



Interreg



EUROPEAN UNION

Danube Transnational Programme

URBforDAN

URBforDAN Strategic part of Integrated multi-use
Management Plan
Avala, Belgrade



Developed by
City of Belgrade
Dragoslava Jovanovica 2
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1. Introduction

1.1 About the URBforDAN Project

Management and Utilization of Urban Forests as Natural Heritage in Danube Cities (with acronym URBforDAN) is an EU co-financed project, which was designed to deliver a change in urban forest management and utilization of ecosystem services (ES). URBforDAN project is being implemented in 7 Danube Cities – Ljubljana (SLO), Vienna (AT), Budapest (HUN), Zagreb (CRO), Cluj-Napoca (ROM), Belgrade (SRB) and Ivano-Frankivsk (UA). Its' implementation is closely observed by 3 associated partner cities – Prague (CZE), Sarajevo (BIH) and Podgorica (MNE), as well as by Food and Agriculture Organization of the United Nations.

Urban and Peri-urban Forests (UPF) in Danube Cities play extremely important role as “green city lungs” - preserving rich biodiversity of Europe and its vivid landscape. They also deliver many economically and socially important ecosystem services – UPF are key areas for experiencing natural and cultural heritage within cities, important tourist attractions, areas for recreation and high quality of living.

All URBforDAN Cities face similar challenges – all manage substantial NH areas (mostly UPF) within their city limits. Due to their characteristics they attract many users (citizens, tourists...), but also have many stakeholders (managers, owners, interest groups...) trying to manage those activities. Today, this is usually done without proper coordination of all stated key actors. UPF also lack appropriate infrastructure and equipment to cope with ever increasing number of users. Thus, UPF are under increasing pressure from diverse set of activities, arising conflicts and unsustainable use of resources – all leading to poor state of NH. Management of UPF in some cities is further challenged by the extreme fragmentation of the ownership (which is often mostly private).

This is why URBforDAN takes on the challenge of mobilization of key actors in URBforDAN Cities to ensure their active participation in integrated planning/management. Protection regimes, mapping/valuation of ecosystem services and development ideas will be combined through a participatory process to deliver Integrated multi-use Management Plans for UPF on strategic and operational level. UPF Danube Network will be established to strengthen the cooperation between key actors, ensure timely knowledge/best-practice sharing, dissemination/transferability of project outputs and enable further capitalization. UPF managers, owners and users will be equipped with management tools supporting multi-purpose use of UPF and exploiting new opportunities for sustainable development. Participatory Planning & UPF Management Guidelines will be developed, based on lessons learned and best practices used.

1.2 About URBforDAN Strategic Planning Guidelines

The overall aim of this document is to support URBforDAN partners in development of Strategic parts of Integrated multi-use Management Plans. This is not a comprehensive guide, but rather a support tool for Project Partners, providing them with a clear joint methodology / approach and an universal template. It was designed and developed by a team of experts from Slovenia Forest Service and external experts of the company ZaVita d.o.o.

2. A template for Strategic part of the Integrated Multi-use Management Plan (IMMP) with guidelines for its development

2.1 The objective of strategic plan

Strategic area of Avala is the northern forest of Sumadija. With its height of 506 m n.v. it stands out in the wider area of Belgrade. "Avala" consists of forests and land located on the territory of the administrative area of Belgrade, the city municipality of Vozdovac. The Gazda unit "Avala" consists of a forest complex consisting of two parts, a hill of Avala and a forest along the Belgrade-Ralja road.



Map 1. Area location



Map 2. Strategic plan area

On it is the only cinnabarite spot in Serbia. In its vicinity in 1894, a new mineral named after the place of avalivity was discovered. It is well-known for its mineral deposits from the ancient and pre-Roman times. Today, there are numerous remains of mining activity (swamps, tricks, etc.). Although the low mountain, however, is characterized by a diverse and specific pedological structure and favorable climate. It is extremely rich in vegetation and floristic elements. It contains phytocenoses with about 597 plant species

Avala has numerous monuments related to the history of the Serbian people. The monument to the Unknown Hero (a cultural good of exceptional significance) stands out, a monument to Vasa Carapic and a Russian military delegation. The protected natural good belongs to the territory of the city of Belgrade, more precisely to the municipality of Vozdovac. It includes 4 cadastral municipalities Ripanj, Pinosava, Zuce and Beli Potok.

Geographical location, specific natural and landscape values, diverse possibilities of use, as well as organized management of the territory of forests, is the reason why Avala is still a part of preserved nature. The total strategic area of the cashier's unit is 819.50 hectares.

Strategic area of Avala was separate into 32 departments. The number of sections in the Avala is 294 and 180 clearings. Average per section has 9 and 6 clearings. The total covered forest is 91% of the area. Untreated land participates with 9% of the surface.

Starting from the current situation, considering the needs to improve forest ecosystems in order to preserve and protect the environment, as well as general useful functions for the needs of the inhabitants of Belgrade, a city characterized by industrialization, traffic development, population growth, it is necessary to bring the forest into their functional state.

Following position and importance we defined a forest functions of this strategic area of Avala:

1. protection of nature (the area of exceptional qualities "Avala", (regime I and II and III degree of protection),
2. production,
3. health,
4. Recreational-tourist,
5. Educational-scientific,
6. land protection.

The forest management plan determines the type and scope of works on reconstruction and raising of new forests. The works on regular management are financed from own funds, reconstruction works are conditioned by the provision of funds from the wider community. In the case of regular maintenance, priority should be given to forest care.

2.2 Analysis of the state of the art

2.2.1 Basic data on the strategic area

The total area of Avala is 943 ha. Total forest covered portion is 91% of the area. Non-overgrown land occupies 9% of the area, while barren land (1.25ha) consists of quarries that are not functioning as stone exploitation ones. Other land includes roads, trim paths, transmission lines, space around historical monuments, various buildings and meadows used for recreational and tourist purposes, which occupy 8% of the area. Forest land, especially for afforestation, accounts for only 1% of the area.

The research area is formed from overgrown and non-grown state-owned areas in the territory of the municipality of Vozdovac. The total area of the state land is 819.50 ha where P.E. "Srbijasume" is the manager of the "Avala" protected natural property. Part of the area of the former parking lot occupied an area of 52 acres. By constructing the facility along the border of the forest in several locations, the facilities are in the process. According to the Law on Restitution, 15.54 ha of forests were returned to private owners. This area is formed from overgrown and non-overgrown state-owned areas in the territory of the Municipality of Vozdovac. The area was obtained on the basis of cadastral parcels allocated by the special act, the Law on Forests to the management and use of the Forestry "Belgrade", the Forestry "Avala", as well as part of the PE "Srbijasume".

In the Avala area, 23.10 ha of private ownership is registered as well as other users PE "Srbijašume", Ministry of Defence, TUP "Avala", City of Belgrade and city municipality.

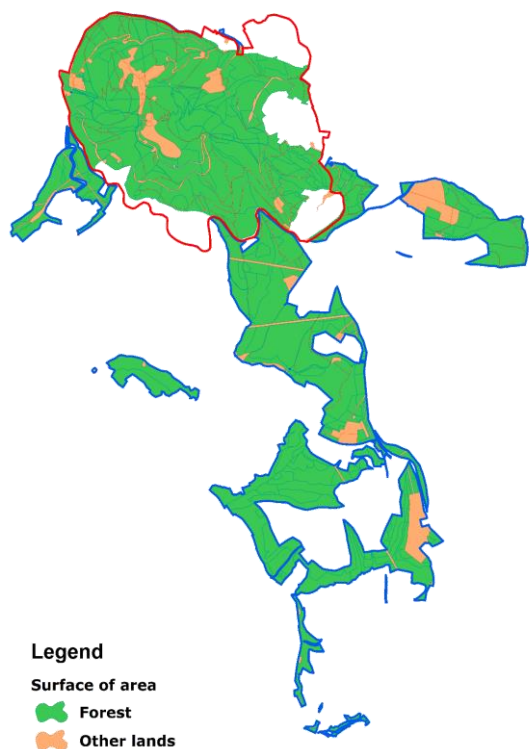
Avala is 15 kilometers away from the center of Belgrade and is territorially owned by the municipality of Voždovac. Residents of the Danubian villages used to be engaged in horticulture, cattle breeding and fruit growing, using their proximity to Belgrade to market their products on Belgrade markets. With the development of Belgrade as an industrial city, the population was employed and worked in many industrial plants (IMR, Rekord, DMB, Galenika, IMT), and additional income was generated from agriculture. In the second half of the twentieth century, many cottages around Avala were abandoned. With the development of communications, electricity, water supply and the acceleration of the pace of life, once a weekend settlement grows into place of residence.

2.2.2 Site classification on the strategic area

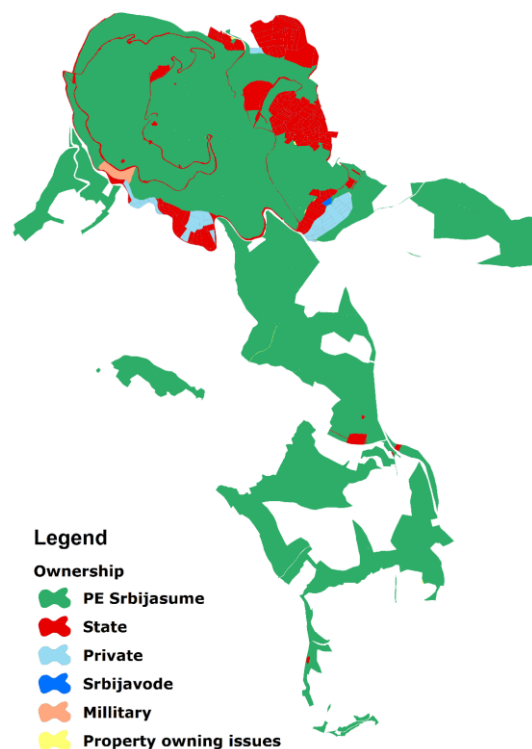
The habitat classification system is based on the EUNIS classification system (Lakušić, D. 2005). This classification was created with the aim of providing a universal and unified habitat classification for the territory of Europe.

For the purposes of the EUNIS classification, the term habitat is defined as: "a place inhabited by

plant and animal species, characterized first by physical properties (topography, plant or animal physiognomy, soil characteristics, climate, water quality, etc.), followed by plant species or the animals that live there ”.



Map 3. Area under state and private forests



Map 4. Areas per property

EUNIS classification is compatible with other classifications, including national ones. The aim of the formation of this system is precisely the creation of a reference database of species, habitats and areas, which forms the basis of the Birds Directive and the Habitats Directive for the NATURA 2000 network and the similar EMERALD network of the Berne Convention, and is also used in the development of indicators (EEA Core Set and others) and creating environmental reports.

F - HEATHLAND, SHRUBBY HABITATS AND TUNDRA	
F3 - TEMPERATE AND MEDITERRANEAN MOUNTAIN SHRUBBY HABITAT	
F3.1 - Moderate scrub and shrub habitat	
F3.17 – Hazel shrubs (<i>Corylus</i>)	Usually densely assembled shrub communities dominated by common hazel (<i>Corylus avellana</i>). Communities generally represent the degradation stages of different types of forests.
F3.2 - Mediterranean-mounted broadleaf deciduous shrubs	
G - FORESTS AND FORESTRY AND OTHER FORESTED AREAS	
G1 - BROAD-LEAVED DECIDUOUS FOREST	
G1.6 - Beech (<i>Fagus</i>) forests	
G1.69 - Moesian beeches (<i>Fagus</i>) forest	
G1.691 - Moesian hill beeches	

(<i>Fagus</i>) forest	
G1.6911 - Moesian monodominant mountain beech forests	Mountain beech forests occur in the form of smaller or larger fragments related to specific habitats in the oak forest area. These forests occupy steep, sheltered shady slopes and coves. The impact of the general climate has been mitigated and modified in the direction of higher relative humidity, lower humidity fluctuations and reduced summer midday temperatures. On silicates it occurs on brown acid soils (WRB: Cambisols dystric), while on limestones it occurs on brown soils (WRB: Cambisols calcaric) or on rendzic (WRB: Leptosols rendzic). Depending on the slope of the terrain, the age of stands and anthropogenic influences, soils under mountain beech forests can be very deep (60-90 and even 120 cm), up to very shallow and extremely skeletal.
G1.6913 - Moesian mountain beech forests with linden trees (<i>Tilia</i> spp.)	Mixed forests with folded or almost completely folded floors of tall trees dominated by the Moesian beech (<i>Fagus moesiaca</i>) with significant participation of different linden species (<i>Tilia argentea</i> , <i>Tilia cordata</i> , <i>Tilia platyphyllos</i>). They are widespread on the northern and eastern slopes of Avala.
G1.7 - Thermophilic deciduous forest	
G1.76 - Balkan-Anatolian thermophilic oak forests (<i>Quercus</i>)	
G1.761 - Mesian woods of <i>Quercus frainetto</i> and <i>Quercus cerris</i>	
G1.7611 - Typical woods of conifer and <i>cerris</i>	Communities occur on flat or slightly sloping, thermophilic terrains of the mountain belt. The substrate is mainly silicate, with deep brown soils occurring (WRB: Cambisols dystric).
G1.7612 - Woods of conifer and <i>cerris</i> with bonfire (<i>Ruscus aculeatus</i>)	Communities generally occur on flat or slightly sloping, thermophilic, mountainous terrain. The soil is heterogeneous, and soils are usually degraded offsprings (WRB: Cambisols eutric), pseudogley (WRB: Planosols), or lesivated brown soils (WRB: Luvisols). They are widespread on Avala (below the Weifert fountain, below the Monument to the Unknown Hero, etc..)
G. 1.7615 - Woods of conifer and <i>cerris</i> with hornbeam (<i>Carpinus betulus</i>)	Communities generally occur on cooler slopes and valleys with wetter soil, which, in addition, has a heavy mechanical composition. The substrate is carbonate or silicate and develops levitated slugs (WRB: Luvisols) or medium-deep eutric brown soils (WRB: Cambisols eutric).
G1.763 - Moesian forests of virginian oak (<i>Quercus virgiliana</i>)	Communities occur on flat or slightly sloping, rarely steep terrain. The substrate is mainly limestone, and various variants of eutric brown soils develop on it, often with a considerable amount of skeleton (WRB: Cambisols calcaric).
G1.8 - Acidophilic oak-dominated forests (<i>Quercus</i>)	

