or high biodiversity value places. In such cases the native broadleaved forest has a pronounced vertical structure with natural regeneration and open

low. Nevertheless the biodiversity and restoration potential of such places can be moderately high and the ES provision potential can be enhanced with environmental friendly forestry.	patches with intense light. These features provide high biodiversity, resilience and aesthetic values to the ecosystems, hence simultaneously enhancing several ES, including provisioning (mushroom, fruit), aesthetic/cultural (beauty, colourful flagship species), regulating (carbon sequestration and soil formation) and supporting (high biodiversity) ES.

Figure 13. Short characterization of forest stands with high natural and economic potential in the targeted forest.

The ES delivery potential of established forest stands versus the regenerating forest stands and selvage area does show differences. The strengths of ES delivery in the two forest types and also the ES tradeoffs associated with different activities and potential uses for the forest are not the same for the three strategic areas (see Figure 17). We suggest that the managers should use a holistic approach to the management of this system, where the economic and other intangible values as well as the supporting ES are maximized. Forest stands with high natural values should be maintained primarily because of their potential for delivering several ES, while the other areas should be valued accordingly. A more complex analysis is required in order to better understand the supply and demand for different forest stands and selvage area (from an ES point of view). Ideally, such an analysis is based on a detailed analysis by experts but also non experts (transdisciplinary approach).

Regulating ES

The regulating ES, such as mentioned in Table 4, are overall strong, although local variations may exist in specific ES due to the structure (biodiversity, age) of the forest stands. Although we did not assess the regulating ES specifically, it is well known, from the scientific literature, that forests are also carbon stocks (hence they contribute to climate change mitigation) and they play a key part in controlling the water flow at local level (water retention) as well as the soil erosion. Furthermore, reforestation activities are considered key aspects for reducing greenhouse gases and fighting against climate change. The forest site addressed in our study has the profile for a maximal contribution to all of these regulating ES: the overall tree density ranges between cca 300-800 trees ha^{-1}, the overall diversity of the trees (i.e. in terms of species richness) is medium-high (with more than 15 tree species), the vertical stratification of the forest is well pronounced including many area with shrubs, the natural tree regeneration occurs in several places of the forest (mainly for hornbeam) and the well-developed forest litter (which also includes dead trees at various stages of decomposition) is present in a large area of the forest (which indicates soil formation). The management interventions should consider the maintenance of the above-mentioned ecosystem features in order to secure those ecosystem processes which deliver the regulating ES and to stop the grazing of the forest that damages the litter and the formation of the soil. Most of these ES can be maintained and enhanced by adopting an environment and nature friendly forest management strategy.

Supporting ES (biodiversity and habitats)

The forest strategic area has high natural values. The main reason for its high natural values is related to the ecosystem structure. The forest has high spatial heterogeneity (horizontal and vertical) which

allows a diversity of conditions regarding light and humidity. The horizontal heterogeneity is higher especially at the edge of the forest and around the small valleys that cross the area (Figure 15), otherwise being quite homogeneous, prevailing the English oak and hornbeam (Figure 16). In terms of vertical stratification there are many patches where the brushwood and shrubbery are clearly highlighted. The diversity of niches translates into a high diversity of wild species. For example, the number of bird species within the target forest parcel is around 35-40 species, while those of vascular plants are 100 species, and there are at least 4 species of amphibian and reptile. The number of mammal species is around 20 species, including bats. The diversity of animal species depends on the quality of the forest edge and the connectivity with the open habitats surrounding the forest, which represents feeding grounds for birds, herbivorous mammals and for bats, and also provide breeding habitat for amphibians (pond and wells used for livestock). It is also important to mention that the forest site targeted for this project has several old trees (mainly English oak, but also Wild cherry, Ash and Small-leaved lime), which are biodiversity surrogates (one old tree can represent habitat for hundreds of invertebrate and vertebrate species) (Figure 14). From the perspective of the resilience and ES provision of this ecosystem it is important to mention that besides the *high species diversity*, there is also a high *functional diversity* of the organisms. For example, the insectivorous bats, amphibians and birds contribute to pest control in the forest ecosystems – this being also recognized by the conventional forestry literature. Furthermore, the insect pollinated plants contribute to the maintenance of pollinators. Hotspots for some of these groups are those areas where human activity is more limited and natural processes dominate. The maintenance of high functional diversity as well as high species diversity in the selected ecosystem should be a key strategic component of the management of this site.

