



City of  
Ljubljana



CITY OF LJUBLJANA  
URBAN FOREST  
DEVELOPMENT  
STRATEGY  
**2020 – 2045**

**CITY OF LJUBLJANA  
URBAN FOREST  
DEVELOPMENT  
STRATEGY**

2020 – 2045

CIP - Kataložni zapis o publikaciji  
Narodna in univerzitetna knjižnica, Ljubljana

630\*62(497.451.1)"2020/2045"  
712.25:630(497.451.1)"2020/2045"

CITY of Ljubljana urban forest development strategy : 2020-2045 / [authors Tina Simončič ... et al.]. - Ljubljana : City of Ljubljana, Commercial Activities and Traffic Department, 2021

ISBN 978-961-6449-92-2  
COBISS.SI-ID 66782723

## TABLE OF CONTENTS

SUMMARY .....	4
1 INTRODUCTION.....	8
1.1 The purpose of the City of Ljubljana Urban Forest Development Strategy.....	8
1.2 Term definition .....	9
2 GENERAL PRINCIPLES AND PRIORITIES .....	9
3 DESCRIPTION OF THE SITUATION .....	12
3.1 Primary data.....	12
3.2 The importance of Ljubljana's urban forests .....	17
3.3 Target groups.....	20
4 THE CONCEPT OF URBAN FOREST LAND USE .....	21
5 MANAGEMENT OBJECTIVES AND GUIDELINES.....	24
6 REFERENCES .....	39

## SUMMARY

The City of Ljubljana Urban Forest Development Strategy 2020-2045 defines a vision and long-term priorities for the comprehensive development of Ljubljana's urban forests. The strategy as such constitutes a starting point for urban forest management, in particular for ensuring a high-quality living space for city residents. The strategy defines the local community's interest in forests within the city and in its immediate vicinity more clearly and contributes to the responsible forest management planning. The strategy was prepared within the context of the Interreg project URBforDAN on the initiative of City Municipality of Ljubljana for the Ljubljana urban forests area, which includes forests that are specified as forests with an exceptionally emphasised social function according to the municipal spatial plan. The purpose of the strategy is to activate a range of institutions, non-governmental organisations and individuals to engage in more active involvement in the development of Ljubljana's urban forests, to strengthen awareness of the importance of these forests and to improve the bases for forest management that fosters social and ecological functions in the urban forests of Ljubljana.

The strategy is prepared in accordance with the applicable laws and it takes into account the objectives connected to the development of forests and green spaces that are defined in other spatial and sectoral plans and guidelines. The strategy was prepared by the City Municipality of Ljubljana – Commercial Activities and Traffic Department and the Slovenia Forest Service. A great number of experts from management and research institutions and consultancy firms were involved in drafting the strategy. The concerned public and forest owners also participated indirectly through workshops, organized in the frame of URBforDAN.

The strategy sets seven priorities for management of Ljubljana's urban forests: 1) ensuring a healthy living environment, 2) providing opportunities for leisure activities and recreation, as well as the promotion of sustainable tourism, 3) providing opportunities for education and lifelong learning, 4) nature and cultural heritage conservation, 5) creating a stimulating environment for forest owners, 6) promoting a circular economy and 7) the development of comprehensive governance.

On the basis of the strategy, plans have been prepared for rounded areas within Ljubljana's urban forests that specify in more detail the implementation of activities associated with the use of urban forests for relaxation and recreation, including infrastructure development and the management regime for visitors, building and managing urban infrastructure and equipment, communication with forest owners and visitors, and awareness rising, education and stakeholder engagement.

## FOREWORD

### *Towards a strategy of sustainable urban forest management in the City of Ljubljana*

What exactly is a strategy, and when and why do we need it? Simply put, a strategy is nothing special. It is something we use all the time, particularly when we tackle something by considering how we will achieve the desired result. Whether we are trying to solve a certain problem or realise a certain idea, only a well-thought-out strategy can lead us to the expected change with certainty. Therefore, we need a strategy to pave the way for changes to the existing situation – a path we can walk on our own or, even better, overcome together with those without whom we would not be able to achieve the goal at all. The strategy therefore, in any case, presupposes the participation of several people, services, partners and contractors who mutually strive to achieve a certain result in a certain time. The strategy can thus only be successful when it encourages and connects participants by way of commitments based on the deep conviction of everyone involved in the common success.

So why precisely do we now need a new strategy on management with forests with a special purpose in the city? In other words, why do urban forests need new consideration right now that is supposed to lead to a new agreement on their management?

There are several reasons for this decision arising from the assessment of the causes and consequences of the existing situation and its changes. Of these, the most important is certainly the finding that forests live and die – that forests do not last forever; therefore we need to take care of and regenerate those that we specifically protect so that they can survive and preserve themselves for our descendants.

The main reason for the new strategy stems from the damage caused to forests by various natural disasters in recent years – damage to an extent that seems unmanageable in some places. Urban forests have also been affected by storms, snow-breaks, ice-breaks, windthrows and bark beetles to such an extent that they will find it difficult to recover on their own during one (re-)generation.

The second reason is the increasing load on sensitive urban forests that, due to their age, are finding it difficult to survive amidst densely built-up areas in an increasingly hot climate. More and more visitors come to these forests to walk, run, cycle, take trips, collect forest fruit, etc. There they interfere with the sensitive natural environment, construct paths into it, pollute it, upset the owners and disrupt forest works. In short, the forests in the immediate hinterland of the city are becoming an increasingly populated natural space that is open, accessible to all and for any use, thus performing more and more functions of a public space.

The third reason for the new strategy stems from the fragmented forest properties belonging to a number of owners. Even those who are not involved in forest management are disturbed by the free access and opening of forests on the one hand, and on the other they do not see any economic interest that would make them want to be actively involved in comprehensive urban forest management in line with the *needs of the forest, owners and communities*. The strategy will certainly help them more easily identify how the different benefits in the forest are linked to the common good and interact with each other.

Such coordination between economic, environmental and social benefits is the key to sustainable development, which includes the sustainable management of urban forests that have a special social purpose.

Each strategy is successful when it is based on a well-prepared and comprehensive assessment of the situation and especially the main problems that it faces. A good knowledge of the causes that lie behind the emergence of problems and the consequences they cause is essential to identify the right objectives and the priorities that follow. The set operational objectives must be as realistic as possible in order to be achievable in the expected time and within the framework of the available resources. This is how we come up with action plans and the projects that support them. Without feasible projects, which must be concrete and interconnected, as comprehensive a strategy still only remains a frame of good intentions. Therefore, it is all the more important that the strategy also has a certain way of managing and implementing the set plans and monitoring progress.

An effective strategy must convince all stakeholders, especially those it relies on. It must inspire them to interact, which can over time only lead to the desired solutions. It must, therefore, be based on proven successful and comparable solutions, particularly from domestic experience, which can even more convincingly eliminate the causes of any doubt and mistrust. It must be written in an understandable way, set in a simple and transparent manner. In its address, a credible strategy does not make empty promises and it must pre-empt unfounded objections and negative reactions, as the creators and proponents of the strategy must be aware that they are creating new relationships that also bring with them new obligations. The roles and responsibilities of the participants must be clearly distributed, it must be determined how it is planned, how the decision-making process shall take place, and how the management and performance of tasks will be realised. The strategy must therefore primarily meet the requirements of the users of the forest, as well as the expectations of its owners, rely on the capabilities of contractors, correspond to the capabilities of all participants, and take into account their willingness and conviction to join a creative community and alliance for the existence of forests.

Each strategy also has invaluable awareness-raising significance and educational purpose. It must motivate and inspire the community it addresses. It is a plan and beginning of a new forest community of smart owners, smart managers and smart users. Therefore, it is all the more important how widespread the procedures for familiarising people with the strategy, its acquisition and adoption will be, so that no one feels disadvantaged.

Forests are a characteristic green lining around the image of our city, as well as its crown. Just gazing at them makes us happy and feel better. Ljubljana is a forest city and, therefore, the residents take the forest for granted, as one of the natural resources that should belong to all of us and is available to everyone. Although the forest is our extended home in this respect, we are still not aware how much the forest really means to us or how much it could mean to us if we understood and respected it more. The forest is a complex habitat that is home to interdependent creatures, plants, animals, fungi, micro-organisms, water and soil.

The forest is our common good and natural refuge. Forests are the lungs of cities, they help us breathe easier. During the time of the pandemic, the thought that the forest was actually our common natural respirator crossed the minds of many people. Forests are actually a large, invaluable air conditioner that automatically runs on solar power. Cities in the vicinity of forests have better air, less overheating and more protection from wind and other weather events such as climate change. The beneficial effects of green forest cover on the climate are most felt in cities, where urban forests mitigate the effects of unexpected weather fluctuations through rejuvenating with suitable tree species and natural conservation.