G1.87 - Central European acidophilic oak (<i>Quercus</i>) forests	
G1.871 - Moesian acidophilic forests of sessile (<i>Quercus petraea</i>)	Communities generally occur on slightly sloping, subtermophilic, exposed terrains, in the hilly and lower parts of the mountainous region. The substrate is silicate and the soils are extremely acidic (WRB: Cambisols dystric).
G1.A - Meso- and eutrophic oak forests (<i>Quercus</i>), hornbeam (<i>Carpinus</i>), ash (<i>Fraxinus</i>), maple (<i>Acer</i>), linden (<i>Tilia</i>), elm (<i>Ulmus</i>) and related forests	
G1.A1 - Oak (<i>Quercus</i>) - ash (<i>Fraxinus</i>) and hornbeam (<i>Carpinus betulus</i>) forests on eutrophic and mesotrophic soils	
G1.A1B - Pannonian oak-hornbeam (<i>Quercus</i>) - (<i>Carpinus betulus</i>) forests	
G1.A1B1 - Pannonian sessile oak-hornbeam (<i>Quercus petraea</i>) - (<i>Carpinus betulus</i>) forests	Communities generally occur in flat or slightly sloping, sheltered terrain, in the lowlands and hilly regions. Substrate is wood, silicate or serpentinite, on which various acidic brown (WRB: Cambisols dystric) and lesivated acidic brown (WRB: Luvisols) soils, slugs (WRB: Cambisols eutric), lesivated slugs (WRB: Luvisols), pararendzine on wood or deluvions (WRB: Chernozems) develop. The land is often well developed, up to 100 cm deep.
G1.A1C - Southeast European oak-hornbeam (<i>Quercus</i>) - (<i>Carpinus betulus</i>) forests	
G1.A1C1 - Moesian sessile oak-hornbeam (<i>Quercus petraea</i>) - (<i>Carpinus betulus</i>) forests	Communities occur in gently sloping, sheltered terrain, in the hilly region, always in the zone of thermophilic oak forests. The substrate is silicate or carbonate, with developing acidic brown (WRB: Cambisol dystric), eutric brown (WRB: Cambisol eutric) and humus-silicate soils (WRB: Leptosols eutric; Leptosols distric), blackberries (WRB: Leptosols mollic) and shallow brown soil (WRB: Cambisols calcaric) on limestone.
G1.A1C5 - Moesian mixed oak-hornbeam (<i>Quercus</i> spp.) - (<i>Carpinus betulus</i>) forests	Communities occur in gently sloping, sheltered terrain, in the hilly region, always in the zone of thermophilic oak forests. The substrate is silicate or carbonate, with developing acidic brown (WRB: Cambisol dystric), eutric brown (WRB: Cambisol eutric) and humus-silicate soils (WRB: Leptosols eutric; Leptosols distric), blackberries (WRB: Leptosols mollic) and shallow brown soil (WRB: Leptosols calcaric) on limestone.
G1.A2 - Ash (<i>Fraxinus</i>) forests outside the watercourse zone	
G1.A24 - Ash (<i>Fraxinus excelsior</i>) linden forests (<i>Tilia</i> spp.) outside the watercourse zone	Communities occur on very steep terrains, with accumulated blocks of larger or smaller limestone rocks, as a rule in the zone of thermophilic oak (less common and mesophilic beech) forests. The substrate is almost exclusively limestone, and the

	soils, although skeletal, are relatively well developed with favorable water regime (WRB: Leptosols eutric; Leptosols calcaric, Leptosols mollic, Leptosols rendzic). Less commonly, these communities occur on serpentinite (WRB: Cambisols eutric).
G1.C - Extremely artificial broadleaf deciduous forest plantations	
G1.CA - Artificially established stands of field ash	
G1.CP - Artificially established stands of black ash	
G1.CR - Artificially established stands of white ash	
G1.CT - Artificially established stands of American ash	
G1.CN - Artificially established stands of ash	
G1.CN1 - Artificially established stands of ash (<i>Acer dasycarpum</i>)	
G1.CN2 - Artificially established stands of milt (<i>Acer platanoides</i>)	
G1.CN3 - Artificially established stands of mountain maple (<i>Acer pseudoplatanus</i>)	
G1.CW - Artificially established stands of ash maple	
G1.C41 - Artificially established stands of wild chestnut (<i>Aesculus hippocastanum</i>)	
G1.C42 - Artificially established stands of birch (<i>Betula verrucosa</i>)	
G1.C43 - Artificially established stands of chestnut (<i>Castanea sativa</i>)	
G1.C44 - Artificially established stands of celtis (<i>Celtis occidentalis</i>)	
G1.C45 - Artificially established stands of <i>Sorbus scandica</i>	
G1.C46 - Artificially established stands of sophore (<i>Sophora japonica</i>)	
G1.C2 - Plantations of deciduous exotic oaks (<i>Quercus</i>)	
G1.CB - Artificially established stands of lužnjaka	
G1.CF - Artificially established stands of lužnjaka i cera	
G1.CK - Artificially established stands of kitnjaka i cera	
C1.CO - Artificially established stands of mečije liske	
G1.C3 - Acacia plantations (<i>Robinia</i>)	
G1.CQ - Artificially established stands of lipe	
G1.CS - Artificially established stands of crnog oraha	
G1.CU - Artificially established stands of gledičije	
G1.CV - Artificially established stands of kiselog drveta	
G1.CX - Artificially established stands of platana	
G3.F – Extremely artificial conifers	
G3.F13 - Artificially established stands of fir trees	
G3.F13A - Artificially established stands with <i>Abies concolor</i>	
G3.F13B - Artificially established stands with <i>Abies cephalonica</i>	
G3.F13C - Artificially established stands with <i>Abies pinsapo</i>	
G3.F14 - Artificially established stands of white pine	
G3.F14 - Artificially established stands of black pine	
G3.F16 - Artificially established stands of black and white pine	
G3.F1A - Artificially established stands of fir and spruce	
G3.F21 - Artificially established stands of duglazije (<i>Pseudotsuga mensienzi</i>)	
G3.F22 - Artificially established stands of pine trees (<i>Pinus strobus</i>)	
G3.F23 - Artificially established stands of larch (<i>Larix decidua</i>)	
G3.F25 - Artificially established stands of nordmanian (<i>Abies nordmaniana</i>)	
G3.F28 - Artificially established stands of cedar (<i>Cedrus</i> sp.)	
G3.F35 - Artificially established stands of hameciparis (<i>Chamaecyparis lawsoniana</i>)	
G5 - LANDWOODS, SMALL ANTHROPOGENIC FORESTS, RECENTLY CUT FORESTS, YOUNG FORESTS AND STUMP FORESTS	
G5.6 - Young natural and semi-natural forests and re-grown forests	

G5.7 – Stump forests and young plants
G5.8 - Recently cleared areas

2.2.4 Status of protected parts of nature

Decision on the designation of a protected area Landscape of exceptional features "Avala" (Official Gazette of the City of Belgrade, No.501-678/07-C-December 24, 2007) classifies the protected area "Avala" as III, II and I protection category. The protected natural property is located on the territory of the city of Belgrade, Vozdovac municipality. The total area of the protected area is 489.13 ha. Most of the forests and land are state-owned and managed by PE "Srbijasume". The base covers 342.34 ha of protected forest.

There are three conservation regimes in the protected natural resource.

The first degree protection regime was established on an area of 8.06 hectares. It is a tall beech, hornbeam and linden forest at a place called "Ladne vode" in sector 26 section b. The total volume of the sector is 2.374 m³ / ha and 294 m³ / ha, with an increase of 5.1 m³ / ha. The most represented species is beech with 1471m³. Health status is satisfactory. The diameter of the trees ranges from 11 to 90 centimeters. It is a rarefied stand of good looks and quality, aged 99 years. In the first degree, it is forbidden to perform any work except for scientific purposes.

The second degree protection regime was established on an area of 101.59 hectares. It is characterized by a wealth of species (22) that are covered by about twenty management classes. The most common are the mixed offspring forests of cerris (25%) and high sessile forests (20%). High forests account for 48%, offsprings with 51% and artificially established 1%. The total volume is 24,352m³, or 240m³ / ha and an increase of 5.0m³ / ha. The most represented species is the sessile with 81,514m³. The preserved stands cover 87% and 23% of the surface rarefied. The age of the stands ranges from 24 to 91 years. These are the best stands of a management unit. The diameter of the trees ranges from 5 to 90 centimeters. The state of health is satisfactory, with individual tree drying.

The third degree protection covers an area of 232.69 hectares. It is characterized by a wealth of species (30) that cover thirty-three management units. The most represented is the offspring mixed sessile forest (11%). High forests account for 29%, offsprings at 44% and artificially established at 27%. The total volume is 46,569m³, or 200 m³ / ha with an increase of 4.4m³ / ha. The most common species is the sessile with 9,030m³. Preserved stands cover 53% and dilute 47% of the surface. Mixed stands account for 87%. The age of stands from 11 to 115 years. The diameter of the trees ranges from 5 to 90 centimeters. The state of health is satisfactory, with individual drying of the trees, except in the part affected by the stormy wind. Remediation works are underway as well as the cutting of individual broken and fallen trees.

In the second and third degree it is forbidden to:

1. change the purpose of the area;
2. construct industrial, infrastructural, economic, hydrotechnical and other structures that can cause adverse changes in the quality of land, water, air, wildlife, character and beauty of the area and its environment;
3. carry out works that could impair and impair the features of the biological, geological and landscape diversity of the protected area;
4. carry out works that impair the morphological and hydrological characteristics of the terrain, except in order to improve the hydrological and ecological conditions of the habitat;
5. damage and endanger the cultural heritage facility;
6. carry out interventions on facilities that represent cultural and historical heritage without the conditions of the competent protection services;
7. hide valuable or significant visions;
8. form landfills, dispose temporary storage of municipal, industrial and other types of waste;
9. dump debris outside the designated areas for this purpose;
10. destruct flora and fauna
11. hunt

as well as many other activities provided for in the decision on proclamation of Avala as Landscape of exceptional qualities.

The Forestry, as the manager of the protected area, complies with all the conditions laid down in the Decision on Proclamation.

In addition to general conservation activities, the maintenance of the purity of the protected natural property, the forestry in cooperation with the City adopts an annual management program that is harmonized with the BFU "Avala".

2.2.5 State of forests of high conservation value (HCV)

All forests of the Avala forestry unit belong to forests of high conservation value (HCV forests), seed stands, protected areas I, II and III, protection of soil from erosion and recreational-tourist forests.

Dedicated forest units 17 (HCV-1), belong to areas that contain important concentrations of biodiversity at the global, regional or national level.

Table No. 59. Forests of high conservation value

Purpose	Total surface area		Total volume			Total growth/increase				HCV
	ha	%	m3	m3/ha	%	m3	m3/ha	Nat. Incr.	%	
17	0.50	0	115	230	0	2.9	5.9	2.6	0	1
26	364.08	48	65864	181	45	1716.4	4.7	2.6	50	4
73	35.85	5	7974	222	5	161.1	4.5	2.0	5	3
81	8.06	1	2374	294	2	40.9	5.1	1.7	1	2
82	101.59	14	24352	240	17	504.3	5.0	2.1	15	2
83	232.69	31	46569	200	32	1027.8	4.4	2.2	30	2
Total FU	742.77	100	147247	198	100	3453.4	4.6	2.3	100	

Dedicated forests of 81.82 and 83 (HCV-2) are large forest areas of landscape level significant at the global, regional and national level.