Wild-cherry - 320 cm in girth - one of the largest wild cherry tree in Romania	Old Field maple tree of about 240 cm in girth
	
Small-leaved lime of almost 300 cm in girth with clear signs of old age	English oak (323 cm in girth) - maybe the oldest tree in the forest

Figure 14. Representatives large old trees in the Lomb forest

	

Plantation of Red oak, a non-native timber tree in the target area. While the economic value of this plantation is high (i.e. provisioning ES), the capacity of this patch to provide diverse ES (except for carbon sequestration as regulating ES) is relatively low. Nevertheless the biodiversity and restoration potential of such places can be moderately high and the ES provision potential can be enhanced with environmental friendly forestry.	Forest areas with native trees and natural regeneration in the study system. The project area has several wild or high biodiversity value places. In such cases the native broadleaved forest has a pronounced vertical structure with natural regeneration and open patches with intense light. These features provide high biodiversity, resilience and aesthetic values to the ecosystems, hence simultaneously enhancing several ES, including provisioning (mushroom, fruit), aesthetic/cultural (beauty, colourful flagship species), regulating (carbon sequestration and soil formation) and supporting (high biodiversity) ES.

Figure 15. Representatives large old trees in the Lomb forest

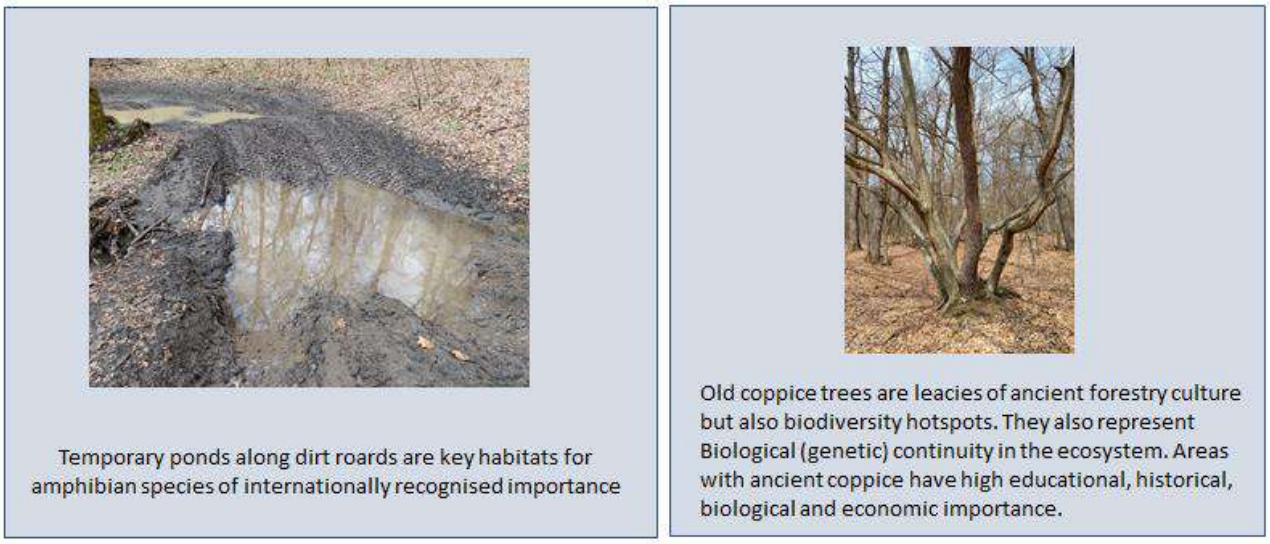

Figure 16. Old coppice trees are biodiversity as well ES hotspots in the forest addressed within this project. These are ES hotspots because the high habitat value of these structures within the forest is dependent on a specific human management (which was implemented to extract provisioning and other ES). Temporary ponds are also important in the context

Cultural ES

As stated above, 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 the ecosystem structures which were created by human actions and are highly biodiverse and have historical values as well. Furthermore, we will emphasize the recreational, educational sports potential of the addressed forest. Some of these values are increasing as the urban society of Cluj-Napoca increasingly recognizes the value of 'nature' for their everyday life. Hotspots of cultural ES are presented in Figure 16 above.