The forest is also a biochemical plant, a wonderful natural machine that metabolises organic and inorganic substances in a closed circle. It is no wonder, then, that the forest is an allegory, a model of a sustainable energy-efficient city, using renewable resources and the closed matter recirculation system to enable self-sufficiency and resilience. The way the forest lives and regenerates naturally should be imitated in the ways of planning and managing it, as well as living in the co-responsible community of the city. Comprehensive urban forest management is also the easiest way to learn through direct practice what sustainable development really is and how to manage it.

The forest management strategy, which also includes their restoration and maintenance, is an integral part of the process of renewal and revitalisation of the city. It is included in the umbrella strategy of the Sustainable Urban Strategy of the City Municipality of Ljubljana, which it supports and complements. In this way, it also realises the long-term vision of a sustainable Ljubljana, in which we are committed that “all future spatial planning will be focused on preserving and upgrading the natural qualities of the city and its region, making better use of extensive hinterland forests, wetlands and other areas of preserved nature, which are greenhouse gas sinks and a valuable ecological balancing area”.

Anyway, the strategy urges us that we still need to learn how to handle urban forests in a wise and sustainable manner, and to adopt it as our enduring value, our ally and our natural protector. Ljubljana should carry out this pioneering role and become an example in this respect as well.

**Prof. Janez Koželj, Deputy Mayor**

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke at the end, positioned to the right of the name.



# 1 INTRODUCTION

## 1.1 The purpose of the City of Ljubljana Urban Forest Development Strategy

The European Union (EU) has recognised the importance of the initiative for the planned management of urban forests prepared by partners from seven Danube countries under the guidance of the City Municipality of Ljubljana (COL). The City of Ljubljana Urban Forest Development Strategy (hereinafter referred to as strategy) was created within the framework of the URBforDAN project and is co-financed by the EU.

The purpose of the strategy is to activate local capacities, institutions, associations and individuals to achieve more active involvement in the development of Ljubljana's urban forests, to develop a participatory approach in managing these forests and to improve the bases for forest management in the sense of promoting social and ecological functions in the urban forests of Ljubljana with an emphasis on providing conditions for a healthy living environment and recreation for residents. The strategy is thus an important tool for communication on development priorities for Ljubljana's urban forests with the public and interested groups in the Ljubljana's urban forest area.

Ljubljana's urban forests represent a wildlife habitat. Management of wildlife populations and their habitats is a complex topic. It is discussed in the Hunting Management Plans for Hunting Management Areas prepared by the Slovenia Forest Service (SFS). However, it is not a matter of the strategy, but the strategy is in line with the guidelines of the above mentioned documents.

Ljubljana's urban forests include multiple rounded forest areas. The preparation of more detailed plans for these forests is sensible for ensuring a balance between public interest, the laws of ecology and economic principles. For the individual rounded Ljubljana urban forest areas, more detailed plans will be prepared that include policies for the implementation of activities connected to the provision of public interest in an individual area, including infrastructure development and the management regime for visitors, building and managing urban infrastructure and equipment, communication with forest owners and visitors, education, cooperation with stakeholders and similar. These plans could form a basis for supplements to the existing forest management plans for this area and at the same time, a plan for management and equipment for forests with a special purpose could be prepared on the basis of the above-mentioned topics and in accordance with the Decree on forests with a special purpose (2010).

The strategy was created in 2019 and 2020. Numerous researchers and experts of the COL, the SFS, research institutions and consultancy firms were involved in the drafting of the strategy. In addition, within the framework of a guided participatory process, forest owners and the users were involved as well.

## 1.2 Term definition

**Urban forest** – a system that includes forests, groups of trees and individual trees in urban and peri-urban areas; it includes: trees, avenues, trees in parks and gardens, as well as trees in abandoned nooks. In a more narrow sense, urban forests are forests or forest ecosystems in cities and their immediate vicinity that provide benefits and services such as wood, forest fruits, clean water, recreation and tourism (FAO, 2016).

**Green spaces** – a set of all public open spaces in an urban area with a high percentage of vegetation and that form green urban infrastructure. They are a system of all public green spaces such as parks, gardens, squares, cemeteries and allotment gardens, as well as forests and other protected areas in the wider urban system (Costa et al., 2008).

**Ljubljana's urban forests** – a system of woodland areas that are defined as a forest according to the definition in the Act on Forests (1993) and that are defined as forest land use according to other acts and are designated as forests with exceptionally important social functions. They do not include other green spaces that are not defined as forests according to the legislation.

**Ecosystem services** – functions and products of ecosystems that benefit human well-being or provide benefits to society (MEA, 2005). They include supporting, provisioning, regulating and cultural services.

**Forest functions** – social demands related to forests (e.g. Dieterich, 1953; Bachmann, 2005). These are defined in the Act on Forests (1993). They include ecological, production and social functions.

**Multifunctional forest management** – a way of forest management that provides different effects/functions/services (Bončina, 2009). Such an integrative forest management approach ensures that different forest functions are provided simultaneously within the same forest land: i.e. production, ecological and social functions (Bončina, 2013). As a rule, their importance is different according to the natural conditions and needs of society.

**Public participation in forest management** – different forms of direct public involvement, wherein people can exchange information, give opinions and express interest as individuals or through organised groups and have the opportunity to impact the decision-making or the result of specific forestry-related issues (FAO/ECE/ILO, 2000).

## 2 GENERAL PRINCIPLES AND PRIORITIES

The most important substantive starting points of the strategy were the forest management plan for forest management unit (FMU) Ljubljana (FMP FMU Ljubljana, 2015) and forest function maps derived therefrom, the municipal spatial plan of the COL (MSP COL SP, 2010), surveys and workshops organised within the framework of the URBforDAN project (URBforDAN Project Report..., 2018; 2019a; 2019b; 2019c), as well as other legal acts that determine the guidelines for carrying out activities in the area.

The strategy is based on the principle of close-to-nature, multifunctional and sustainable forest management. All forests are managed taking into account the ecological, social and production functions of the forest; however, the urban forests of the COL have the special status of forests with a special purpose (Decree on protection forests and forests with a special purpose, 2005) due to their exceptionally highlighted social and ecological functions. When guiding urban forest management and the development of activities in urban forests, a balance between public interests, the laws of ecology and economic principles should be sought.

The forest management plan of the Ljubljana FMU serves as the main framework for forest management of the Ljubljana's urban forests and defines the management objectives associated with ecological, productive and social forest functions (FMP FMU Ljubljana, 2015). Furthermore, the Strategic part of the Ljubljana Municipal Spatial Plan (MSP COL SP) defines the importance of Ljubljana's urban forests (MSP COL SP, 2010). The strategy highlights seven priorities for Ljubljana's urban forest development based on the existing documents and URBforDAN project activities. With the exception of fifth and sixth priorities, they are primarily associated with ensuring social and ecological functions in those forests. The priorities were defined within the framework of the URBforDAN project – initially within a narrow project group and later with the inclusion of external experts whose work covers the urban forests in Ljubljana and the wider area. Priorities are also derived from workshops organised by forest owners and users that have been carried out within the framework of the URBforDAN project, as well as surveys conducted among visitors to Golovec. The set priorities address the main target groups that are defined in Chapter 3.3.:

### **1. providing a healthy living environment;**

A forest in the city is a key factor for air quality and local climate improvement, as well as for ensuring drinking water. It is extremely important for the physical and mental well-being of humans. Priority is given to protecting urban forest lands of the COL from changes to other land uses, while the COL buys off urban forest areas. In this context, the preservation and development of vital, stable and accessible forests that will, in view of global changes, significantly contribute to a healthy living environment for the city population and visitors, are encouraged.

### **2. providing opportunities for sustainable recreation and leisure activities and promoting sustainable tourism;**

Because they are interwoven into the urban fabric, the Ljubljana's urban forests represent a high-quality environment for leisure time and numerous recreational activities, and therefore have a significant impact on the quality of life in Ljubljana. At the same time, they are important for the promotion of sustainable tourism. It is important to ensure opportunities for sustainable recreation and leisure activities, as well as the promotion of sustainable tourism, in cooperation with forest owners (primarily with the COL, Republic of Slovenia and, depending on the possibilities, also with private owners).

### **3. providing opportunities for education and life-long learning;**

Due to the relatively easy access and the vicinity of educational institutions, the urban forests of Ljubljana represent an ideal environment for playing, learning, experiencing nature and exploration for younger and older generations of residents. It is important to recognise the needs of the selected target groups (educational institutions and others) and, together with them and forest owners, provide opportunities for conducting educational activities, thereby increasing the importance of the forest in terms of education, development and life-long learning.

### **4. nature and cultural heritage conservation;**

In addition, Ljubljana's urban forests also include forest lands that are important for the conservation of nature and natural values. They encompass areas that are important in terms of nature and biodiversity conservation. Ljubljana's urban forests are also home to cultural heritage sites that must be protected. Nature and cultural heritage must be promoted to the city population and visitors in a suitable manner.