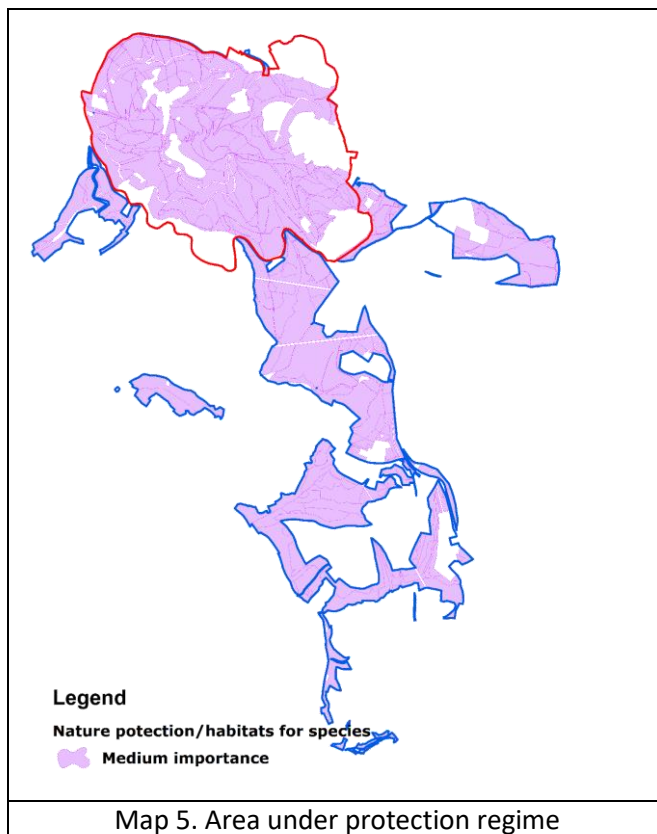
Dedicated forests 26 (HCV-4) belong to areas that provide basic natural benefits in critical situations

Dedicated forests 73 (HCV-5) belong to an area necessary to meet the basic needs of local communities.

The largest part of the forests of the Avala forestry unit belong to forests of high conservation value (HCV-4), an area that provides basic natural benefits in critical situations of 364.08 ha.

A small part of the 0.50 ha forest was isolated as the seed stand of sessile of the highest value (HCV-1).

Copies of the decision on the conditions of nature protection and designation of the seed facility are provided in the annex to the basic document.



This whole area was mapped as of medium importance. There are important, relevant habitats and local biodiversity hotspots, which is why it was declared Landscape of exceptional features in the first place.

2.2.6 Status of rare, threatened and endangered species (RTE)

In accordance with the Rulebook on the Proclamation and Protection of Strictly Protected and Conserved Species of Plants, Insects, Animals and Mushrooms, the following species have been established in the area of the management unit:

Strictly protected insect species: *Acrda ungarica ungarica*, *Carabus ullrichi nastasi*, *Necrodes litoralis*, *Onthophagus furcatus*, *Cerambyx cerdo*, *Morimus asper funereus*, *Osmoderma eremita*, *Oryctes nasicomis*, *Lucanus cervus*,

Protected Insect Species: *Metrioptera domogledi*, *Cortodera flavimana*, *Paracorymbia pallens*, *Oberea pedemontana*,

Birds: *Accipter nisus*- sparrow-hawk, *Accipter gentilis*- tercel, *Buteo buteo*- buzzard, *Columba oenas*-pigeon, *Coracias garrulus*-crow, *Cuculus canorus*- cuckoo, *Dendrocopos major*, *medius*, *minor*- large colorful woodpecker, medium and small, *Dryocopus martius*- black bush bird, *Otus scops*-yellowhammer, *Strix aluco*- forest owl

Mammals: *Dryomus nitedula*- forest fluff, *Scirus vulgaris*- squirrel, *Talpa europea*- mole, *Testuda hermanni*- forest turtle, *Erinaceus concolor*- hedgehog,

Species on the red list with international threat status:

Insect types: *Cerambyx cerdo* VU(threatened), *Morimus funereus* VU, *Osmaderma eremita* VU, *Mertrioptera domogledi* VU, *Anex imperator*LC(least endangered).

Amphibian species: *Triturus vulgaris*LC, *Salamandra salamandra*LC, *Bombina varegata*LC, *Bufo viridis*LC, *Bufo bufol*LC, *Rana dalmatina*LC.

With the proclamation of Avala as protected natural asset, the level of protection of rare,

threatened and endangered species was raised to a higher level of protection.

2.2.7 The state of health of stands

During extraction and measuring of stands, no higher presence of phytopathological and entomological diseases was observed. Individual physiological drying was observed.

In the stands in which the conifers were planted individually or in groups, there was noticeable drying due to the 2012 and 2013 droughts. Drying is expressed in black pine. Of entomological diseases various bark beetles have been observed, as secondary agents of the disease. This caused the physiological weakening of the plants and the dying out. There are some stands that are in poor health, where the intensity of decay (drying) is stronger.

The peak of Avala was hit by windstorm in 2016 on 200 hectares, causing tree and group fractures. The Belgrade Forestry immediately began recording damage and drafting a remedial program. Remediation work is ongoing. There is a real danger that, in the coming period, Avala forests may show increased tree drying, especially in shallower habitats.

In other parts of the forestry management unit not affected by the storm, the health status is satisfactory.

The expected increased drying is also affected by the age of the forestry unit stands. A large number of stands are at or near the end of the rotation coppice.

The presence of gypsy moths and other defoliators was not observed.

2.3 Ecosystem services in UPF

2.3.1 Status of forests by purpose

All the forests in the area are divided by global and basic purpose. By global purpose, most of the management unit forests are protected as forests with a priority protective function (49%) (code 12), a smaller part, a range of exceptional features (46%) (code 20) and forests intended for recreation and general cultural and educational functions. (5%) (code 13).

Table br.12. Global purpose

Purpose	Total area		Total volume			Total growth/increase			
	ha	%	m3	m3/ha	%	m3	m3/ha	%incre	%
12	364.08	49	65864	181	45	1716.4	4.7	2.6	50
13	35.85	5	7974	222	5	161.1	4.5	2.0	5
20	342.84	46	73409	214	50	1575.9	4.6	2.1	46
Total FU	742.77	100	147247	198	100	3453.4	4.6	2.3	100

Forests of the area have six main purposes: Seed stands (code 17), Land protection against erosion (code 26), Recreation and tourism center (code 73), Protected area - I degree of protection (at 81), Protected area - II degree of protection (82), Protected area - III degree of protection (code 83).

Table 13. Basic purpose

Purpose	Total area		Total volume			Total growth/increase			
	ha	%	m3	m3/ha	%	m3	m3/ha	%incre	%
17	0,50	0	115	230	0	2,9	5,9	2,6	0
26	364,08	48	65864	181	45	1716,4	4,7	2,6	50
73	35,85	5	7974	222	5	161,1	4,5	2,0	5
81	8,06	1	2374	294	2	40,9	5,1	1,7	1
82	101,59	14	24352	240	17	504,3	5,0	2,1	15
83	232,69	31	46569	200	32	1027,8	4,4	2,2	30
Total FU	742,77	100	147247	198	100	3453,4	4,6	2,3	100

The most common primary purpose in the forests of the Avala area is to protect the soil from erosion on an area of 364.08 ha, with a volume of 65863.7m³ and an increase of 1716.4m³ / ha.

Part of the forest, the Avala peak, belongs to the protected natural assets of the first, second and third degree of protection as an area of exceptional features. The forests around the protected natural property are designated for recreational and tourism purposes. The forest area of purpose 73 is 35.85ha with a volume of 7974m³ and an increase of 161.1m³ / ha.

The first degree of protection is present on the surface of 8.06 ha, as well as one seed oak plant on the surface of 0.50 ha.

2.7 Status of seed stands

Pursuant to Article 12, Paragraph 1 of the Law on Reproductive Material of Forest Trees (Official Gazette of RS, No.135 / 04,8 / 05 - Correction and 41/09) and Article 24, Paragraph 2 of the Rulebook on Recognition of Starting Material and Control of production of forest tree reproductive material (Official Gazette, Nos. 76 / 05,105 / 05 and 83/09), the then Ministry of Agriculture, Forestry and Water Management, Forestry Authority, issued a certificate of recognition of the starting material no. 322-05-24 / 2012-10 dated 10.12.2012. The group of sessile oak (*Quercus petraea*.) trees is registered under RS-2-1-qpe-22-637. The seed yield is solid and it reproduces each second to third year. The health status of the stand is satisfactory.

A seed stand of 0.50 hectares in department 24, section -I was also isolated. Ministry of Agriculture, Forestry and Water Management, Forest Directorate, has issued a certificate of recognition of the starting material, seed stand number: 322-05-26 / 2012-10 dated 10.12.2012. The seed stands of oak (*Quercus petraea*.) are registered under RS-2-2-qpe-22-638. The seed yield is solid and reproduces each second to third year. The health status of the stand is satisfactory.

2.3.2 Wood production

The production function of the forest (wood) is evaluated through the structure of the forest fund, shown by the following elements (indicators):

- Total area (i.e. overgrown and non-overgrown areas)
- Representation of individual tree species and their mutual ratio
- Growing and structural form
- Representation and relationship of individual categories in one-year forests
- Inventory height
- The degree of conservation

2.3.3.1 Total area (ratio of overgrown and non - overgrown area)

The total area of the forestry management unit is 819.50 acres.

Table No.1. Condition of areas

MUNICIPALITY	Surface area ha	%
FOREST	740,20	90
FOREST CULTURE	2,56	1
TOTAL OVERGROWN	742,76	91
FOREST LAND	6,81	1
LAND FOR OTHER PURPOSES	68,15	8
NON-FERTILE	1,25	0
OCCUPIED	0,53	0

TOTAL NON-OVERGROWN	76,74	9
VOZDOVAC MUNICIPALITY	819,50	100
OTHERS' LAND	23,10	

The managing unit is divided into 32 classes. The number of sections in the managing unit is 294 and 180 clearings. There are 9 sections and 6 clearings on average per class. The average size is 1.73 ha. Total forest cover is 91% of the area. Non-overgrown land accounts for 9% of the area. The barren land (1.25 ha) consists of quarries that are not in the function of stone exploitation. Land for other purposes includes roads, trim paths, transmission lines, space around historical monuments, various buildings and meadows used for recreational and tourist purposes (8%). There is 1% forest land, i.e. afforestation land in the management unit.

We can consider that the relationship shown between overgrown and non-overgrown surfaces is optimal.

The total area of the management unit is 819.50 ha in state ownership. The economic unit is territorially located in one municipality, Vozdovac.

5.10. CONDITION OF NON-OVERGROWN AREAS

Table No.56. non-overgrown land

Total	Forest land	Other land	Non-fertile land	Occupation	Others' land
76,74	6,81	68,15	1,25	0,53	23,10

Non-overgrown areas account for 9% of the total land area.

There is no forest land. There are 0.53 ha occupied. Out of the non-overgrown areas, 68.15 hectares are the most represented land for other purposes. Other lands include meadows, fields, roads, transmission lines, buildings and other structures. The barren lands include quarries that are not in operation or exploitation.

2.3.3.2 Representation of individual tree species and their ratio

The relatively large number of tree species, over 41, indicates the floral diversity and attractiveness of the area. The most common species are cerris with 29%, sessile with 12%, small-leaved linden with 9%, malt with 8%, black pine with 7%, pedunculate oak and beech with 6%. All other species account for 23% of the volume.

The first afforestation in Avala was made in 1906. It was afforested with conifers, black and white pine, spruce and fir. After the Second World War, it was afforested with cedar, longhorn, larch and other conifers, from hardwoods with pedunculate, acacia, linden and other species.

Hardwoods with 79% are the most prevalent, followed by conifers with 12% and softwoods with 9% of which the most common is linden.

Future care and restoration measures should reduce the proportion of linden, black ash and increase the participation of other species. Oaks, beech, white ash, maple, fruit trees and other indigenous species should be forced to suit habitat conditions. Of conifers, the most common is black pine, which shows signs of weakening and dying.

Cedar as a species has turned out extremely well. Disease resistance and canopy attractiveness are nurtured on a few surfaces, on the most attractive tourist sites.

The presence of fruit trees is very important for flora and fauna and future measures should increase their participation.

Table 1.

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2.3.3.3 Breeding and structural shapes

2.3.3.4 Representation and ratio of individual categories in one-year-old forests

STATUS OF THE STANDS BY THICKNESS STRUCTURE

Purpose : 17 - According to the thickness structure, the condition in the seed stand is satisfactory.

Purpose : 26

Table No.37. By purpose

Purpose	P (ha)	V (m ³)	Thickness classes										Zv (m ³)	
			Do 10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	>90		
17	0.50	115	0	16	75	20	4	0	0	0	0	0	0	2.9
Volume by Biolie			91			24		0						
%		100	79			24		0						
26	364.08	65864	993	10373	25263	22661	5454	889	146	0	5	80	1716.4	
Volume by Biolie			36629			28115		1120						
%		100	56			42		2						
73	35.85	7974	18	516	2837	3379	997	219	7	0	0	0	161.1	
Volume by Biolie			3372			4376		226						
%		100	42			55		3						
82	101.59	24352	97	1274	4404	8658	5954	2703	1000	174	88	0	504.3	
Volume by Biolie			5775			14612		3965						
%		100	24			60		16						
81	8.06	2374	0	38	176	579	704	378	269	175	40	14	40.9	
Volume by Biolie			215			1282		876						
%		100	9			54		37						
83	232.69	46569	606	4991	10443	13646	9687	4727	1732	597	128	12	1027.8	
Volume by Biolie			16040			23333		7196						
%		100	34			50		15						
Total	742.77	147247	1714	17208	43200	48942	22800	8914	3154	947	262	107	3453	
Volume by Biolie			62121			71742		13383						
%		100	42			49		9						

The wood is mostly thin. Since these are forests purpose of which is to protect the soil from erosion, the

thickness of the trees is not the most important but the overgrowth of stands and the type of trees that should protect the soil from landslides. There is a large proportion of acacia stands whose trees rarely exceed 40 cm in diameter at a 30-year rotation coppice.