In our study area, the cultural ES are closely related to the dirt roads, where activities like walking, running and biking are occasionally conducted. Most of the ancient coppice trees are situated across these roads.

The study area provides a great potential to understand how natural/wild processes shape the ecosystems' structure. These are also cultural ES that are mostly concentrated on the areas where human impact is low or absent (at least for the past decades).

The educational importance of the area is high in all its parts. By just having a short walk, students and other interested groups can learn about the sustainable forest strategies as well as about the ways in which the human-nature interactions can result in high socio-cultural and natural value ecosystems.

Table 4: Summary of the most important ES

Ecosystem service (ES) – area (ha) and % of entire forest area – only 1st rank and 2nd rank	**Individual objective/ES**	**Area (ha) and % of entire forest area**
Provisioning ES	11_Timber production	
	12_Non-timber products	96.4 ha, 100%
	13_Provision of drinking water	
Regulating ES	21_Local climate mitigation	100 ha, 100 %
	22_Local air quality	100 ha, 100 %
	23_Protection against noise pollution	
	24_Regulation of floods	100 ha, 100 %
	25_Protection against erosion	41,15 ha, 41,15%

	26_Waste-water treatment	
Supporting ES	31_Nature protection / habitats for species	100 ha, 100%
Cultural ES	41_Recreation and tourism	100 ha, 100%
	42_Scientific / educational	100 ha, 100%
	43_Cultural heritage	100 ha, 100%

2.3. Target groups

Recreation and tourism users

The targeted forest is visited every year by less than 1000 of people. The visits are made especially during the weekends or holidays and in the hot season. The visitors of the forest are mainly mushroom pickers and recreational walkers. These users are almost all local residents. Mountain biking is rarely practiced in the area. There are no marked paths, even though there is a great potential for biking. The tourists access the area by personal car, by bike or on foot for those nearby. As more and more people are moving out of the city to the surrounding villages (ex. Popesti), the demand for natural recreational areas in the vicinity is constantly growing.

Forestry

The local forestry administration is a key stakeholder that needs to be involved in the management of the area.

Scientific community

Local scientific knowledge is important, therefore scientists should be involved in all the activities related to the management of the Lomb forest.

Local NGO

Local environmental NGOs are interested in the area and usually the people from these groups have a good expertise regarding the problems of the area. A special culture, oriented towards the green infrastructure of the city is rapidly evolving and they are showing greater interest toward the peri-urban forests.

3. THE STRATEGIC PRIORITIES

Provisioning ES

Non-wood forest products

1.Highlight the traditional activities related to mushrooms and forest fruits

Priorities:

- Improve the practice of mushrooms and forest fruits harvesting. This practice is linked to Cultural ES.
- Control the amount, the time and the harvested species in order to maintain a high diversity of the species.
- Inform visitors about the mushroom species existing in the forest and their palatability.

There is a need to raise awareness around these cultural practices in order to develop a sustainable strategy. The importance of this can be highlighted by guiding and informing people who conduct this activity. There are important legal aspects related to that. The collection of forest fruits and mushrooms is regulated by law, but very few people take this into account when harvesting for personal use.

<u>Regulating ES</u>

Local climate mitigation, Erosion prevention, Regulating of floods, Local air quality

2.Control the erosion and maintain the climate regulating service

Given that the current state of the forest is exceptional, we propose the maintaining of this state, which would be the ideal way to preserve the forest capacity to mitigate climate change and contribute to regional climate regulation. There are two main gullies in the forest and both are quite well developed, but also they are kept in control by the forest vegetation. The management practices should aim to maintain as much water as possible in the forest, given the fact that water scarcity is a main social and environmental issue in Europe and in Romania as well.