### **5. creating a conducive environment for forest owners;**

Urban forest is mostly privately owned. From the economic viewpoint, it has a significant production potential that is limited due to its fragmented ownership structure. The priority is to create a conducive environment for owners together with them in order to better motivate them to manage their forest. With this, the economic benefits of the forests will increase for the owners, which can have a positive impact on green economic growth and sustainable development of the area. Due to the importance of urban forests for the residents of Ljubljana, the COL will develop mechanisms to help owners manage their forests (e.g. closures of areas during work activities in forests, logging for interested owners, the organisation of silvicultural works, subsidy system etc.) and, if necessary, to provide funding or professional and administrative support.

### **6. promoting a circular economy;**

In addition, the urban forests of Ljubljana are important due to their production function. They should be utilised for the green economy and sustainable development of the area. The wood from urban forests must be used for the development of the economy and self-sufficiency in the city municipality to a greater extent, thereby strengthening the role that urban forests play in the development of a circular economy. The principles of a circular economy are also realised through green public procurement, which enables short production chains and the efficient use of wood.

### **7. development of comprehensive governance;**

Different levels of authority regarding the management of the area and the predominantly private ownership of the urban forests of Ljubljana represent a challenge for the realisation of multifunctional forest management. In such areas, participation is therefore more important and more challenging, and constant communication with the public is also required. The priority is to establish a management model that will upgrade the forest management guidance system implemented by SFS, with new management mechanisms. These are associated with guiding recreation and leisure activities in the urban forests and require a specific approach and measures and, above all, include a much greater number of users.

The priorities or targets are defined in more detail in Chapter 5, which also lists the guidelines for achieving individual objectives.

## 3 DESCRIPTION OF THE SITUATION

### 3.1 Primary data

#### Database

The major part of the area of Ljubljana's urban forests falls under the FMU Ljubljana (FMP FMU Ljubljana, 2015), while a minor part also falls under the Polje FMU. All the data is adopted from the SFS's database. It was collected during the preparation of the FMP of FMU Ljubljana in 2014 and does not include changes in the conditions of the forests due to natural disasters after 2014 (windthrow and bark beetle attacks).

#### Area

The MSP COL SP defines urban forests as forests that have a special purpose for city residents due to their location and social, recreational, tourist and aesthetic qualities. On the Map 07 of MSP COL SP that shows the concept of green areas, these forests are defined as forests with extremely emphasised social functions. Considering MSP COL SP, the whole area of Ljubljana's urban forests is therefore defined in a way to encompass the forests on Rožnik and Šišenski hrib, Golovec, Dobrunjski hrib, the Castle hill, Šmarna gora and Grmada, along the Sava river, in Stožice and Zajčja dobrava, Brdo and in Vrhovci, Dolgi most, Za Mošenico, in Koseški boršt, Draveljska gmajna and Mestni log (Figure 1). Due to their emphasised ecological and social functions, the majority of these forests gained the status of a forest with a special purpose (Decree on forests with a special purpose, 2010).

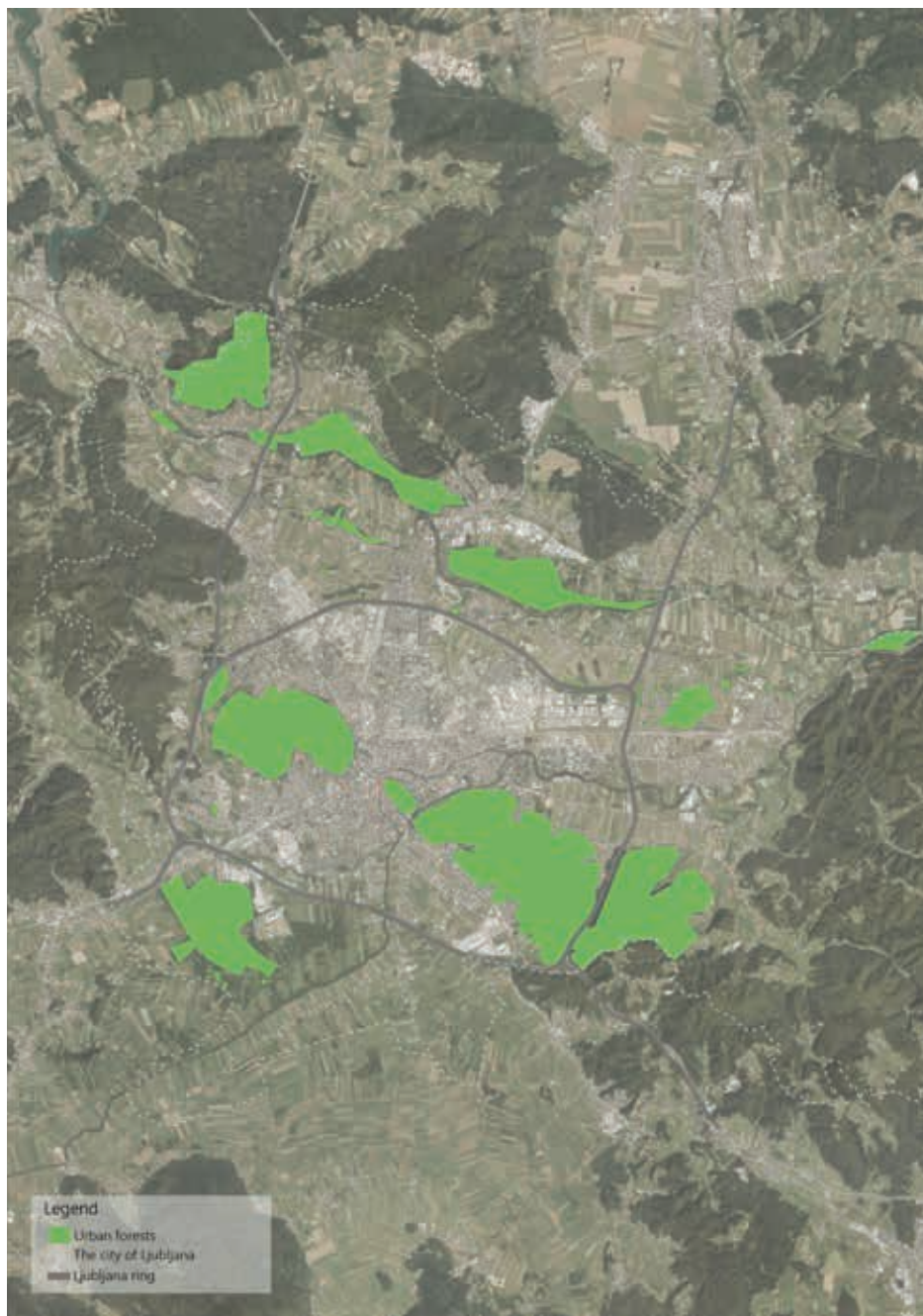


Figure 1: The area of Ljubljana's urban forests

Ljubljana's urban forests cover 2,151 ha of land, which represents 7.8 % of the area of the COL. The urban forests area encompasses the surface of forests with substantially emphasised social functions (Map 07, MSP COL SP, 2010), which are defined as a forest land use category according to the MSP COL. In nature, the urban forests area is slightly larger because the municipal spatial plans envisage future deforestation and land-use change for some woodland areas.

### Site and stand characteristics of urban forests

Ljubljana's urban forests are exceptionally diverse because almost all rounded areas within the urban forests are different in terms of the composition of tree species and forest communities. Among the forest sites, the acidophilous beech grove community with deer fern (*Blechno-Fagetum*) prevails (a greater part of the Tivoli, Rožnik and Šišenski hrib Landscape Park (TRŠ LP) and Golovec), followed by acidophilous red pine groves (*Vaccinio myrtilli-Pinetum* var.geogr. *Castanea sativa*) (a part of Golovec), pre-Alpine oak-hornbeam groves (*Quercus-Carpinetum* var. *Luzula*) (the Castle hill, a part of TRŠ LP, Zajčja dobrava, black alder groves (*Alnetum glutinosae*) (riparian woodland in Tomačevski brod), European ash groves (*Aceri-Fraxinetum illyricum*) (Stožice, along Sava River), pre-Dinaric/Dinaric thermophilous deciduous tree forest (*Quercus-Ostryetum carpinifoliae*) (Šmarnogorska grmada), pre-Alpine/Alpine thermophilous beech groves (*Ostrya carpinifoliae-Fraxinetum ornii*) (Šmarnogorska grmada, Šmarna gora) and other minority forest communities (FMP FMU Ljubljana, 2015).