These are recreational-tourist forests, the existence of thin to strong trees over 90 centimeters is desirable. The current condition of the stands is satisfactory. Medium to strong trees account for 58%. Future care measures should pay attention to the strong trees and allow their continued undisturbed growth to make the forest as attractive as possible.

According to the thickness structure in the second degree of protection, the condition is satisfactory. All thickness classes are present. Medium-strong material is most prevalent, which indicates the potential of the habitat and the possibility of obtaining assortments of greater technical value when used.

In the first degree of protection, the condition of the thickness structure is good, the largest number of trees are medium and strong timber.

In forests of the third degree of protection, the condition of the thickness structure is relatively favorable. Over half of the trees make medium to strong material. Fifteen percent of the timber volume belongs to trees over 51 centimeters. Among the trees of medium strength and strong material are the trees of the future that will participate in the restoration of stands.

The thickness structure is satisfactory. Fifty-eight percent of the volume is made up of trees over 30 cm. Since these are forests near urban areas, their attractiveness is significant. Individual trees over ninety centimeters are scattered throughout the management unit as historical monuments. Care must be taken to allow them to grow freely. These trees indicate the appearance and composition of forests at the beginning of the last century. These trees are also significant for the bird world, which often nests in these trees.

STATUS OF STANDS BY AGE

The width of the age classes is determined by the height of the rotation coppice:

For stands up to 40 years of age, the age class period is 5 years.

For stands from 41 to 80 years old, age class period 10 years.

For stands over 80, age class period is 20 years.

Age class period	Purpose	Age class										
		Total	I		II	III	IV	V	VI	VII	VIII	
			Low	High								
20	17	P (ha)	0.50					0.50				
		V (m ³)	115					115				
		Zv (m ³)	3.0					3.0				
5	26	P (ha)	84.78		16.59	11.64	1.51	40.6	3.3	6.18		4.96
		V (m ³)	6511		0	535	60	3984	354	983		595
		Zv (m ³)	276		0	20	3	169	15	45		24
10	26	P (ha)	361.46		19.28	30.8	2.99	108.9	37.63	24.85	11.73	125.30
		V (m ³)	65224			1954	190	17057	8281	5046	2140	30555
		Zv (m ³)	1702			67	8	488	227	116	47	749
20	26	P	47.48			0.28		47.20				

		(ha)										
		V (m ³)	10197			75		10122				
		Zv (m ³)	237			1		236				
5	73	P (ha)	4.08		1.04			1.45				0.89
		V (m ³)	291		0			181				111
		Zv (m ³)	11		0			7				3
10	73	P (ha)	31.77	1.44	0.51	0.48	0.19		3.67	10.67	5.83	8.98
		V (m ³)	7683	0	0	7	44		797	2782	1653	2401
		Zv (m ³)	150	0	0	0	1		16	49	30	54
10	81	P (ha)	8.06									8.06
		V (m ³)	2374									2374
		Zv (m ³)	41									41
10	82	P (ha)	79.18				0.48			0.49	0.93	77.28
		V (m ³)	19138				58			54	173	18854
		Zv (m ³)	396				3			1	4	388
20	82	P (ha)	22.41					7.24	15.17			
		V (m ³)	5213					1726	3487			
		Zv (m ³)	108					36	73			
5	83	P (ha)	30.91		5.54	0.84	0.33	11.22	7.12	5.86		
		V (m ³)	3242			114	66	1459	877	726		
		Zv (m ³)	166			7	4	78	47	31		
10	83	P (ha)	156.99		0.28			18.65	7.75	5.59	38.62	83.48
		V (m ³)	36386		0			4321	1317	907	8286	20916
		Zv (m ³)	689		0			102	26	19	180	346
20	83	P (ha)	38.34				0.19	19.2	22.27			
		V (m ³)	6957				70	3412	4095			
		Zv (m ³)	141				2	71	85			

		(m ³)										
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The seed stand is 67 years old.

There is an irregular arrangement of age classes in the pure and mixed conifer forests.

Acacia forest in 32nd class is 47 years old, a stand that has been rotation coppiced. It is scheduled for renewal in this planning period.

Stands age class of which is 10 years old also have an irregular age schedule. Large areas are in the eighth class. Although the current condition of these stands is relatively good, they as such prevent soil erosion. There may be some weaknesses in the following design period (over-rarification, health, sensitivity to wind and humidity, and other consequences).

In artificially established oak stands age class period of which is 20 years, the age class is extremely unfavorable. Almost all the stands are in the 4 age class. The bare areas of the management unit were afforested after World War II in order to protect the land.

In the mixed stand of acacia (32 class), which is in the eighth age class, the cutting of acacia in this planning period will be taken by care measures.

There is a certain irregularity of the age classes, older stands predominate. For recreational and tourist purposes, the age of stands is less important. Much more important is the general appearance of stands and their arrangement than the age of the forest.

The nature reserve is in the eighth grade, at the end of the rotation coppice. The stand is designed to monitor natural processes, aging and regeneration without human influence.

As in the previous purposes, the condition by age classes is unfavorable, there is a large proportion of mature stands, little or complete absence of young stands.

The forests of the Avala management unit are under a certain degree of protection, where other parameters of the stands are more important, and age is only an orientation value. However, in the coming planting periods, the general forest condition due to aging should be expected to deteriorate.

The status of stands by age in the management unit is poor. Over 50% of stands are at the end of the rotation coppice. The most common is the eighth age class, comprising of 41% of stands. Incorrect age schedules and high age indicate the need to enter the renewal process. Part of the stands will be scheduled for renewal in this planning period.

5. 8. STATUS OF FOREST CULTURES

Total management unit

Table No.55. By management classes

managing class	surface		age	V	Zv
	area	ha	age		
73469212	1.44	56%	5		
73469212	0.51	20%	10		
73469212	0.33	13%	11		
26469212	0.28	11%	10		
73469212	2.56	100%			

Forest crops account for less than one percent of the total overgrown area, at 2.56 hectares. These are young cultures of maple, white ash, red oak and other hardwood raised in the previous systematic period. The condition is good. Cultures are properly and timely nurtured.

2.3.3.5 Condition of stands by origin and preservation

The seed stand is artificially established stand of sessile. It is a preserved stand, age 65, of properly developed canopy and trunk, of good health status.

For the purpose of erosion protection, the state by origin is unsatisfactory, most of the stands are 74% of germinating origin. There are no high stands, and artificially established stands participate with 26%.

In the offspring stands, the large share is made by the Acacia which is managed by offsprings so that the large share of the stands does not pose a problem.

The condition is good, 81% of stands are preserved. There is little involvement of the devastated ones and they will be reconstructed in this planning period. Forests of this purpose fully satisfy their function, erosion protection.

The high forest of beech, hornbeam and linden is in the first degree of protection so any works are forbidden in it. It is a rarified stand.

Purpose	Preservation	P (ha)	P (%)	V (m ³)	V%	V/ha	Zv (m ³)	Zv%	Zv7ha	%Zv
17	Preserved	0.50	100	115	100	230	2.9	100	5.9	2.6
	Rarified									
	Devastated									
26	Preserved	294.61	81	55459	85	188	1488.2	87	5.1	2.7
	Rarified	68.41	19	10278	16	150	226.4	13	3.3	2.2
	Devastated	1.06	0	127	0	120	1.8	0	1.7	1.4
81	Preserved									
	Rarified	8.06	100	2374	100	294	40.9	100	5.1	1.7
	Devastated									
73	Preserved	31.08	87	7131	89	229	143.2	89	4.6	2.0
	Rarified	4.77	13	843	11	177	17.9	11	3.7	2.1
	Devastated									
82	Preserved	69.66	69	15379	63	221	340.4	68	4.9	2.2
	Rarified	31.93	31	8972	37	281	163.9	32	5.1	1.8
	Devastated									
83	Preserved	122.36	53	20926	45	171	569.6	55	4.7	2.7
	Rarified	109.85	47	25601	55	233	457.0	44	4.2	1.8
	Devastated	0.48	0	42	0	88	1.2	0	2.5	2.9
Total	Preserved	518.21	70	99010	67	191	906.1	26	4.1	1.9
	Rarified	223.02	30	48068	33	216	906.1	26	4.1	1.9
	Devastated	1.54	0	169	0	110	3.0	0	1.9	2.3

Artificially established stands for recreational and tourist purposes participate with 53% and the offspring with 47%. We can consider the current situation to be satisfactory.

The state of conservation and recreation is good, with 87% preserved and 13% rarified.

The condition of stands in origin and conservation is satisfactory in the dedicated second-level protection class. High and artificially established stands participate with 49%. Preserved stands participate with 69%.

The condition of the stands by origin is satisfactory in the dedicated third-level protection class. Most consist of tall and artificially established stands (56%). Most stands are preserved (53%). The state of forests by origin in the management unit is poor, 60% of stands are of offspring origin. There are 17% high stands. Artificially established stands participate with 23%.

The conservation status of the stands is good. Most stands, 70% are preserved. Devastated stands are less than 1%. Devastated stands will be reconstructed in this planning period.

5.4. STATUS OF STANDS BY MIXTURE

Purpose 17

Intend	Mixture	Surface		Volume			Increase			
		ha	%	m ³	m ³ /ha	%	m ³	m ³ /ha	Zv%	%
17	Pure	0.50	100	115	230	100	2.9	5.8	2.5	100
	Mixed									
73	Pure	9.50	26	1787	188	22	32.0	3.4	1.8	20
	Mixed	26.35	74	6187	235	78	129.0	4.9	2.1	80
26	Pure	86.86	24	18996	219	29	472.6	5.4	2.5	28
	Mixed	277.22	77	46868	169	72	1243.8	4.5	2.7	73
81	Pure									
	Mixed	8.06	100	2374	294	100	40.9	0.0	0.0	100
82	Pure									
	Mixed	52.20	51	11408	219	47	248.9	4.8	2.2	49
83	Pure	30.38	13	3540	215	14	128.8	4.2	2.0	12
	Mixed	202.31	87	40029	198	85	899.0	4.4	2.2	86
Total	Pure	127.49	17	27498	216	19	637.1	5.0	2.3	18
	Mixed	615.28	83	119749	195	81	2816.3	4.6	2.4	82

The seed stand is a pure sessile stand. It is desirable to keep them clean without the admixture of other species, which could endanger seed trees and compete for light and moisture.

For recreational purposes 74% of stands are mixed. Such a relationship is desirable as mixed stands are more stable and more attractive to tourists. The presence of conifers is of particular importance especially in winter.

For the purpose of erosion protection, most of the stands are 77% mixed. Such a ratio is desirable.

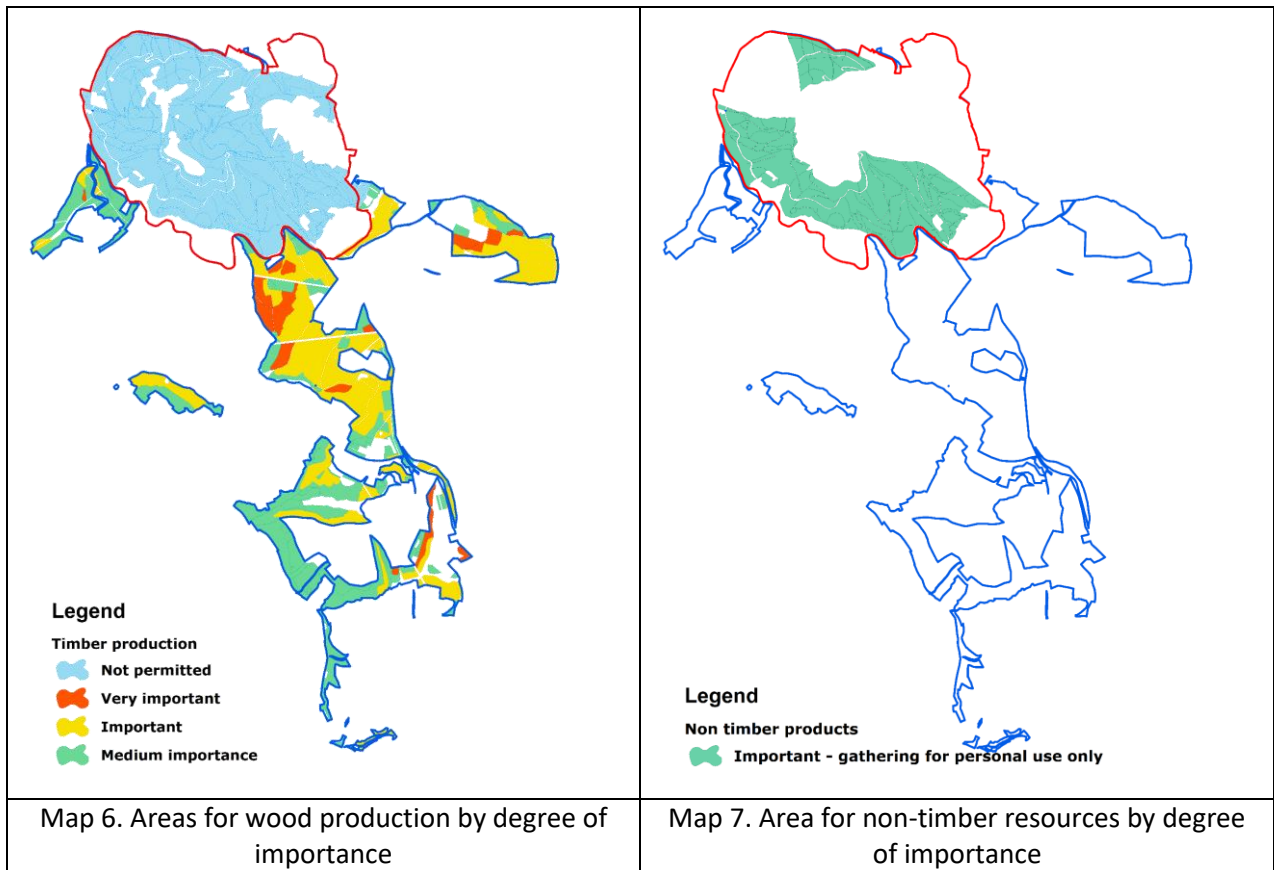
In the first degree of protection there is a mixed stand of beech, hornbeam and linden.