Considering that the two gullies are so well developed, we propose the creation of a path that goes along or even crosses these gullies in order to better integrate them in the forest system.

The forests around Cluj are very important in the context of maintaining the air quality of the city. Recently, there were a lot of concerns related to this, because the city is facing increasing traffic jams.

<u>Suporting ES</u>

Nature protection

3.Develop an integrated strategy for the protection of species and habitats as they are at the base of all the 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 found in the forest. This strategy will address several issues of high importance:

- Develop a network of small ponds. Build them up, if necessary, in order to sustain the amphibian populations and provide habitat for the species present in the vicinity, but not inside the forest.

- Maintain the areas with high natural values. Conserving these high biodiversity areas will assure that the species will have a refuge and these areas can act as sources for population growth as well. These areas also include keystone habitat structures, like wetlands, large old trees, hollow or dead

trees (standing or falled). 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, the natural ecosystem processes such as tree regeneration and litter formation. This refers also to 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. Include artificial structures to enhance the habitat offer for species dependent on tree hollows (birds, bats, arboreal rodents).
- When considering the area of interest, keep in mind that the functioning of the ecosystem is maintained also by the nearby area, which includes the surrounding pasture, scrub and connections with other natural areas in the close proximity.
- Develop/maintain ecological corridors in the area.

Cultural ES

Recreation and tourism

4.Develop a network that will facilitate the forest access and experience

The network should include:

- Bike trails and support for nature friendly biking
- Walking and running paths
- Birdwatching facilities
- Walking bridges over the major gullies

Scientific/Educational

5.Develop a scientific infrastructure addressing scientists and students

- 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.

6. Develop a valorisation networks for coppice and large old tree

- Consider the development of a large old tree and coppice circuit.

4. THE SPATIAL DEVELOPMENT CONCEPT OF UPF

The strategic map (Figure 17) is developed by taking into consideration the priorities identified for the area. Our vision is centred around the recreational, scientific and nature protection ecosystem services. The relatively small area does not allow for a lot of priorities to be included so the aim of the map is to accentuate the most relevant ecosystem services. This does not mean that the other ones should be excluded. As previously mentioned, we believe that the ecosystem services act in a synergic way and the spatial delineation is only an artificial construct allowing for the better management of the area.

The prioritised ecosystem services in the area are:

Nature protection

The field research proved that the area is highly biodiverse. There are some "wild" spots that need to be preserved. These are defined as having high natural value. Conserving the biodiversity of the area emerges as a key factor for this strategy. Currently, the people who visit the area are mainly interested in sports and recreational activities. We plan to increase ecological awareness, so that people will focus also on biodiversity and conservation. This is important for the young groups of children but also for university students who could use this natural laboratory.

Recreation and tourism

As already mentioned, recreation and tourism are key ES in the area. Recreational activities are the main current activities and the forest is important for the inhabitants of Cluj-Napoca.

The recreational and tourism activities should be promoted in order to increase the awareness about the area and nature in general.

It is important to note that these activities should not have a substantial impact on the forest as an ecosystem. This means that some elements like lightning posts, major buildings (even if of natural materials) should be avoided.