The average growing stock totals 273 m<sup>3</sup>/ha and the average annual increment totals 7.6 m<sup>3</sup>/ha. The total allowable cut in the urban forests of Ljubljana is 94,819 m<sup>3</sup>, of which deciduous trees represent 61% and coniferous trees 39% of that volume. The dominant tree species include spruce (18.4%), red pine (17.5%), beech (16.6%), sessile oak (*Quercus petraea*) (15.9%), chestnut (9.6%) and pedunculate oak (*Quercus robur*), as many as 35 tree species are present, which indicates a great biodiversity of tree layer (the data on stand parameters are gathered during the forest inventory in the frame of preparation of FMP FMU Ljubljana, 2015). With regard to the natural disasters that greatly affected the urban forest in the years from 2015 to 2017 (windthrow, bark beetles), we can assume that the share of spruce is now significantly lower (estimated by approx. 10%). More accurate data will be available during the next forest inventory, which is to be carried out by the SFS in 2024.

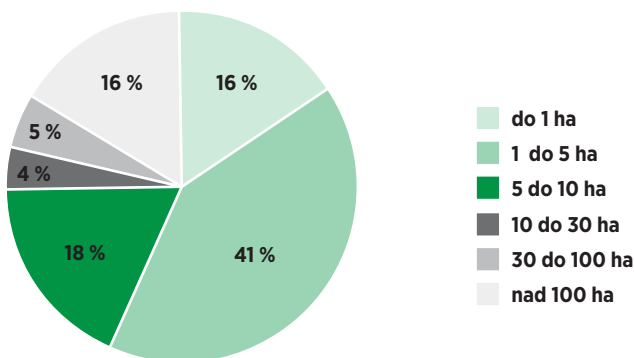
Older stands predominate in the area since a large part of the land represents stands at thick developmental stage (average diameter of trees at breast height is greater than 30 cm). The density of trees is relatively low since more than half of the stands have an open canopy; many forests are also of poor state (FMP FMU Ljubljana, 2015). Given the natural tree species composition of these forests, most forests are preserved and about a third of them have been modified; i.e. these are forests in which spruce has been planted in the past. The quality of the trees is average and better with coniferous trees than with deciduous trees (FMP FMU Ljubljana, 2015).

The average allowable cut equals 4.4 m<sup>3</sup>/ha. This is much lower than the Slovenian average and it is typical of forests where the allowable cut is significantly affected by social and ecological functions. The forest management plan envisages the attainment of the allowable cut mainly through the care of thick stands and pole stands, the introduction of stands for restoration

and by carrying out sanitary cut – i.e. restoration, especially of those forests that were badly damaged by ice breakage and due to the bark beetle attacks in the period between 2014 and 2017 (FMP FMU Ljubljana, 2015).

### Ownership

The largest share of all Ljubljana’s urban forests are private forests – i.e. 82.5%. The total number of private forest owners (according to 2018 data) and co-owners is 1562. In addition, the COL (173 ha) and the Republic of Slovenia – forests managed by the state-owned company Slovenski državni gozdovi or SIDG (207 ha) – are also among the forest owners. Given the structure of forest property (all ownerships considered), the forest property in size between 1 to 5 ha prevails (41 %) (Figure 2). The average private forest holding totals 1.2 ha, which is well below the Slovenian average (2.6 ha).



**Figure 2: Forest property structure (% of all forest land) in Ljubljana’s urban forests**

### The Ljubljana green system

The Ljubljana green system is defined within the MSP COL SP (2010), which stipulates that the green wedges that cut into the urban fabric are to be preserved. This preserves the biodiversity and ventilation of the city, while the temperature extremes are reduced and the conditions for the development of leisure activities in nature are improved. The key component of Ljubljana green system are forests, but other green park areas and areas along watercourses (Figure 3) are also important.



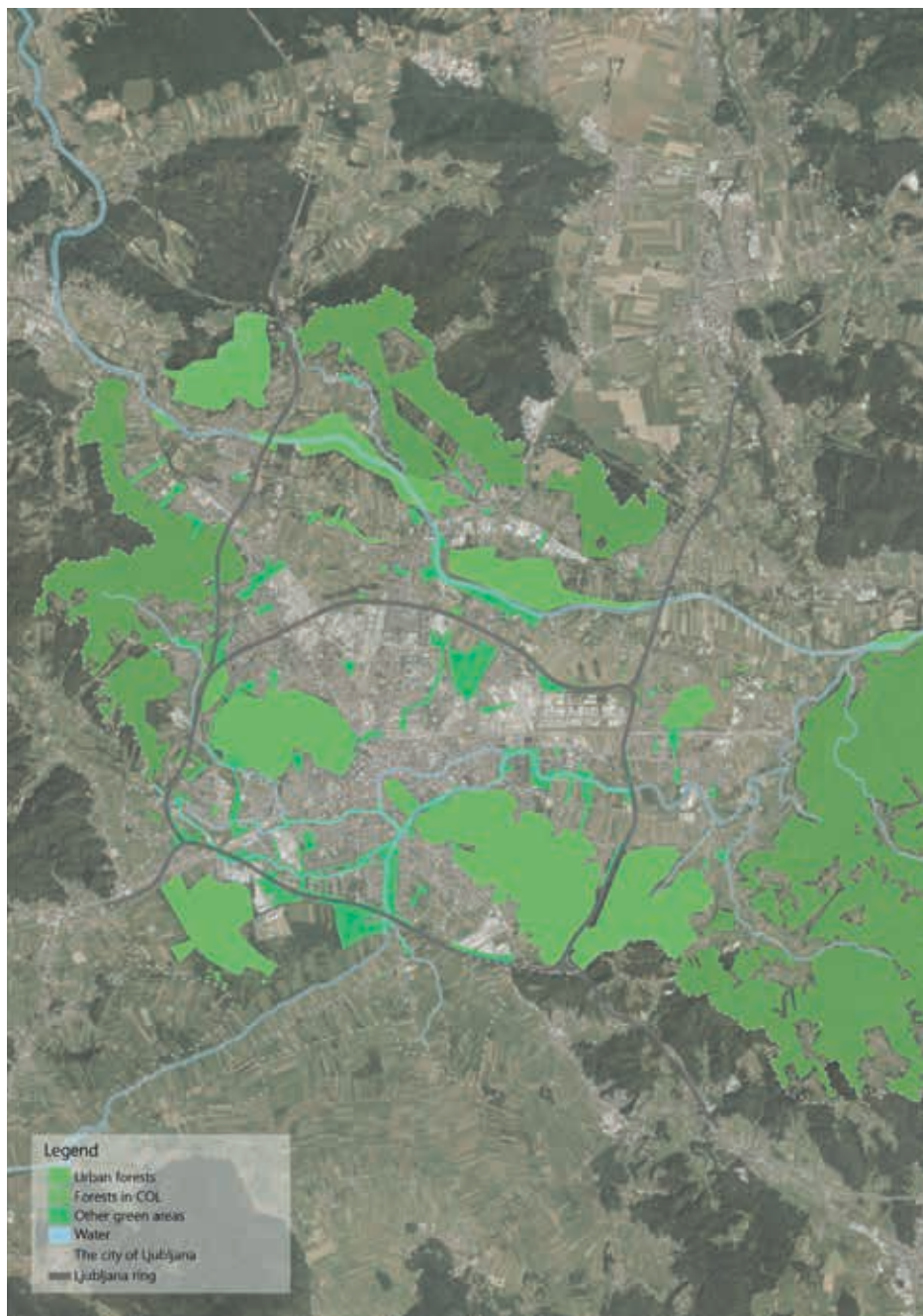


Figure 3: The Ljubljana green system (MSP COL SP, 2010)

## 3.2 The importance of Ljubljana's urban forests

### 3.2.1 Recreation and tourism

Forest is an important place for various types of recreation: running, walking, cycling etc. In addition, people visit forest to find peace of mind and relaxation, as well as new ways of spending their leisure time, due to the beneficial effect that forests have on human health and well-being. Those benefits are backed up by a considerable amount of research, which has been growing significantly in the last two decades. Among other findings, studies emphasise that urban forests have positive impact on mental and physical health, can improve academic performance when schools and classrooms have views on trees and forests, can increase social cohesion and, in some cases, contribute to a reduction in crime (Hanson and Frank, 2016). Several targeted studies have been conducted for the Ljubljana urban forests area on their importance for the city inhabitants (e.g. Golob, 1993; Gozdarski vestnik, 2010).

Due to their immediate vicinity to the city and relatively large spatial extent, Ljubljana's urban forests are of critical importance to the city population for **leisure activities and recreation**. At the same time, the number of tourist visits is increasing sharply and, therefore, these forests are also very important for the **promotion of sustainable tourism**. Recreation is important throughout the urban forest area, in particular around trails (walking and cycling trails), around forest entrance points and in places with special features, e.g. remarkable trees, ridges, intersections of two important trails, recreational grounds, mountain and hill peaks, bars and restaurants (e.g. Šmarna gora and Rožnik). The western part of Rožnik and the eastern part of Golovec are visited less frequently; the latter is of particular interest for mountain bikers and runners.