In the second degree of protection, almost all the stands are mixed. Mixed stands are more resistant than pure and florally richer. Floral diversity is also significant in forests that are recreationally visited.

In the third degree of protection, the highest number of stands is mixed (87%). Such a ratio is very favorable and speaks of the great plant diversity and richness of the protected natural resource.

The situation in the forestry management unit is good. Most of the stands, 83% are mixed. Such blending is very significant for forests such as in Avala. The large number of species and their blend make the forests of Avala very attractive to its visitors.

2.3.3 Manufacture of non-timber products



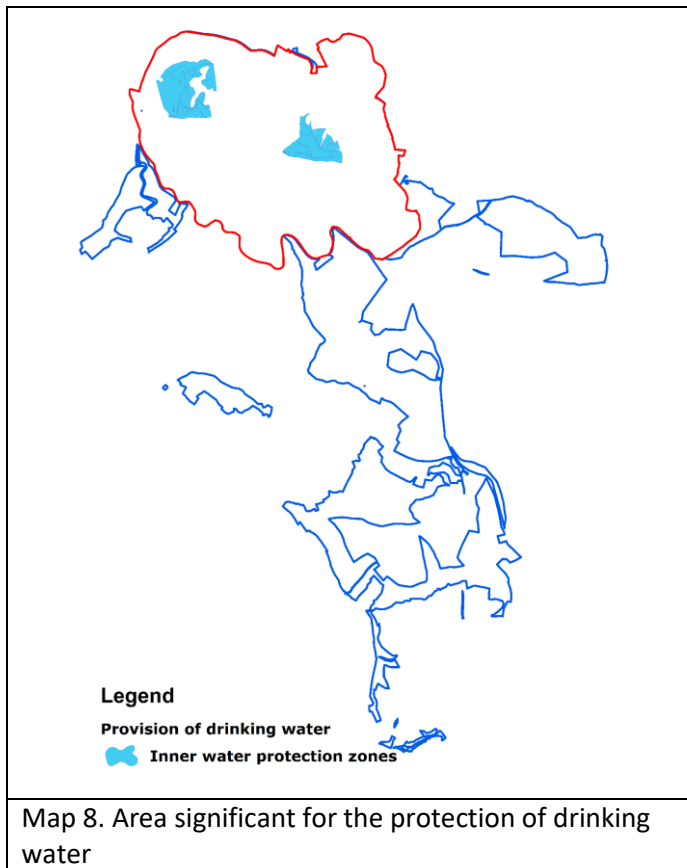
2.3.4 Water source protection zones

Water protection forest affects the maintenance of the cleanliness of groundwater, stagnant and running water. Therefore, the forest is an important element that plays a role in ensuring the stability of the springs, contributing to a more even flow of water, improving quality, reducing its surface runoff, and enhancing subsurface and underground runoff.

All elements involved in the protection of the water source are divided into external and internal.

The external include relief, microclimate, hydrological features of the basin, geological background, pedological layer and method of use.

The internal factors include forest cover, species of trees, structural cover of forest cover, conservation of the complex and more. The map shows the water source zone in the area.



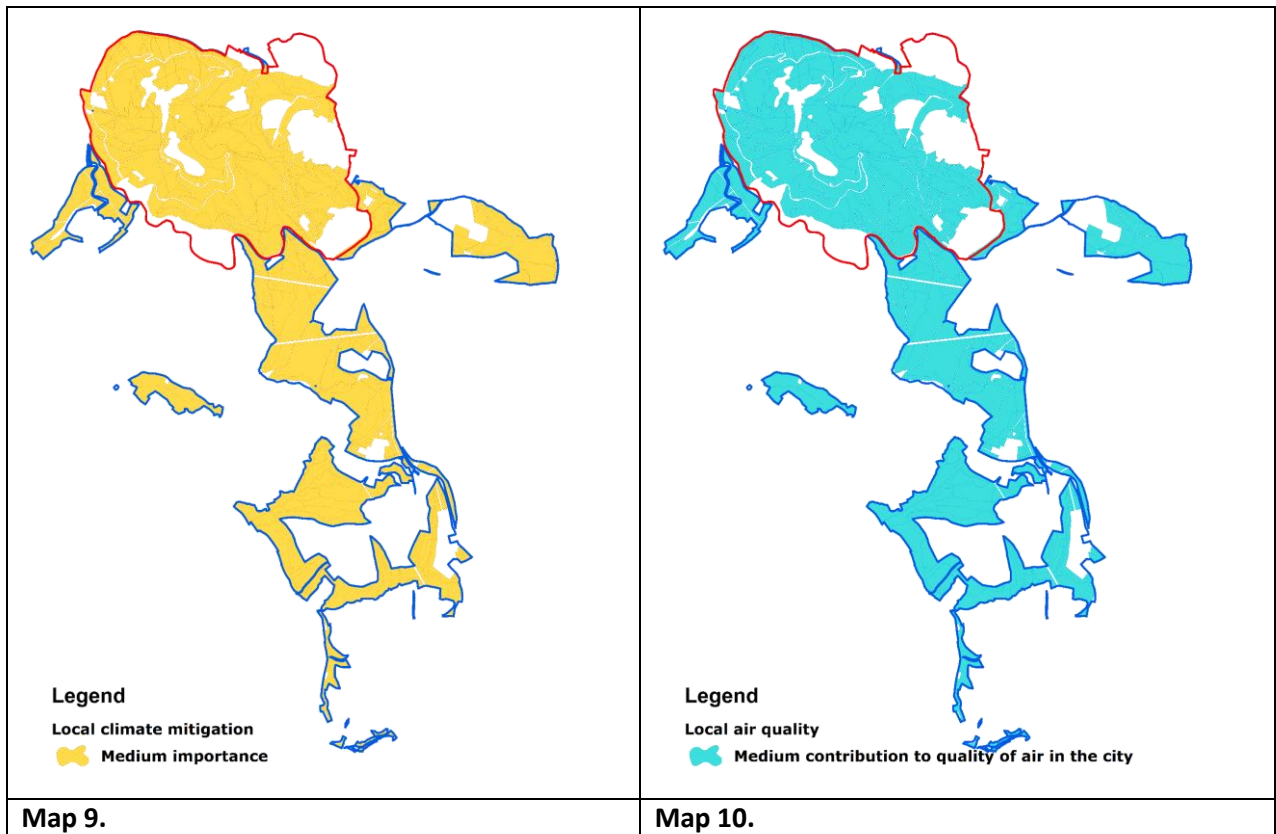
2.3.5 Climate

The forest has an effect on mitigating the effects of extreme climatic factors. It prevents the formation and slowing down of cold air outflow, protects surfaces from the harmful effects of wind, and contributes to increased vorticity and thus air mixing. The local and regional impact of the forest on climate is highlighted. The importance of the forest for climate improvement depends on external factors, namely: the shape and form of the landscape, the ratio of the forest surface to the surface of the facility to be protected, and the distance of that facility from the forest or space. Internal parameters include forest density, condition and assemblage of forest.

According to expert knowledge and climate studies, the entire area is ranked as being of medium importance in mitigating extreme climatic factors (Map)

2.3.6 Air quality

The forest has a beneficial effect in enhanced dust sedimentation, suspended dust filtering and radioactive contamination, gas absorption, and purification of water sediment. All area forests are ranked as medium importance forests that affect air quality (Map).



2.3.7 Soil protection against erosion

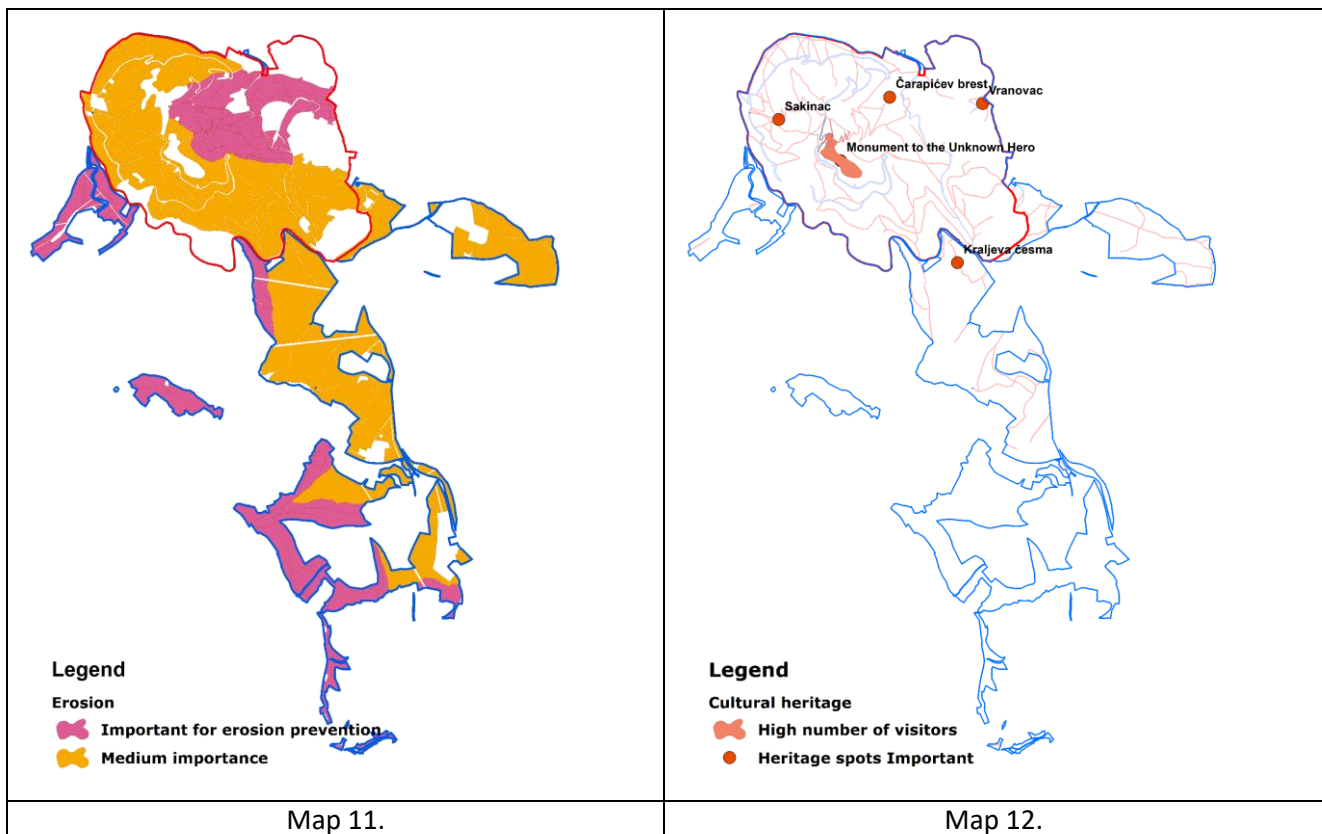
Soil erosion is reduced by the fact that the forest, as a specific soil cover, stabilizes and equalizes the flow of water with its deep root system. Due to the positive impact of the forest on the soil, parts of the area have been designated as forest protection against erosion. The map shows two zones of protection. Significant areas are marked in red and orange areas of moderate importance for protecting soil from erosion. Climatic conditions, landforms, exposures, geological background and soil type are included to determine the factors affecting erosion processes.

2.3.8 Cultural property

Here is a very important historical and cultural area - the famous Monument to the Unknown Hero (World War I Monument, designed by Ivan Mestrovic) and the Monument to Soviet War Veterans. (A plane crash in 1964. A delegation flew to Belgrade to attend the celebration of the 20th anniversary of the liberation of Belgrade).

The most significant monuments are the Unknown Hero Monument, erected in 1938, the monument to Russian veterans erected in 1964, and the monument to Vaso Carapic. The symbol of the city of Belgrade, the Avala Tower, built in 1964, demolished in the NATO bombing and then rebuilt in 2010, should also be mentioned. The first mountaineering house was built in Avala in 1924 (Mitrovica dom).

Recognizing Avala's natural and cultural values, the Institute for Nature Conservation in 2007 declared the Avala peak as a "Land of Extraordinary Features Avala".