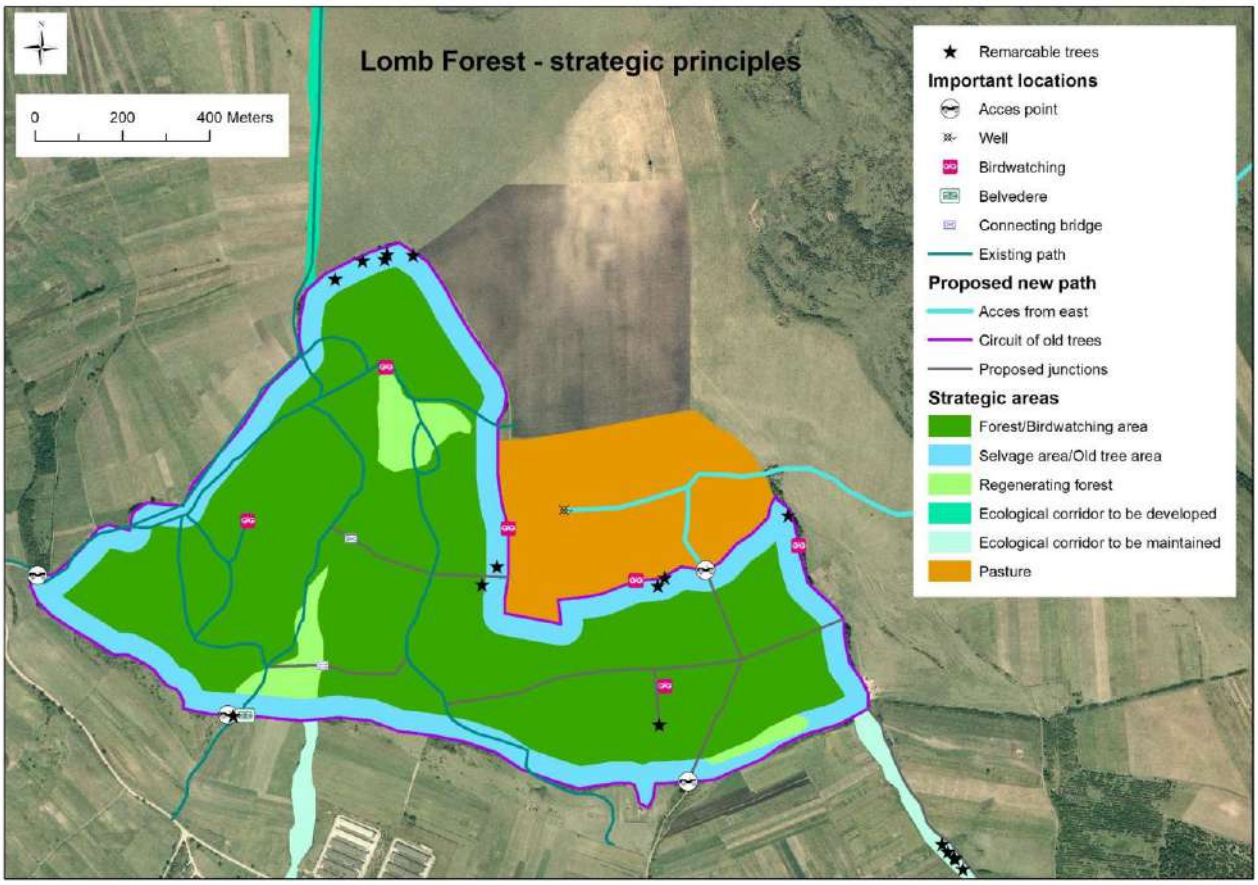

Figure 17. Lomb Forest strategic map

5. STRATEGIC MANAGEMENT OBJECTIVES AND GUIDELINES

5.1. Highlight the traditional activities related to mushrooms and forest fruits

Collecting mushrooms and forest fruits is a traditional practice in the area. However, there is no control over this activity and the collected amount. At the current moment the main species that are harvested are mushrooms. However, these are difficult to identify and also dangerous to consume.

There is a need to raise awareness around these cultural practices in order to develop a sustainable strategy. The importance of this can be highlighted by guiding and informing people who conduct this activity. There are important legal aspects related to that. The collection of forest fruits and mushrooms is regulated by law, but very few people take this into account when harvesting for personal use.