The Ljubljana Castle hill is the symbol of the city and its most important tourist site. For the city population, it is particularly important for old city centre dwellers. The Castle hill is a park forest and boasts an exceptional number of visits by both domestic visitors and tourists. The TRŠ LP is the most visited landscape park in Slovenia and boasts almost two million of annual visitors. Visitors to the park area (Ljubljana residents, domestic and foreign tourists) mostly seek relaxation and recreational activities. The Zoo area and Tivoli park attract many tourists and the forests in their vicinity are also visited particularly frequently. Tivoli is an important reflection of the city, and also the wider area in terms of outdoor exhibitions and a host of events. In the landscape park, Ljubljana residents and visitors mostly appreciate the proximity of nature; in other cities, such a symbiosis of city and park and forest land can rarely be found. The botanical garden also has a special role as the first scientific institution in Ljubljana and it just recently celebrated 200 years since its establishment. It is situated at the very edge of the urban forests under Golovec.

Golovec is the biggest complex in the urban forests and encompasses 651 ha of forest lands. Due to its spatial extent and lower density of organised trails compared to other forest lands in the city, it has preserved its somewhat more natural character. In practice, Golovec is visited less frequently than other urban forest complexes; however, it is very important to various target groups, such as walkers, runners, cyclists, mountain bikers etc.

Less visited are the forests along the Sava river and in the Ljubljansko barje, since they lack a regulated infrastructure and are less accessible to visitors.

### 3.2.2 Education and learning

In the age of technological development, educational approaches based on learning about natural processes and learning in nature through experience are used less and less frequently. In nature, the child's development in all areas – cognitive, social, emotional and motoric – happens spontaneously at the highest possible level during play, experience-based and situational learning and movement. Over the past decades, neuroscience has proven that nature is an invaluable therapeutic and developmental environment that stimulates brain development, which enhances the child's abilities. Children that play in a natural environment on a regular basis have better-developed motor skills and are ill less frequently. In recent years, awareness about the importance of forests and contact with nature for children and their healthy development has been increasing. The evidence for this is the growing number of Forest Kindergartens and increasing interest in the implementation of educational programs in the natural environment. However, it is not just younger generations who can benefit from learning, playing and exploring in nature. Even later in life, we can gain new knowledge from observing natural processes. Therefore, the forest is an important environment for life-long learning.

Ljubljana's urban forests are important for the **education of younger generations** because they are visited by kindergarten and school children every day. Here, children learn about the forest and nature. Moreover, urban forests are equally important for **life-long learning** because they are regularly visited by older generations.

### 3.2.3 Regulation of the local climate

Ljubljana's urban forests have a significant impact on the quality of life in Ljubljana. They considerably **reduce air pollution** and are of key importance in the **regulation of the local climate**. Namely, urban forests regulate the drainage of rainwater and contribute to the reduction of fine-particle air pollution, improve carbon sequestration and **reduce the urban heat island effect** (Hanson and Frank, 2016; Komac et al., 2017). At the same time, urban forests reduce the presence of atmospheric particulate matter and reduce peak temperatures (e.g. McDonald et al., 2016). Urban forests, as well as solitary trees, parks and avenues in urban areas, contribute significantly to the improved quality of life for the residents. Together with other green spaces (avenues, parks, gardens, solitary trees and agricultural land), the Ljubljana's urban forests thus have an extraordinarily **positive impact on human health**. Due to their relatively large area (they represent 8 % of the entire COL), the Ljubljana's urban forests offer **protection against noise pollution** from highways and radial roads and therefore represent a shelter where residents can retreat.

### 3.2.4 Protective effects

The **protective function** of urban forests is also important, since they protect against soil erosion. This function is especially evident on the steep slopes of Šmarna gora and Šmarnogorska grmada and the Castle hill; most of these forests have been proclaimed as protective forests by the Decree on protection forests and forests with a special purpose

(2005). Besides the protection function, the forests on Castle hill also have a direct protective function, which means they **protect the buildings directly below the hill against erosion**.

In addition, the forests are also important for **reducing flood hazards**. Some urban forest areas also have water retention facilities that protect the populated low-lying areas against flood risks. Due to intensive urbanisation and the reduction of retention areas, the role of the forest needed to be upgraded with measures for retaining hinterland waters.

### **3.2.5 The protection of drinking water sources**

The **protection of drinking water sources** is extremely important for the city, as well as for the strategic reserve of natural drinking water in the form of springs and streams in the area of urban forests, which usually never dry up and have served for water supply in the past. In accordance with the legislation in the field of water protection, some areas are designated as water-protection zones and the management of those areas is adjusted to the water protection requirements (for more details, see FMP FMU Ljubljana, 2015). From the viewpoint of high-quality drinking water conservation, forests are highly important on Rožnik, along the Sava river, on Šmarna gora and Grmada and in the Ljubljansko barje. These forests are situated inside water-protection zones with sources of drinking water that are of vital importance for ensuring high-quality drinking water for the Ljubljana residents.

### **3.2.6 Nature conservation**

Protected, endangered and rare plant and animal species live practically in the middle of urban areas, which gives the city a great advantage and many opportunities. Within the Ljubljana urban forest area, the areas of TRŠ LP, Zajčja dobrava and a part of the Ljubljana barje are designated as protected landscape parks. The TRŠ LP is important from the viewpoint of the conservation of natural values and landscape features, as well as from the viewpoint of biodiversity conservation. Namely, this is an area of 459 ha, of which 70 % is covered by forests that are included in the urban forests area. TRŠ LP connects different natural units into a whole and forms a mosaic interplay of numerous well-preserved ecosystems with rare and endangered plant, fungi and animal species.

The forests on Šmarna gora, Tivoli, Rožnik and Šišenski hrib, along the Sava and Ljubljanica rivers, Zajčja dobrava, the Castle hill and smaller areas on Golovec are designated as areas of high nature value. The forest areas on Šmarna gora, along the Sava and in Mestni log are included in the Natura 2000 network or represent a habitat of one of the Natura 2000 qualifying species. Therefore, these areas are important from the viewpoint of the conservation of important European species and habitat types.

The Ljubljana's urban forests are the habitat of several game species (roe deer, wild boar, coypu, and jackal). These species' populations are managed by hunting societies, responsible for hunting units, in line with the long-term and yearly hunting management plans prepared

by the SFS for separate management areas. The hunting management units in the area of the urban forests are the following: Brezovica, Dobrova, Pšata, Pugled, Rakovnik-Škofljica, Šmarna gora, and Toško Čelo.

Together with streams and rivers and extensive grassland, the forests are important for biodiversity conservation. Thus, their contribution is vital to the biodiversity of the city, which is among the highest of all European capitals. In addition to global changes, the greatest threat to biodiversity conservation are urbanisation and the intensification of agricultural production, and partially invasive non-native species. The most notable in the areas along the Sava are the tree of heaven (*Ailanthus altissima*), Japanese knotweed (*Fallopia japonica*) and goldenrod (*Solidago sp.*).

### 3.2.7 Cultural heritage

Cultural heritage is very important in the forests that are located near cultural heritage sites. Of the major sites that are important for the protection of cultural heritage, the Trail of Remembrance and Comradeship and the Castle hill should be highlighted. The Trail of Remembrance and Comradeship, as a unique trail facility, represents both cultural and natural heritage. It encircles the entire urban fabric and connects Golovec with the TRŠ LP, i.e. both major wings of Ljubljana.

### 3.2.8 Timber production and non-wood forest products

**Timber production** is important in Ljubljana's urban forests, but the potential of the forest stands as a key criterion for assessing the significance within the area that varies considerably. Timber production is of slightly greater importance in the eastern part of Golovec and the western part of TRŠ LP and on Šmarna gora and Grmada, Dobrunje Hill and in the forests along the Sava. Timber production is limited in the area of the designated protective forests; forests are also not managed in the area of natural monuments and nature reserves. More detailed description of the importance of timber production function can be found in FMP FMU Ljubljana (2015).

In addition, Ljubljana's urban forests are important for the collection of **non-wood forest products**, in particular for the collection of chestnuts, mushrooms and blueberries. This function is especially important in the forests on Golovec, Rožnik and Šišenski hrib.

### 3.3 Target groups

The strategic plan addresses the following main target groups:

- 1. residents of Ljubljana;** urban forest provides a healthy environment for all citizens and visitors and has a beneficial effect on the physical and mental health of people;
- 2. forest owners;** a good 80% of urban forests are privately owned. Among the forest owners, a wide range of interests and large differences in the intensity of forest management are observed;
- 3. different user groups active in the field of leisure activities and recreation;** walkers, hikers, runners, cyclists, dog walkers, families, archers, horse riders etc. The primary interests of these target groups are organised and marked recreational infrastructure, urban forest accessibility, attractive sightseeing points/trails/content etc.;
- 4. educational institutions;** these are nursery schools, primary schools, scout associations, senior activity centres etc.; for this target group, areas suitable for education, organised learning trails and classrooms, and other organised themed routes are the most important;
- 5. tourists;** a managed forest in the vicinity of the city that is accessible to tourists offers additional opportunities for leisure time and visits.