2.3.9 Recreational function

Avala has long been a Belgrade picnic site for meeting the recreational and tourist needs of Belgrade residents. The development of civilization has influenced the change in the way of life of people and affects all segments. Industrialization, automation, modern traffic, informatics and the like have changed human life completely compared to the life of our ancestors. For this reason, in the daytime, recreation in nature becomes a necessity of life. Forests offer the greatest opportunities for recreation in nature.

Today, recreation is viewed through various types of forest vacations, such as walking, hiking, skiing, running, horseback riding, hunting and many other sports activities.

The assessment of the forest recreation complex includes determining the minimum recreational area per visitor and the natural equipment of the forest.

Forests for recreation are divided into several functional zones: a high visitors area (> 100 visitors per day), a medium visitors zone (50 to 100 visitors a day) and a low visitors zone (10 to 50 visitors a day).

The forests of Avala are located in the immediate vicinity of the city of Belgrade, which is why the blue area is important (50-100 visitors a day). And the Avala TV Tower is ranked extremely important because it attracts more tourists, the yellow area is mapped because it is near the road to work between local settlements.

2.3.10 The scientific-educational function of the forest

Forests are the subject of education for those who have a vocational calling (forestry engineers, forestry technicians, forestry workers, hunters, rangers, foresters, etc.) as well as those in forestry related activities (water management, agriculture, tourism, etc.). Forest as a renewable resource

requires the education of every human being, and the changes that are happening require that new generations, from a young age, acquire basic knowledge of nature, forest and its importance in the environment and the development and survival of civilization.

Climate change deforestation requires a scientific approach to address this issue in several aspects: environmental, economic and social. The study of the forest, its elements and its environmental impact should be multidisciplinary.

The red area is ranked as extremely important (Map). The school in nature (open classroom in the forest) contributes to having a high educational and scientific value in this area.

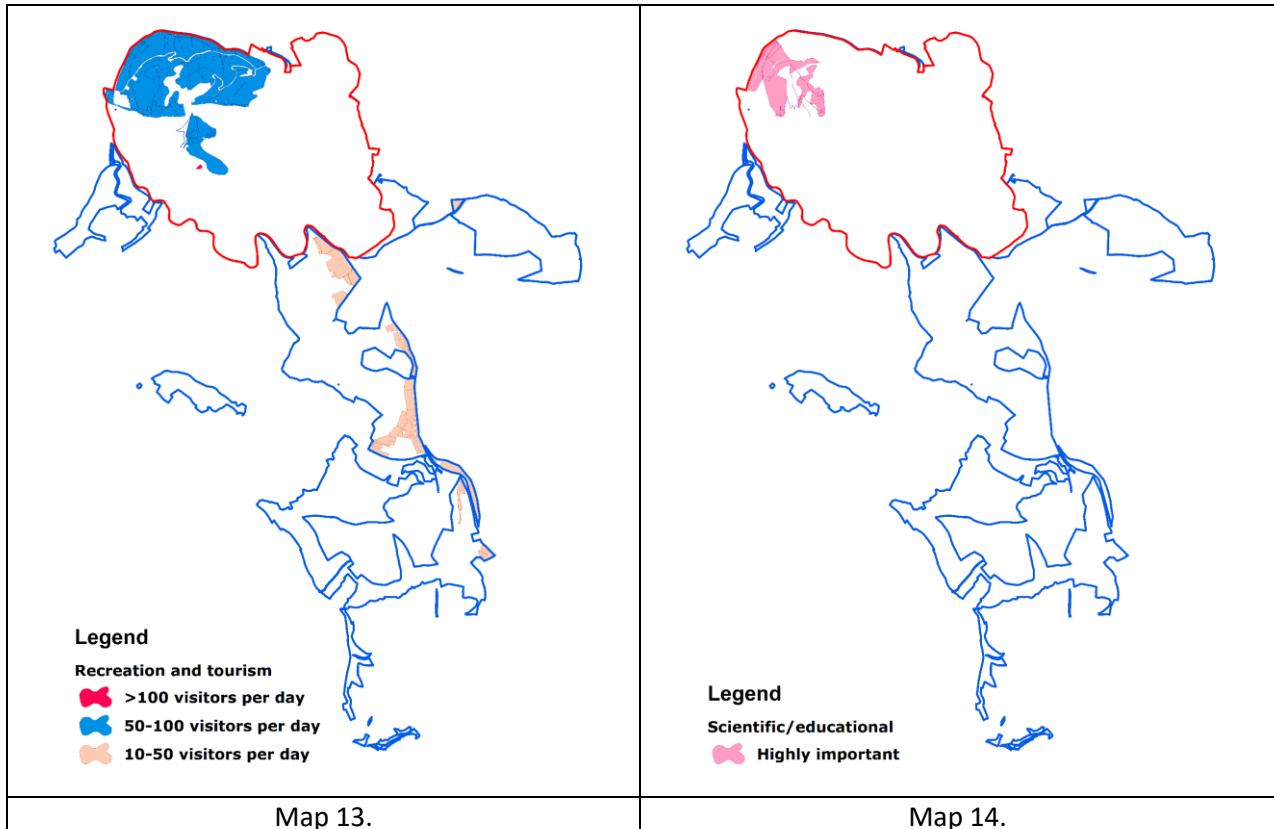


Table: Summary of the most important ES (In the table, you should include all the ES you mapped with 1st and 2nd rank and the area in ha

Strategic area			
Type of ES	Rank	ha	%
Provisioning ES			
Timber production	0	337	35.7%
	1	34	3.6%
	2	180	19.1%
	3	161	17.1%
Non timber products	3	177.04	18.8%
Provision of drinking water	1	38.18	4%
Regulating ES			
Local climate mitigation	3	743	78.8%
Local air quality	3	743	78.8%
Protection against erosion	2	247	26.2%
	3	192.27	20.4%

Supporting ES			
Nature protection/habitats for species	3	743	78.8%
Cultural ES			
Recreation and tourism	1*	0.02	0%
	2	95.66	10.1%
	3	36	3.8%
Scientific educational	1	24.82	2.6%
Cultural heritage	1*	7.35	0.8%

2.4 Target groups

Describe the main target groups/ stakeholders that the strategy will address (e.g., city inhabitants, visitors, educational institutions, forest owners). Include a short paragraph for each.

This is the largest group of users. It is mainly composed of joggers, hikers, cyclist and recreational walkers. These users are local resident who like to practice sports in a nature area. They access the area by using the personal car, some of them by bike and a smaller proportion by using public transport.

Forestry

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

Scientific community

Local scientific knowledge is important so scientists should be involved in all the activities related to the management of Fåget forest.

Local NGO

Local environmental NGO's are very interested in the area and usually people from this groups have a good expertise about the problems of the area.

3 THE STRATEGIC PRIORITIES

In this chapter you will need to present the overall strategy - what are the main priorities (i.e., your long-term strategic objectives) for your UPF that will help you to promote the desired ecosystem services in your UPF? You should list the strategic priorities and for each one, provide a short explanation (a sentence or two). For each priority, define the main target groups that the priority is addressing.

Note that you should define your strategic priorities based on the overview of important ecosystem services in your area, the recognized conflicts, the challenges in forest management and the legal and planning frameworks.

3.1 Removing waste dumps



Waste dump on the „Avala“ site

3.2 RECONSTRUCTION OF THE FOUNTAINS

– landscaping and constant quality control of drinking water sources in the Avala area.

Avala abounds with clean water springs that have been used by locals since ancient times. The most famous in this area are:

Sakinac

Among approximately 10 mountain springs on Avala, the most well known is the Sakinac spring, the source from which the water was used at the George Weifert beer factory. The source was named after water barrels erected on two wheels which were driven on horse-drawn carts to the settlement.

Ledinac

Spring Ledinac popularly known as Ladne vode, is located in the valley of the Vranovac stream.

Kamenac

Spring Kamenac was named after the water that flows from the stone, located at 275 meters above sea level.

Vranovac

Spring Vranovac is on the way to the village of Zuce from Beli Potok

The King's Fountain

It was built in 1930 by the then owner of the Hunting Meeting Tavern, which is located nearby.



The King's faucet may be incorporated into the future reconstructed Central Arboretum

3.3 RENOVATION OF ARBORETUM OF FORESTRY TREES ON SUPLJA STENA

Due to the termination of funding in 1967, the Central Arboretum of the Forest Institute Suplja stenabfell into oblivion. These areas have continued to be managed as with other artificially raised stands, without realizing the invaluable importance it has for science and the profession, because it is a unique facility of its kind and area in the Balkans.

Its importance, however, multiplies with climate change as it provides important information on the adaptability of species to new conditions.

In many countries, Arboretums have been raised to the level of national treasure. In the next few photos we will look at the state and potential opportunities that reconstruction of the Central Arboretum offers, not only in the application of adaptive measures of forest ecosystems, but also in the development of the tourism potential of Belgrade.



Map 15.

Map 16.

Indigenous hardwoods: *Celtis occidentalis*, *Tilia platyphyllos*, *Acer platanoides*, *Quercus robur*, *Alnus glutinosa*, *Fraxinus excelsior*, *Acer-tilia*, *Acer*, *Castanea*, *Betula*, *Fraxinus nigra*, *Quercus*, *Fraxinus Americana*, *Juglans*, *Fraxinus americana*, *Carpinus Betulus*, *Ulmus laevis*, *Prunus padus*, *Rhus typhina*, *Corylus avellana*, *Corylus colurna*, *Acer tataricum*,

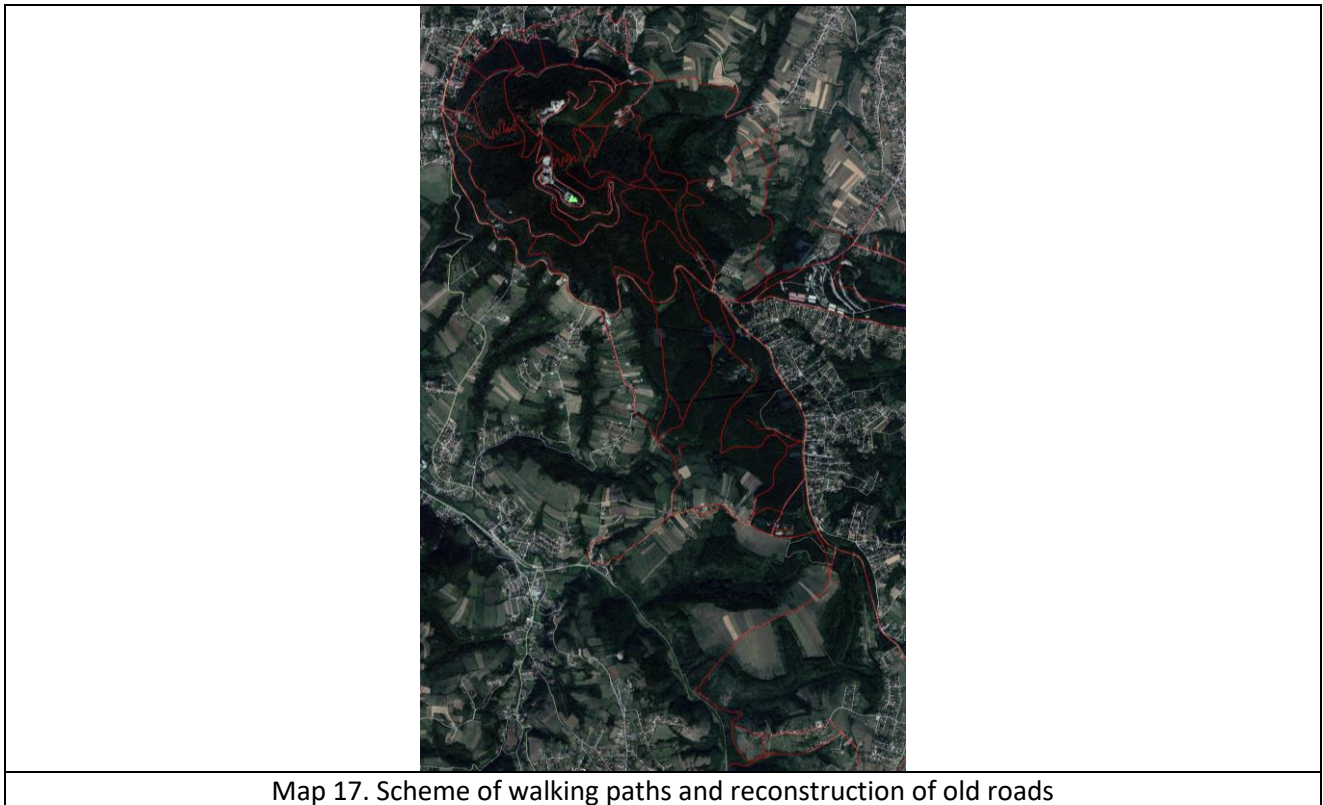
Indigenous conifers: *Pinus nigra*, *Picea abies*, *Pinus sylvestris*, *Pinus nigra* / provenance Usce – Studenica, *Pinus nigra* / provenance Rasko selo Trnava, *Pinus nigra* / provenance Maljen – Divcibare, *Pinus nigra* / provenance Kraljevo – Goc, *Pinus nigra* / provenance „Deliblatski Pesak“, *Pinus sylvestris* / provenance Uzice „Zlatibor“, *Pinus peuce*, *Abies alba*, *Picea omorika*.