Strategic objective	*Highlight the traditional activities related to mushrooms and forest fruits*
State (SWOT)	*Advantages* Richness of mushroom species; Suitable areas, large public involved
	Weaknesses

	No control over this activity
	Possibilities The number of people involved
	Threats Impossibility to control the activity as access in the area cannot be restricted;
Guideline	**A special mushroom and forest fruit strategy should be developed. The strategy should address issues related to the public involved in the activity, like toxicity of the species, the importance of maintaining these species and the species richness. The guideline should focus on the local community and stewardship of the area**
Detailed directions:	- Identification of mushrooms and forest fruit species - Determine the collectable amount - Inform people about the species and the collectable amount - Raise awareness about the issues involved
Responsible entity:	Cluj Town Hall
Needed participation:	The Forestry authorities, NGO, Scientific community
Coordination with another ES:	Supporting ES by increasing the biodiversity; Cultural and Educational ES by involving the public
Positive outcomes:	Maintaining the mushroom and forest fruit species, Increase the public knowledge about this activity
Negative outcomes:	No
Legal basis	Ministry of Environment Order No. 410/11.04.2008

5.2. Control the erosion and maintain the climate regulating service

Given that the current state of the forest is exceptional, we propose the maintaining of this state, which would be the ideal way to preserve the forest capacity to mitigate climate change and contribute to regional climate regulation. There are two main gullies in the forest and both are quite well developed but they are kept in control by the forest vegetation.

Strategic objective	*Control the erosion and maintain the climate regulating service*
State (SWOT)	*Advantages* The climate and erosion control functions are already there. There is only the need to maintain them by not altering the structure and functionality of the ecosystem
	Weaknesses Gully erosion is difficult to control
	Possibilities The gully is controlled by local vegetation at this moment
	Threats Losing the climate and erosion control functions by deforestation, increased gully erosion
Guideline	**The climate function is maintained by simply maintaining the forest. Gully erosion will progress naturally so there is the need to prevent this**

	process, but the forest vegetation is keeping the process under control. There is the need to periodically evaluate the erosion rate
Detailed directions:	- Maintain the forest - Use anti-erosional structures if necessary in the future. Use these during educational and scientific events (as examples)
Responsible entity:	Cluj Town Hall
Needed participation:	Consultant (University), Local soil protection institution (OSPA)
Coordination with another ES:	Cultural ES
Positive outcomes:	Maintaining the climate control and reduce gully erosion
Negative outcomes:	No
Legal basis	No

5.3. Develop an integrated strategy for the protection of species and habitats as they are at the base of all The 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 found in the forest. The strategy should identify all the species in the area, establish the conservation status for priority species and design conservation measures. The number of bird species within the target forest parcel is around 35-40 species while those of vascular plants are 100 species and there are at least 4 species of amphibian and reptile. The number of mammal species is around 20, including bats. The diversity of the animal species depends on the quality of the forest edge and the connectivity with the open habitats surrounding the forest, which represents feeding grounds for birds, herbivorous mammals and for bats, and also provide breeding habitat for amphibians (pond and wells used by livestock). It is also important to mention that the forest site targeted for this project has several old trees (mainly English oak, but also Wild cherry, Ash and Small-leaved lime), which are biodiversity surrogates (one old tree can represent a habitat for hundreds of invertebrate and vertebrate species).

Potholes are artificial structures, but they are very important for the amphibian population. By developing these structures, the population will improve. There is the need for these artificial potholes but those can be designed in a manner that maintains as much as possible the natural appearance.

Also there is the need to maintain keystone habitat structures, large old trees, hollow or dead trees (standing or fallen). These habitats are important for mammals, birds, reptiles, amphibians and insects.

The functional groups are actually insect species that play a key role in the ecosystem; worldwide the groups have been reduced, with serious impacts at the ecosystem level. They play a key role in the ecosystem by helping the development of plants and by recycling organic matter.

Natural ecosystem processes are the base of the food chain and the entire functionality of the ecosystems depends on them.

The strategy should include ecological corridors as key elements. Also the pastures around the forest need to be considered.