## 4 THE CONCEPT OF THE SPATIAL DEVELOPMENT OF LJUBLJANA'S URBAN FORESTS

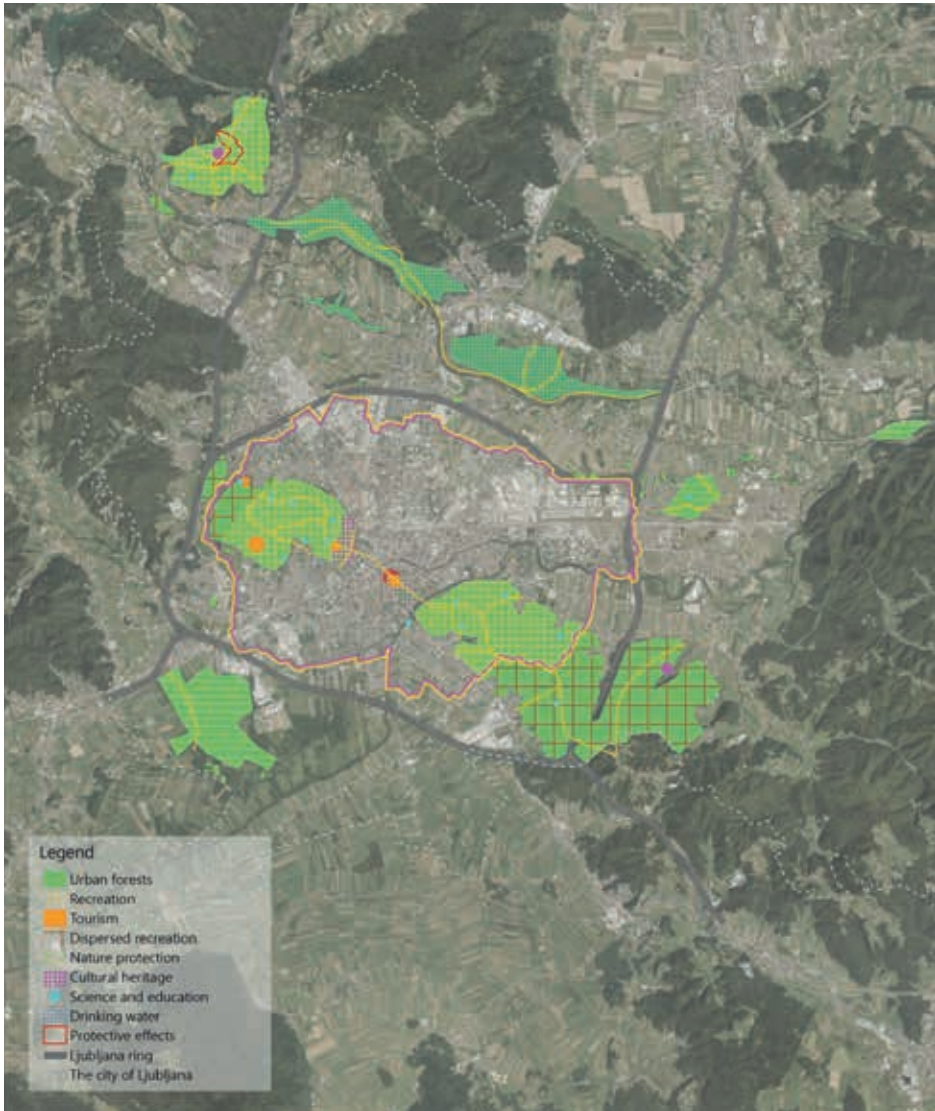
When managing any urban forests area, all forest functions (social, ecological and production functions) should be considered. This is a fundamental principle of multifunctional forest management (Act on forests, 1993). The concept of the spatial development of Ljubljana's urban forests defines areas where certain forest functions are more important than elsewhere. Of course, this does not mean that other forest functions in this area are not important.

The strategic map (Figure 4) is, to a great extent, based on the forest function map (FMP FMU Ljubljana, 2015). In particular, it takes into consideration those forest uses that are associated with high public interest. The production function of forests is not especially highlighted on the strategic map since practically all forests, with the exception of protection forests, are also important for the production function. In Ljubljana's urban forests, areas for the following activities are defined:

- **Leisure activities and recreation** areas; in a major part of the Ljubljana urban forest areas, recreation and leisure activities of residents and visitors to the city are extremely important. Due to the great diversity of types of recreation, these areas are divided into two categories according to the intensity level of recreation:
  - areas of intensive recreation that are located in the direct vicinity of the city and have many daily visitors; the important target groups are mainly walkers, runners, cyclists and dog walkers;
  - areas of dispersed recreation that are less frequently visited since they are located slightly away from the city; such include, for example, areas on Golovec east of the Trail of Remembrance and Comradeship and in the western part of Rožnik between the Večna pot Road and the Trail of Remembrance and Comradeship; the target groups are mainly runners and mountain bikers who use single trails and downhill courses;
  - less important recreational areas are those areas where we do not want visitors due to limiting factors in connection with nature conservation. A larger complex falling into this category is the forests in Mestni Log.
- **The development of sustainable tourism** is especially important in the areas of the Castle hill, TRŠ LP, Šmarna gora and the Zoo;
- The preservation of cultural heritage is important in the area of the Trail of Remembrance and Comradeship, in TRŠ LP, on the Castle hill and Šmarna gora;
- Areas, highly important for **nature conservation** where natural values are preserved and biodiversity is maintained with the aim of contributing to nature conservation (TRŠ LP, Ljubljansko barje LP, Zajčja dobrava LP, the Natura 2000 area, areas of natural values); a part of these forests (they are mainly forest remnants in agricultural landscape) was even established as a protection forest by a decree due to its extremely important function of preserving biodiversity;
- The area of thematic routes, quiet zones where no activities are being conducted, areas of points of attraction and other accessible areas in the vicinity of educational institutions are particularly important for **education**;
- Areas for **drinking water**; the forests along the Sava River are particularly important from the point of view of high water retention, as well as the retention of pesticides and fertilisers that seep into drinking water wells and the Sava from the agricultural land;
- Due to their protective function, **protective forests** have been established by a decree in a smaller part of the urban forests (Šmarna gora and the Castle hill);

- A smaller part of the urban forests is important for **flood water regulation**.

Urban forests are very important for the quality of life in Ljubljana. Social and ecological functions are extremely important for city residents. However, these forests also have a production function in almost all forest areas in the city and its immediate vicinity. Most of these forests are privately owned and, therefore, it is crucial to recognise and understand the forest owners' interests and align them with the interests of other urban forest users. This cannot be resolved through spatial zoning, but through other measures of integrative multi-objective forest management that are defined in detail in Chapter 5.



**Figure 4: The concept of the spatial development of Ljubljana's urban forests**



## 5 MANAGEMENT OBJECTIVES AND GUIDELINES

### OBJECTIVE 1: Ensuring a healthy living environment for city residents

#### Main issues

Globally, the importance of forests for the mitigating effects of climate changes and city pollution and thereby ensuring a positive impact on the health and well-being of city residents is increasingly recognised, but in Slovenia we still do not pay enough attention to this. Different programmes and projects (e.g. ECOschool, the Network of Forest Kindergartens and Schools of Slovenia, the Out for health project) draw attention to the positive impacts of forests on human health; however, currently, this aspect has still not been largely addressed in urban forest management.

From the point of view of the protection of drinking water, all forests in the city and its immediate vicinity are extremely important. These forests filter and regulate the percolation of rainwater into groundwater and thereby ensure the preservation of high-quality drinking water for the needs of city residents and visitors. The protection of drinking water sources, protection against floods and the reduction of soil erosion hazards are extremely important hydrological functions of Ljubljana's urban forests (Vilhar et al., 2010; Vilhar, 2017). Two bodies of groundwater are particularly important for the water supply of the COL: the Ljubljana polje aquifer and the Ljubljansko barje aquifer system (Decree on the water protection area for the aquifers of Ljubljansko barje and outskirts of Ljubljana, 2007; Decree on the water protection area for the Ljubljansko polje aquifer, 2007). Of the 102 catchment areas and springs that are available and renewable water sources in the COL, 5 are located outside the forest, 36 are located in the forest, and 61 are located at the forest edge (Vilhar et al., 2010). In aquifers, the forests with a naturally preserved composition of flora and stand structure represent an important filter against the introduction of pollutants from adjacent agricultural land, traffic routes and urban land into groundwater and surface waters. The role of forests in erosion-prone areas is in terms of maintaining the regime and quality of water sources, mainly the maintenance of forest soil stability with root systems, reducing (extreme) surface drains of water and preventing or retaining of moving landmass. Erosion-prone areas are mostly located in the eastern part of the COL, which is dominated by hilly and mountainous terrain.