Allochthonus hardwoods: *Aesculus hippocastanum*, *Acer saccharinum*, *Morus Alba*, *Ulmus minor*, *Acacia*, *Styphnolobium japonicum*, *Catalpa speciosa*, *Gleditsia triacanthos*, *Acer negundo*, *Fraxinus americana*, *Juglans nigra*, *Ailanthus altissima*, *Pteleya*, *Paulownia tomentosa*, *Acer pseudoplatanus*, White mulberry, Fine leaf linden, *Gleditsia triacanthos*, *Cercis siliquastrum*, *Celtis occidentalis*, *Ginko*,

Allochthonous conifers: *Thuja orientalis*, *Chamaecyparis thyoides*, *Pseudotsuga menziesii*, *Pinus pinaster*, *Calocedrus decurrens*, *Abies magnifica*, *Pinus strobus*, *Cupressus sempervirens* 'Pyramidalis', *Pinus ponderosa*, *Pinus jeffreyi*, *Abies concolor*, *Abies nordmanniana*, *Larix europaea*, *Larix decidua*, *Pseudotsuga menziesii*, *Cedrus atlantica*, *Cedrus deodara*, *Picea sitchensis*, *Picea pungens*, *Thuja occidentalis*, *Sequoiadendron*, *Pinus brutia*, *Abies cephalonica*, *Abies concolor*, *Pinus Nigra*.

3.4 DESIGNING NEW AND RECONSTRUCTION OF OLD ROADS AND TRAILS

Old trails and roads will be reconstructed in the area, which will be in function of the development of mountain tourism and cycling. In places where the tracks intersect regionally, the construction of an overpass is envisaged in order to safely cross the roads. For this purpose it is needed to build at least three passes.



Map 17. Scheme of walking paths and reconstruction of old roads

3.5 FORMING A BOTANICAL GARDEN ON SUPLJA STENA

The formation of the Botanical Garden is planned in the area of Suplja stena, which will have educational and scientific character.

The purpose of the Botanical Garden is to expose species of trees, shrubs and terrestrial flora in a limited area to serve pupils, students, hikers, tourists and other visitors, to become acquainted with the flora, as well as to study the biological and phenological characteristics of individual species, collection, distribution and exchange of seeds and other plant material.

The Botanical Garden formed on these criteria and principles is conceived as a multifunctional creation.

By purpose, the Botanical Garden surfaces will be divided into: contact space, space with collections of native and allochthonous flora and other spaces.

Respecting the tasks and goals to be achieved, the Botanical Garden will be divided into three functional areas - zones: Exhibition Zone, Science and Education Zone and Economic Section.

The exhibit area will include preserved fragments of native and allochthonous vegetation, dendrium and collections of herbaceous plants. The preserved vegetation fragments contain the following species:

Species of indigenous hardwood: *Fraxinus excelsior*, *Betula*, *Fagus*, *Cerris*, *Fraxinus ornus*, *Pyrus pyraeaster*, *Prunus avium*, *Prunus cerasifera*, *Acer pseudoplatanus*, *Carpinus betulus*, *Fraxinus excelsior*, *Acer*, *Quercus petraea*, *Acer campestre*, *Tilia platyphyllos*, *Tilia*, *Quercus robur*, *Corylus avellana*, *Acer platanoides*, *Juglans*, *Fraxinus angustifolia*, *Tilia cordata*, *Quercus frainetto*, *Tilia tomentosa*,

Species of indigenous conifers: *Pinus sylvestris*, *Pinus nigra*, *Abies alba*,

Species of allochthonous hardwood: *Robinia pseudoacacia*, *Ulmus nigra*, *Quercus sectio Lobatae*, *Morus*, *Gleditsia triacanthos*, *Ailanthus altissima*, *Acer negundo*,

Species of allochthonous conifers: *Cedrus atlantica*, *Pseudotsuga menziesii*, *Chamaecyparis lawsoniana*, *Thuja*, *Pinus strobus*

In the preserved fragments of vegetation, it is planned to fill the corresponding indigenous hardwoods or conifers in places where sanitary cutting or removal of undesirable species will be carried out. From a forest-growing standpoint, it is a biotechnically simple process, but it is also necessary to take into account the aesthetic-spatial component.

When imitating natural conditions, observe the principles of striving for simple but effective solutions, because the area should be viewed as a biological-spatial entity.

When aesthetically designing a space, the potential of the area will be optimally utilized. This will be achieved by an integral view of the entire area using the following landscape components: greenery, terrain configuration and the diversity of the surrounding area, with meadows and pastures, (as light elements), shrubs and trees (as a source of light contrast)).

Breeding of species and lower taxonomic units represented by one or more specimens and arranged into smaller groups is predicted in the dendarium. The Botanical Garden will be divided into fields separated by paths. Individual plant species in the dendarium will be grouped by genera. When scheduling it will be ensured to take advantage of the micro-characteristics of the space (slope, shade, humidity, etc.), in an effort to provide optimal conditions for development.

Species of light (heliophytes) are intended to be planted as solitaires (individually) or in the foreground at exposed sites. Shadow species are intended for planting in the background or in the shade of trees. Species that are adapted to humid habitat conditions (hygrophytes) will be planted next to the stream or in the area of the garden where wetter terrain is present. Shrubs without special requirement according to ecological conditions, coloristically and aesthetically rich in all phenophases will be arranged according to compositionally aesthetic criteria in all fields of the botanical garden.

For plants for which it is not possible to provide the conditions for their survival within the garden, the presentation of these types of plants could be done as part of the exhibit through herbarium material or photographs.

The relatively large area of the Botanical Garden provides the opportunity for a visually interesting tour of the garden, in a pleasant and interesting walk.

The Botanical Garden has more than convenient access. A parking space will be formed. Access communications are far enough away to eliminate the negative effects of aero-pollution and noise pollution from passing vehicles.

BUILDING TOWERS IN THE HUNTING AREAS ON THE SUPLJA STENA WITH THE AIM OF DEVELOPMENT OF HUNTING TOURISM

Table No.58. View of hunting areas

HUNTING AREA WITHIN F.U.									
Hunting Association	Head office	Hunting area	Surface	Forests and for.land	Meadows and pastures	Arrable land and plowland	Orchards and vineyard	Water, ponds and reeds	Other land
Ripanj	Ripanj	Avala	14849	2598	1260	8165	1117	61	1648

Data source: hunting data 01.04.2012-31.03.2022

Number of game on the day of counting on 31 March 2017 is as follows: game deer 260, rabbit 2000, field partridges 900 and pheasant 2500.

In the area of the Avala management unit, hunting is managed by the hunting association Ripanj, based in Ripanj. The hunting ground covers the entire area of Vozdovac municipality. No hunt is made on the surface of the Avala management unit in the Avala peak. The main and basic reason is that the management unit is under the protection level and due to tourist attendance.

In the rest of the hunting area, the hunting association manages hunting according to hunting grounds and annual plans.

3.6 Construction of a zip line

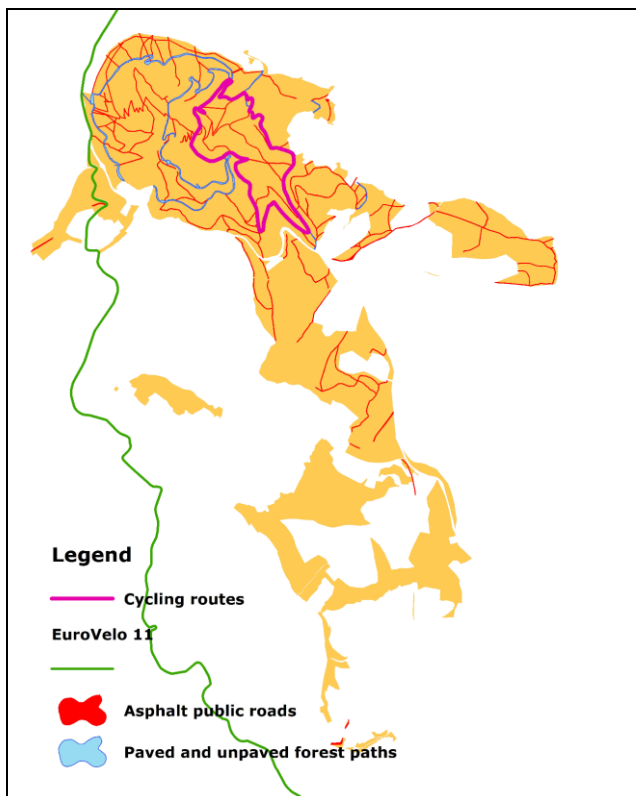
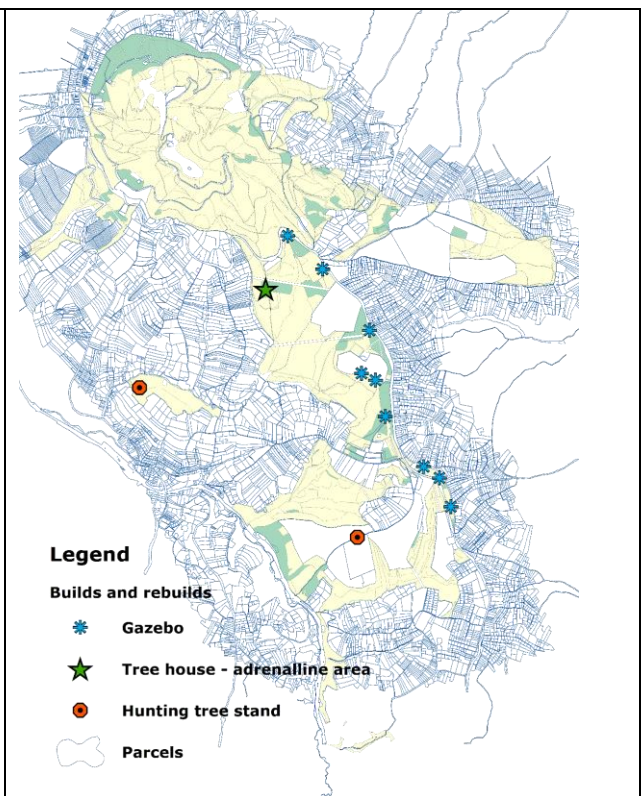
Construction of a zip line in the area of Suplja stena, which was created as a need for the inhabitants of mountain areas to cross rivers and gorges where it is not possible to build bridges. In the last twenty years it has gained his sport and recreation vision. The very process of setting up a zip line is very simple, the cable is placed between two hills and visitors can descend from one hill to the other, with an unforgettable dose of adrenaline and the opportunity to see the beauty of the mountain from a whole new angle. This attraction is very popular in the world and attracts a large number of tourists with special panoramic pleasure.

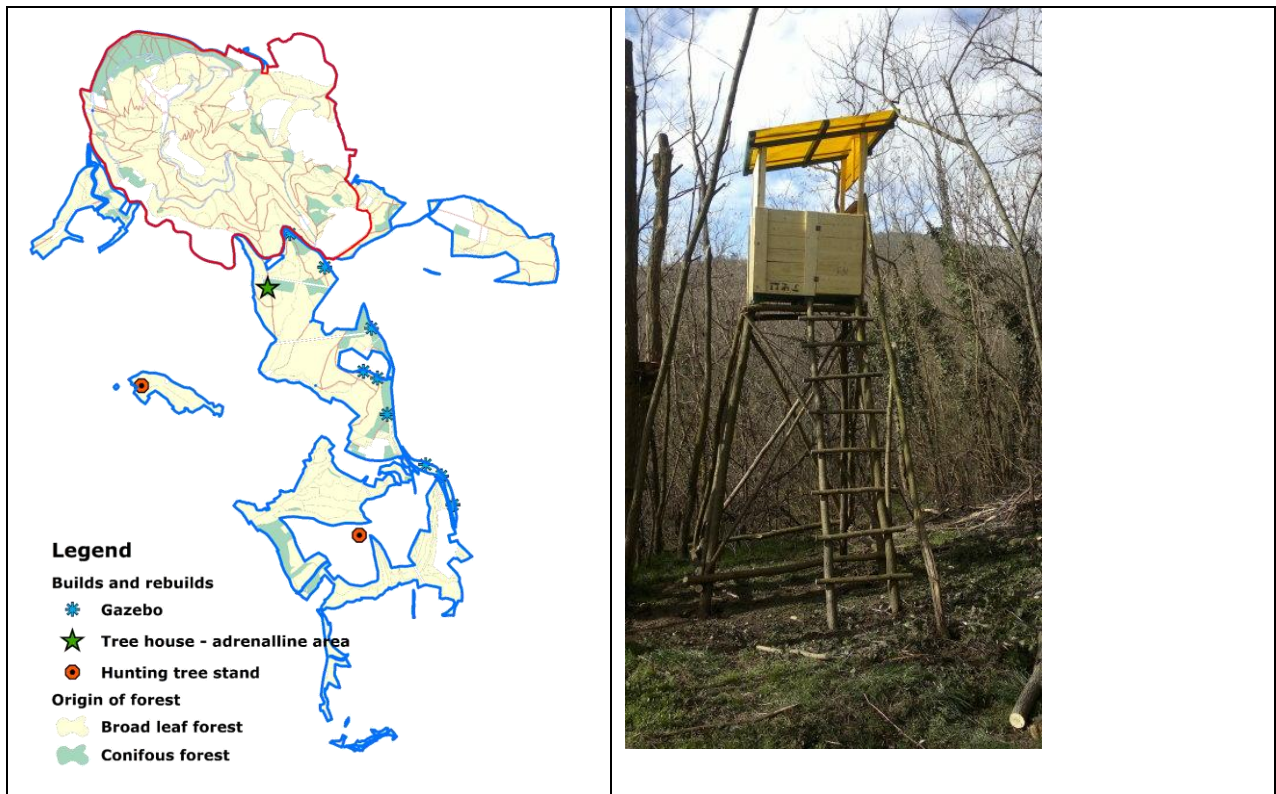
3.7 RECONSTRUCTION OF CHILDREN'S RESORT SUPLJA STENA

Suplja stena is a children's resort only 22 kilometers away from Belgrade. It was built in the 1970s - now already in the last century, it was devastated by the housing of refugees in the 1990s, and the municipality of Vracar re-acquired it in 2007 and completely renovated it.