Strategic objective	*Develop an integrated strategy for the protection of species and habitats*

	as they are at the base of all the Ecosystem Services in the area.
State (SWOT)	*Advantages* The high biodiversity. The number of species is quite high. The area could be used as a real life laboratory for the rehabilitation of ecosystem services by integrating the natural and small human interventions (small wetlands, artificial structures for certain species)
	Weaknesses The area will need maintenance from a natural point of view (maintaining the wet areas and the structures). The local community might not accept the changes
	Possibilities Key element illustrating the relationship between man and nature; Good scientific expertise in the project area
	Threats In the absence of a biodiversity conservation strategy, the tendency is to lose biodiversity and ecosystem services. A solution for this is related to the development of ecological corridors
Guideline	**The biodiversity strategy should be developed in partnership with relevant scientific organizations. All the relevant species in the area need to be identified. For the priority species, there is the need to design conservation measures. Potholes need to be developed and wooden nestboxes need to be installed. The insect species of the area need to be first comprehensively studied and conservation measures should be developed. There is a need to 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. There is a need to develop ecological corridors and connect the forest with the surrounding pasture and nearby forests.**
Detailed directions:	- Identification of all relevant species in the project area/ Create a relationship table between species and ES - Map key elements - Prioritize species and groups - Design conservation measures to address key elements: wetlands, functional groups, “wild” areas, natural ecosystem processes by conserving species and human activities related to them - Create ecological corridors and connectivity measures - Publish the strategy
Responsible entity:	Cluj Town Hall
Needed participation:	Scientific community, NGO, Forestry authority
Coordination with another ES:	This strategy is important for all other ES and can only have a positive impact
Positive outcomes:	Maintaining and increasing biodiversity and ecosystem services
Negative outcomes:	No
Legal basis	OUG 5/2007

5.4. Develop a network that will facilitate the forest access and experience

Mountain biking is widely practiced in the area around Cluj-Napoca, as is the trail running and walking. Considering that these activities are important for the local community in Cluj, a network of trails addressing these activities will prove beneficial. However, as good practices tend to show, local stewardship is a key driver for the development of the area. By increasing the accessibility, the visitors flow to the area will change. As a result, the local community can become disconnected from the forest. What is proposed, is to integrate the general activities into the local (neighborhood) framework and to involve the inhabitants of the area in the stewardship of the area.

There are a lot of cultural events in Cluj-Napoca, so there should be no reason why the Lomb UPF could not be linked to one of these events. The town hall is a key factor in order to promote the area and can organize competitions like a nature photo contest, geocaching events and so on.

Strategic objective	*Develop a network that will facilitate the forest access and experience*
State (SWOT)	*Advantages* A network of unmarked walking/running paths is already present in the area. A large population of birds
	Weaknesses Biking is practiced without regulations; Trails are not marked; Transport capacity, Weather
	Possibilities The area is not so much used by cyclists and trail runners. This opens the possibility to develop a specific strategy for the area. More focus should be put on the trail running part. A large proportion of trail runners use Faget forest for this activity but there is the possibility to attract some of those people toward Lomb Forest. There is a need to integrate bird watching into the preferred activities of people, especially walkers
	Threats Possible interactions between runners, walkers and cyclists; The people attracted to cultural events would not be interested in participating in nature events
Guideline	**The running paths should be developed considering the whole area, including also the nearby pastures and forests. The current walking paths are north-south orientated because of the two deep gullies. We consider that a west-east path should be developed by integrating two suspended bridges over the main part of the gully. Another important walking path needs to be developed at the forest edge, this being a circular path used for the valorisation of the large old trees that are found near the forest edge.**
Detailed directions:	- Identify the possible running and walking trails - Develop a map and information panels for bikers, walkers, runners - Merge cultural events with nature events in the area - Identify bird watching spots
Responsible entity:	Cluj Town Hall
Needed participation:	The Forestry authorities, Romanian Ornithological Society University, Association of cyclists, Event organizers
Coordination with	The trails could impact biodiversity, there is the need to avoid high natural

another ES:	value areas
Positive outcomes:	The popularity of the area will increase
Negative outcomes:	Possible impact on biodiversity
Legal basis	

5.5. Develop a scientific infrastructure addressing scientists and students

As UPF's tend to have an important role regarding the education of communities, it is important that this educational role is focused and organised. The administrator of the area should not be directly involved in the educational process, but should be able to offer the educational facilities. Other institutions will follow, and it is highly probable that by having the infrastructure in place, educational institutions will be attracted to the area.