Ljubljana's urban forests are spread throughout the entire city area. They consist of larger forest complexes and smaller forested patches that are woven into the urban fabric. All urban forests, especially forest patches, are under great pressure from urbanisation. Ensuring a healthy living environment for city dwellers in these forests is challenging due to many negative impacts and conditions, such as pressures imposed by deforestation, illegal waste landfills, hazards to drinking water quality due to erosion caused by urbanisation, agriculture and forest management, the unplanned development of recreational areas, challenges due to scattered small-scale forest ownership structure which hinders active management, and other.

## Guidelines

<b>Guideline 1</b>	<b>Ensuring stable and vital forests</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Carrying out measures for the improvement of the stability and resistance of forest stands (structural and species diversity, etc.; the measures are defined in detail in the FMP FMU Ljubljana, 2015)</li> <li>• Timely restoration of forest stands after natural disasters</li> <li>• Establishment of a system for the early detection and response to invasive non-native species</li> <li>• Providing assistance to owners when carrying out sanitary works</li> <li>• Encouraging and assisting forest owners in carrying out silviculture and protection works</li> <li>• Cooperation with forest owners, information provision</li> </ul>
Stakeholders	Forest owners, SFS, COL
Bases	FMP FMU Ljubljana, 2015; FMP FMR Ljubljana, 2012; Strategija prostorskega razvoja Slovenije 2050, 2020
<b>Guideline 2</b>	<b>Buying off urban forests by the COL</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• The purchasing of urban forests by the COL</li> <li>• The protection of all urban forests against land-use change</li> </ul>
Stakeholders	COL, SFS, forest owners
Bases	Decree proclaiming forests with a special purpose, 2010; MSP COL SP, 2010; Strategija prostorskega razvoja Slovenije 2050, 2020
<b>Guideline 3</b>	<b>Informing the public regarding the importance of forests for the environment and the impact of forests on human health</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Raising the awareness of the residents about the importance of urban forests for the quality of living</li> <li>• Raising the awareness of residents regarding the importance of actively spending leisure time in nature for human health</li> <li>• Raising the awareness of residents regarding suitable behaviour and allowed activities in urban forests (forest etiquette)</li> </ul>
Stakeholders	COL, SFS, residents, forest owners
Bases	/

Guideline 4	Preserving the quality and quantity of drinking water sources
Detailed guidelines	<ul style="list-style-type: none"> <li>• Raising the awareness of residents regarding the importance of forests for preserving the quality and quantity of drinking water</li> <li>• Preserving lowland floodplain forests as high-water retention sites</li> <li>• Construction of forest roads under strict conditions and building and maintenance standards that are specified in Rules on forest traffic routes (2009)</li> <li>• Preventing damage to the upper road layer</li> <li>• Mandatory use of biodegradable oils for the lubrication of chainsaws and in the hydraulic systems of machines while carrying out forest work in order to prevent unnecessary water and forest pollution inside the water-protection zones</li> <li>• Additional and more detailed guidelines associated with the water-protection zones (see the Vilhar et al., 2010; FMP FMU Ljubljana, 2015)</li> </ul>
Stakeholders	COL, SFS, water protection agencies, forest owners, forest contractors
Bases	Decree on the water protection area for the aquifers of Ljubljansko barje and the outskirts of Ljubljana, 2007; Decree on the water protection area for the Ljubljansko polje aquifer, 2004; Rules on forest traffic routes, 2009

### The protection and protective function of the urban forest

Ljubljana's urban forests also have very important protective functions – especially on the Castle hill and Šmarna gora, where forest stands protect land and underlying buildings from erosion and landslides. The major part of these forests have also been proclaimed as protective forests by the Decree on protective forests and forests with a special purpose (2005). Major guidelines in these areas include the preservation of forest areas without deforestation, limiting urbanisation in the immediate vicinity of protection forest, the improvement or preservation of forest vitality and stability, limiting recreational use in areas with high erosion and other guidelines that are specified in more detail in the forest management plan (FMP FMU Ljubljana, 2015) and in the Decree on protection forests and special purpose forests, such as ensuring and maintaining a stable and diverse forest structures, a mixture of tree species that is adopted to the site conditions, continuous forest cover, limited cutting (predominantly sanitary cut and small-scale tending cut), rapid restoration of bare areas and similar (FMP FMU Ljubljana, 2015).

The forests along the Sava and Ljubljanica, in Mestni log and Koseški boršt and on Golovec and Šmarna gora are important for the regulation and prevention of floods and should be preserved also with the aim of ensuring the safety of Ljubljana residents against floods.

## **OBJECTIVE 2: Providing opportunities for relaxation, recreation and active leisure**

### **Main issues**

Ljubljana's urban forests have an important recreational and touristic function. There is a dense network of recreational trails, but many trails are unplanned or are not suitably managed, causing damage to the forest floor and vegetation, as well as the disturbance of wildlife. Many people do not comply with the restrictions on motorised traffic while the vehicle parking in the urban forest area is especially problematic during periods of increased visits. Some areas are heavily burdened due to the high number of visits. On some paths, disagreements between pedestrians, cyclists and motorised traffic are common. There are many unplanned activities being carried out in the forests, which lead to disagreements between participants and owners and have a negative impact on the forest ecosystems (e.g. stumping on vegetation, soil compaction and forest soil erosion). Inadequate information and cooperation causes disagreements between forest owners and visitors, for instance in the period of felling and skidding.

There is a need for additional recreational infrastructure, such as mountain biking trails, trim trails, forest viewpoints, various courses and similar. Access to some areas is not properly regulated (lack of public transport, poor road connections, no parking spaces). Some entry points and trails are not properly regulated, while the orientation in space is difficult due to poor signage.

Areas along the Sava river and Ljubljansko barje receive fewer visits due to the poor accessibility and lack of infrastructure for visitors. Most illegal activities are taking place in these areas (excavation of gravel, littering, the disposal of construction waste, off-road motor vehicle use etc.), which further discourages people from visiting these areas.

The visitors should be reminded that different users have different needs and wishes regarding the use of that area and therefore they must be considerate of others and respectful towards the forest and the people that care for it, as well as the forest owners. Visitors are often unaware that urban forests are also commercial/managed forests where logging and harvesting occur regularly.

Currently, most tourists visit the main tourist locations, heavily burdening those areas. The infrastructure of attractive parts should be upgraded with attractive content, while the visitors should be encouraged to visit other areas that are not so heavily visited but have great potential.

## Guidelines

Guideline 1	Arrangement and maintenance of recreational infrastructure
Detailed guidelines	<ul style="list-style-type: none"> <li>• <b>Arrangement of footpaths and cycling trails;</b> the trails must be managed and maintained in a way that they ensure safe recreation for visitors and are aimed at different target groups. In areas with a great number of visitors, the cycling trails and footpaths should be separated. Paths for the blind and visually impaired, as well as for people with reduced mobility, are being arranged as well. Horse riding trails are also being arranged as needed.</li> <li>• <b>Arrangement and maintenance of urban facilities;</b> alongside the recreational infrastructure, urban facilities are also being installed. They are made from natural materials to the greatest possible extent, mostly from locally harvested wood. The density of individual urban facilities is adjusted according to the needs (e.g. more benches in areas aimed at the elderly and small children).</li> <li>• <b>Arrangement of courses;</b> activities that require specific arrangement (adrenaline parks, jumps, mountain biking courses etc) must be arranged in such a way that they are in harmony with other recreational activities and other important uses of the forest. They are not suitable in narrow nature conservation areas, as well as in areas that are home to critically endangered animal and plant species and in areas where leisure time activities are strongly established, such as the entire area of TRŠ LP. The courses are arranged as a whole and are clearly marked, aimed at specific target groups.</li> <li>• <b>Arrangement of signage;</b> signage will be unified and arranged and maintained in such a way that visitors can acquire basic information on the route, recreational infrastructure and locations of activities conducted along the paths. Signage must also include rules on behaviour in the urban forest.</li> <li>• <b>Restoration of degraded urban forests;</b> areas that are degraded due to past illegal activity must be restored and recreational activities should be developed in those areas. A larger number of visitors to the area will discourage further illegal activities. Before restoration, expert opinion should be sought for the purposes of the preservation of protected and endangered species and their habitats.</li> <li>• <b>Cooperation with forest owners regarding the arrangement of recreational infrastructure in privately-owned forests;</b> a part of the recreational infrastructure reaches into privately-owned land. Cooperation with forest owners should be established and the terms of use and ways of maintenance of this infrastructure should be defined together with the forest owners.</li> <li>• <b>Promotion of less visited forests;</b> by raising awareness and arranging equipment in some degraded and less accessible areas, those areas should be made fit for recreation and some of the people seeking recreational activities should be directed towards visiting those areas (e.g. area along the Sava river).</li> </ul>
Stakeholders	COL, SFS, Institute for the Protection of Cultural Heritage of Slovenia, Institute of the Republic of Slovenia for Nature Conservation, sports associations, district communities
Bases	FMP FMU Ljubljana, 2015; FMP FMR Ljubljana, 2012; Decree on the municipal spatial plan of the City Municipality of Ljubljana, 2010; Decree proclaiming forests with a special purpose, 2010