The resort has a main hostel facility with 105 beds and a multifunctional lounge, as well as the Mountain Lodge, which has become a cozy mountain restaurant, above which there are 3 hotel rooms and one apartment. Suplja stena is an ideal place for anyone who wants to organize various types of events in a natural setting: congresses, seminars, conferences, picnics, workshops, promotions...

The goal of SREC Vracar is to restore the famous image to Suplja stena and it has been intensively working on it during the recent years.

 <p>Legend</p> <ul style="list-style-type: none"> — Cycling routes — EuroVelo 11 — Asphalt public roads — Paved and unpaved forest paths 	 <p>Legend</p> <p>Builds and rebuilds</p> <ul style="list-style-type: none"> * Gazebo ★ Tree house - adrenaline area ● Hunting tree stand Parcels
<p>Map 17. With coordination with cycling organization of Belgrade as stakeholder, we planned on developing a cycling route, that could be easily connected to the EuroVelo 11 route. Existing road infrastructure could also be used. Also, we will put sign at the main entrance of Avala.</p>	<p>Map 18. We found out that wouldn't be a any bylaw violation to rebuild hunting tree stand as that parcel is property of municipality.</p>



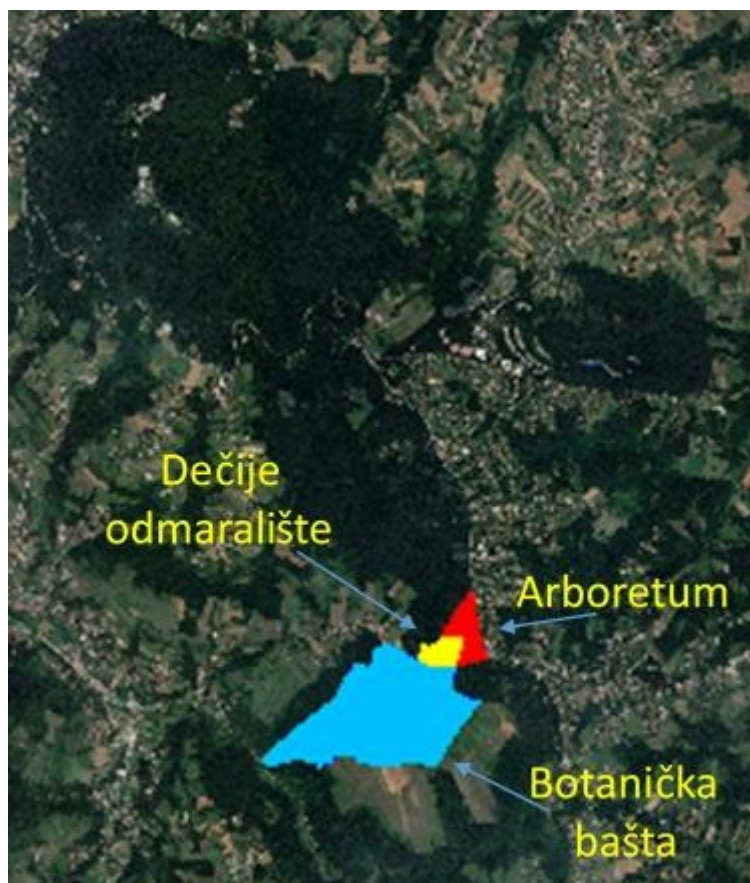
Map 19.

We are planning on rebuilding existing gazebos and hunting stands, and also building 9 new gazebos and 2 more hunting stands. Adrenalin park is also planned. As an example of public/visitors participation in monitoring, we are planning on positioning multiple “photo points”, where “citizen scientists” can upload their own photos of birds, rare plants, extraordinary sites etc. Coniferous forests are marked, because those areas are unfavorable as picnic areas, and there should be signs clearly informing visitors about that.



4. THE SPATIAL DEVELOPMENT CONCEPT OF UPF

The strategic map shows the priorities of the area. Our vision is focused on the development of a research and developmental education center at the Šuplja stena site. The center should cover the area intended for the erection of the Botanical Garden, the Arboretum of forest species of trees and shrubs as well as the Children's Resort. Such a conceptual center can in the near future become a center for exploring the possibilities of adaptive tree species to climate change. This segment is particularly important because there are already vegetation segments (70 years old) in the area that can be the starting point for research. Children's Resort facilities built can be used as lab space. The accommodation facilities of the Children's Resort can be used for educational purposes, i.e. educating all stakeholders on climate change and how to mitigate them. The intended organization should also allow for economic sustainability.



Map 19. Area of R&D Educational Center

This does not mean that other ecosystem services will be shut down, but they will act as a synergy, which will make the entire area a unique whole in which individual parts will have the opportunity to optimally manage the space.

5 STRATEGIC MANAGEMENT OBJECTIVES AND GUIDELINES

5.1 STRATEGIC OBJECTIVE KEY OBJECTIVES AND GUIDELINES - WOOD PRODUCTION

Strategic objective	<i>Stable and vital forest that provide economic benefits to forest owners</i>
State (SWOT)	Strengths <i>Relatively good forest infrastructure network</i> <i>Quality and maintained forest infrastructure network</i>
	Weaknesses <i>Relatively small complexes of forest</i> <i>Damage due to extreme events</i> <i>Absence of motivation of owners to salvage after disturbances</i>
	Opportunities <i>Made associated management in forest to create stabile and vital forest</i>
	Threats <i>Unplanned development of agricultural activity</i> <i>Unplanned development of recreation</i>

Guideline 1	Forest owners association for effective forest management
Detailed directions:	<i>Associating mainly and inactive forest owners and other owners of land in a way that will enable cost – effective and objective – oriented forest management</i>
Responsible entity:	<i>Forest owners, association and other owners of land</i>
Needed participation:	<i>Forest owners, JP Srbijasume, City of Belgrade and institute for nature conservation of Serbia</i>
Coordination with other ES:	
Positive outcomes:	<i>Increased level of safety, coordinated implementation of management activities</i>
Negative outcomes:	<i>Different management plans between national and local institutions</i>
Legal basis	
Guideline 2	Establishment of stable vital and high quality forest stands
Detailed directions:	<i>Forest trending and cutting to create species divers stable and quality and biodiversity protection</i>
Responsible entity:	<i>Forest owners, JP Srbijasume</i>
Needed participation:	<i>Forest owners, JP Srbijasume, City of Belgrade and institute for nature conservation of Serbia</i>
Coordination with other ES:	<i>Main recreation</i>
Positive outcomes:	<i>High quality of wood, production of biomass</i>
Negative outcomes:	
Legal basis	<i>Forest management plan, spatial plan of Avala for city of Belgrade</i>
Guideline 3	Determination of the compensation system and setting the standards of forest management and implementation of management activities
Detailed directions:	<i>Higher standards for the use of the mechanization Minimum standard of salvage after disturbances must be defined Cleaning after the harvesting must be carried out with higher standards and immediately after the harvesting. Definition of measures that the COB and JP Srbijasume, performs for the forest owners Definition of activities that may be carried out by forest owners for JP Srbijasume and COB.</i>
Responsible entity:	<i>Forest owners, JP Srbijasume,</i>
Needed participation:	<i>Forest owners, JP Srbijasume, City of Belgrade and institute for nature conservation of Serbia</i>
Coordination with other ES:	<i>Other owners</i>
Positive outcomes:	<i>Less conflict, improved forest management, high level of safety</i>
Negative outcomes:	
Legal basis	<i>Forest management plan, spatial plan of Avala for city of Belgrade</i>

5.2 STRATEGIC OBJECTIVE KEY OBJECTIVES AND GUIDELINES - RECREATION AND NATURE PROTECTION

Strategic objective	<i>Urban forests provide residents of City OF Belgrade and its visitors opportunities for recreation, active leisure time and a healthy lifestyle and</i>
State (SWOT)	<i>Strengths</i>

	<p><i>Big forest complex</i> <i>Well maintained forest and special habitats</i> <i>Surrounded and closer by the City</i></p>
	<p>Weaknesses <i>Conflict between users and owners</i> <i>Unregulated access to forests (motors, quads...)</i> <i>Problems with traffic regime (cars races and motocros)</i> <i>No routes and entry points are specified</i> <i>Non-existing infrastructure in the part of strategic area especially in the Location of Suplja Stena</i> <i>Threats due to climate change</i></p>
	<p>Opportunities <i>regulation of access points and access to them</i> <i>Regulation and planning of access routes</i> <i>Awareness raising</i></p>
	<p>Threats <i>Unplanned development of agricultural activity</i> <i>Unplanned development of recreation</i> <i>Conflict with forest users</i> <i>Urbanization</i></p>
Guideline 1	Management of recreational infrastructure for protection biodiversity of Avala
Detailed directions:	<p>Management for protection biodiversity of Avala <i>Must be defining special and rare habitats with rules in accordance with applicable laws</i> <i>management must be management in a way to not be in conflict with other recreational activities</i></p> <p>Arrangement and maintenance of hiking trails and biking trails <i>Trails must be regulated and maintained in a way to assure safety of visitors and multiuse for various types of recreation. In areas with high number of visitors, biking and hiking trails must be separated. Paths for blind, weak-eyed and physically impaired are also being arranged</i></p> <p>Arrangement and maintenance of urban infrastructure <i>Urban equipment should be installed along the recreational infrastructure. It should be as much as possible made from the natural materials, especially wood. The density of equipment should be adapted to the needs (benches are more common along paths visited by older people and children).</i></p>
Responsible entity:	<i>Forest owners, association and other owners of land, municipality,</i>
Needed participation:	<i>Forest owners, JP Srbijasume, City of Belgrade and Institute for nature conservation of Serbia</i>
Coordination with other ES:	<i>Private and public company</i>
Positive outcomes:	<i>Conflicts are reduced, new attractive areas for recreation are created</i>
Negative outcomes:	<i>pressure on forests, pressure on special habitats,</i>
Legal basis	<i>Forest management plan, decree on spatial municipality plan COB</i>

Guideline 2	Restriction on the use of motorized vehicle
Detailed directions:	The use of motorized vehicle is restricted in the urban forest. It should only be allowed for the needs of forest management and for specific target groups such as organized groups of children and for maintenance of facilities (restaurants, houses, jumpers etc.). The rules for using motorized vehicles should be set and implemented through the municipal regulations.
Responsible entity:	Forest owners, JP Srbijasume, Recreation
Needed participation:	Forest owners, JP Srbijasume, City of Belgrade and institute for nature conservation of Serbia
Coordination with other ES:	Main recreation
Positive outcomes:	Control for the use of motor vehicles, small pressure on urban forest
Negative outcomes:	Conflict with users and recreations
Legal basis	Forest management plan, spatial plan of Avala for city of Belgrade, management on protection area.
Guideline 3	Accessibility of urban forests Avala
Detailed directions:	Higher standards for the safely accessible Entry points should be assured and infrastructure for bikers and pedestrians must be arranged Definition of main entry points Definition of public transports and bus stops
Responsible entity:	JP Srbijasume, COB
Needed participation:	Forest owners, JP Srbijasume, City of Belgrade and institute for nature conservation of Serbia
Coordination with other ES:	Other owner and municipality
Positive outcomes:	Less conflict, high level of safety
Negative outcomes:	
Legal basis	Forest management plan, spatial plan of Avala for city of Belgrade
Guideline 4	Protection of the area
Detailed directions:	Conservation of sites that are important for the protection of nature and biodiversity of Avala Preservation of the forest and special habitats Rehabilitation of degraded areas Informing and raising for mitigation and adaptation to climate change
Responsible entity:	JP Srbijasume, COB
Needed participation:	Forest owners, JP Srbijasume, City of Belgrade and institute for nature conservation of Serbia
Coordination with other ES:	Other owner and municipality
Positive outcomes:	improved state of nature protection areas greater awareness
Negative outcomes:	Conflict with owners
Legal basis	Forest management plan, spatial plan of Avala for city of Belgrade, management for protection area

6 GOVERNANCE

In this chapter, you should define the governance model for your UPF. How will management be organized, who will be responsible for implementation of the strategic plan?

Since the owner of much of the forest area is the state, the city of Belgrade should take over management of the area. This means that in addition to the local population, partnerships with forest management, the scientific community and NGOs will be strengthened. This type of organization should assist in the process of raising the necessary funds to achieve strategic goals in the Avala area.