As mentioned before one of the strategic priorities is targeted towards the development of rehabilitation measures, including the build up of artificial wet areas for amphibians, bird nets and platforms and also facilities for insects. The development of these structures is basically a real life laboratory and as such the forest can prove to be a good location for scientific studies.

Scientific events are important in order to promote the Cluj UPF as a model for other municipalities. Scientific events can be organized in partnership with universities from Cluj-Napoca and the field trip part could be organised in Lomb UPF.

Strategic objective	*Develop a scientific infrastructure addressing scientists and students*
State (SWOT)	*Advantages* Many educational institutions in Cluj; Large numbers of people interested in nature and conservation.
	Weaknesses The infrastructure should target only reconstruction measures, focusing on nature and ecosystem not on access and structures for people
	Possibilities A lot of young nature lovers, students and teachers; A scientific community orientated towards nature;
	Threats The rehabilitation infrastructure could not function as proposed; Local scientists will be interested only for a limited time span
Guideline	**The focal areas for the development of reconstruction/rehabilitation measures should be identified. Areas suitable for each target group need to be mapped and then developed under the supervision of scientists**
Detailed directions:	- Identify the locations for scientific and ecological focal points - Choose the best infrastructure for these locations; - Identify scientific events that are programmed in Cluj-Napoca - Create a partnership with the scientific event organisers - Establish the details about the event - Promote the removal of waste from the area
Responsible entity:	Cluj Town Hall
Needed participation:	The Forestry authorities, Architecture office, NGO, Scientific community
Coordination with	Supporting ES; The activity will have a positive impact on biodiversity

another ES:	conservation.
Positive outcomes:	Increase the education level of people; The knowledge of the area will be improved. There is the possibility that some papers will be published; Increasing the scientific knowledge about the Lomb UPF
Negative outcomes:	No
Legal basis	No

5.6. Develop a valorisation network for coppice and large old trees

As UPF's tend to have a major role regarding the education of communities, it is important that this educational role is focused and organised. The administrator of the area should not be directly involved in the educational process but should be able to offer the educational facilities. Other institutions will follow, and it is highly probable that by having the infrastructure in place, educational institutions will be attracted to the area.

As mentioned before, one of the strategic priorities is targeted towards the protection of species and ecosystems services but also on cultural values. These two often "meet" in the form of specific structures such as large old trees and coppice.

Strategic objective	*Develop a valorisation networks for coppice and large old tree*
State (SWOT)	*Advantages* Important cultural features like large old trees and coppice in the area
	Weaknesses These values are not recognized by the majority of visitors
	Possibilities A lot of young nature lovers, students and teachers. Large old trees are more present here compared to other areas.
	Threats Overuse of resources in the area by increasing the number of visitors.
Guideline	**Develop a strategy for the valorisation of large old trees and coppice. Not only for the Lomb area, but the entire municipality.**
Detailed directions:	- Identify the locations of coppice and large old trees - Develop a walking circuit based on the coppice and large old trees. - Establish the details about the event - Promote the removal of waste from the area
Responsible entity:	Cluj Town Hall
Needed participation:	The Forestry authorities, Architecture office, NGO, Scientific community
Coordination with another ES:	Supporting ES; The activity will have a positive impact on biodiversity conservation.
Positive outcomes:	Increase the degree of education in people;
Negative outcomes:	No
Legal basis	No

6 GOVERNANCE

We consider that, because the actual owner of the forest area is the municipality, the governance should be in the hands of the Local Council of Cluj-Napoca. This does not mean that the Local Council will be the only stakeholder involved; there is the need to establish a strong partnership with the Forestry authority, but also with the scientific community and local NGOs. These organisations could also help the City Council in order to obtain the necessary funding for the area.

Financing such an area is difficult and we consider that the financial analysis should be included in a separate study and defined in detail. The current proposed measures are not money consuming and as a result we are sure that the funding is available.