<b>Guideline 2</b>	<b>Enabling access to urban forests</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Access to urban forest areas must be safe. Access with public transport should be provided to the main entrance points and infrastructure for cyclists and pedestrians must be arranged. Where appropriate and required, other infrastructure should be arranged at entrance points (toilets, parking facilities for bicycles, parking spaces for vehicles, litter bins etc.). According to the level of their arrangement, the entry points are classified as follows:</li> <li>• main entry points are points with public access and infrastructural equipment (public transport, a cycle lane, a footpath, a parking space, a drinking fountain)</li> <li>• side entry points</li> <li>• special entry points:</li> <li>• entry points for organised visits/specific target groups (the Zoo, botanical garden, shooting range, areas for mountain bikers, etc.)</li> <li>• entry points with special permit for people with special needs and organised groups of children and the supply and maintenance of buildings (catering establishments, residential buildings, jumps, etc.)</li> <li>• Most entry points will be set on lands owned by the COL. In the case of joint ownership, entry points will only be arranged in agreement with the landowners. COL takes care for the equipment and maintenance of entry points.</li> </ul>
Stakeholders	COL, SFS, Institute for the Protection of Cultural Heritage of Slovenia, Institute of the Republic of Slovenia for Nature Conservation
Bases	FMP FMU Ljubljana, 2015; FMP FMR Ljubljana, 2012; MSP COL SP, 2010; Decree proclaiming forests with a special purpose, 2010
<b>Guideline 3</b>	<b>Information and public awareness</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Visitors should be informed about opportunities for recreation and rules of behaviour, and about their attitude towards private owners and forest production using various information channels. Key information tools are:</li> <li>• Information panels at entry points and across the area</li> <li>• Online presentation</li> <li>• Mobile application with all the information on the area</li> <li>• Social networks and other interactive tools</li> <li>• Forest etiquette</li> <li>• Code of conduct in nature „Visiting nature in Slovenia“</li> <li>• Logging and timber extraction are also performed in urban forests. This is a dangerous work and therefore, a part of the working site must be closed off to visitors while works are being carried out. Public will be informed and made aware of the working sites and hazards through media and on site. The public must also be educated about other forest management measures required for ensuring a continued presence and resilience of such a forest, which constantly contributes to quality of life in the city.</li> </ul>
Stakeholders	COL, SFS, Institute for the Protection of Cultural Heritage of Slovenia, Institute of the Republic of Slovenia for Nature Conservation, Ljubljana Tourism
Bases	FMP FMU Ljubljana, 2015; Environmental Protection Act, 2006

<b>Guideline 4</b>	<b>Restricting the use of motor vehicles</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Within the urban forest area, the use of motor vehicles should be further restricted. They should only be used for the needs of area management, forest management and carrying out activities in the public interest. Regulated motorised access to the areas should be provided for people with reduced mobility and the elderly, as well as transport for pre-school children.</li> <li>• Rules for use of motorised vehicles will be determined for each area individually. These rules should be implemented with municipal regulations, whereby their compliance must be ensured.</li> </ul>
Stakeholders	COL, SFS, visitors, nursery schools, schools, associations
Bases	Act on Forests, 1993; Nature Conservation Act, 2004; Decree on driving in natural environment, 1995
<b>Guideline 5</b>	<b>Sustainable dispersal of tourist visits throughout the broader area of urban forests</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Urban forests should be added into the sustainable tourist offer as an attraction with the aim of showing the tourists how forests are integrated into life in Ljubljana and the importance of urban forests for quality of life in city centres.</li> <li>• Links with other thematic tourist trails and products should be established (The Bee Path, Slovenian Mountain Bike Route etc.) and additional tourist programmes in the area of urban forests should be added.</li> </ul>
Stakeholders	COL, Ljubljana Tourism
Bases	Strategy on development and marketing the Tourist Destination of Ljubljana for the period 2014-2020, 2014; Environment protection action programme for the City Municipality of Ljubljana 2014-2020, 2014

## OBJECTIVE 3: Providing opportunities for education

### Main issues

Educational institutions in Ljubljana are already using forests for the implementation of educational activities. On the basis of general programmes, a range of approaches are being developed that are open to all visitors to the area (e.g. thematic trails) and specific programs organised for target groups that are usually carried out under professional guidance. However, not all potentials have been fully exploited. One reason is scattered small-scaled ownership structure, which makes it difficult for institutions to implement programmes, and the other reason is inadequate communication between institutions and owners. At the same time, educators are pointing out the lack of appropriate programmes and materials in the field of forest pedagogics that would be aligned with nursery school and school curricula. The promotion of education is also made impossible by unsuitable areas for educational purposes, the urban forest areas that are suitable for the implementation of programmes are not identified and marked, access points are not properly arranged and are therefore not safe or suitable for specific target groups.

### Guidelines

Guideline 1	Improving the opportunities for conducting educational activities in the forest
Detailed guidelines	<ul style="list-style-type: none"><li>• Define appropriate locations for forest pedagogics in a collaboration with schools, kinder gardens, SFS and other professionals</li><li>• Setting up outdoor classrooms, thematic trails and other educational infrastructure and programmes in the COL forests or in a collaboration with private owners</li><li>• Ensuring the safety of visitors by setting up monitoring and regulation protocols for these parts of the forest and their consistent implementation</li><li>• Strengthen co-operation between COL, state, private forest owners, SFS and educational institutions</li></ul>
Stakeholders	COL, forest owners, National Education Institute Slovenia, SFS, schools and nursery schools, centres for life-long learning activities, campers, scouts
Bases	FMP FMU Ljubljana, 2015; Environmental Protection Act, 2006; curricula



## **OBJECTIVE 4: Preserving nature and safeguarding the cultural heritage in urban forests**

### **Main issues**

Approximately 20 % of the COL area has the status of a protected area (NATURA 2000, ecological areas and areas that have been proclaimed forests with a special purpose). NATURA 2000 sites cover 13% of the total area of the municipality, and some of those sites are situated in the area of Ljubljana's urban forests. Forest areas have different conservation status and are exposed to different pressures.

There are four landscape parks in the COL. The Government of the Republic of Slovenia proclaimed the Ljubljansko barje LP, while COL proclaimed other protected areas with local decrees pursuant to the Nature Conservation Act (2004) and the conservation of cultural heritage area in accordance with the Cultural Heritage Protection Act (2008). Zajčja dobrava is the oldest LP in Ljubljana. By proclamation, the indigenous lowland forest, which represents a green barrier between residential and industrial areas, has been preserved and is a popular spot, used for recreation and relaxation by the city dwellers. The TRŠ LP lies in the heart of the city centre. A number of different species that have a great significance for nature conservation and are listed on the Red List of Threatened Species are being preserved. The Ljubljansko barje LP, with its northern part extending into the Ljubljana urban forest area, is the largest humid grassland area in Slovenia with a system of borders and forest areas, shrublands and water areas (Environmental protection programme of the City Municipality of Ljubljana 2014-2020, 2014). Currently, only Ljubljansko barje LP and TRŠ LP have park operators. From the point of view of nature conservation, the forest areas where recreational activities and various interventions (urbanisation, agriculture) are being intensively carried out are heavily burdened. Those areas are mainly TRŠ LP, Zajčja dobrava LP and Šmarna gora. The areas along the Sava that are under significant pressure due to illegal activities, such as gravel excavation, construction and municipal waste disposal, the off-road use of motor vehicles and the spread of invasive non-native species, are also included in the Natura 2000 site along the Sava. The issues are slowly being resolved with the support of the public, which does not approve of illegal activities. One of the underexploited opportunities is the targeted preservation of nectariferous species of trees and shrubs, which are of key importance for attracting pollinators

and maintaining a favourable conservation status of their populations. Those species are important from the viewpoint of preservation and the increase in the diversity of organisms and for providing food.

Among the areas that have been recognised as cultural heritage sites, Ljubljana castle and Tivoli are most heavily visited, while the Trail of Remembrance and Comradeship, which is a key recreational green spot in Ljubljana that also connects some of the forest areas, also has a special place.

Currently, one of the key weaknesses – and also one of the key opportunities – is the fact that nature and cultural heritage are not sufficiently presented to the city dwellers and other visitors. Therefore, many people are unaware of the importance of nature and cultural heritage conservation.

## Guidelines

<b>Guideline 1</b>	<b>Preservation of the area and the improvement of the condition of areas that are important in terms of nature conservation</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Carrying out measures for the conservation or improvement of the condition of protected areas, natural values, Natura 2000 sites, areas with great biodiversity and diversity of landscape and ecologically important areas (for details, see the Environmental protection programme of the City Municipality of Ljubljana 2014 – 2020 and Natura 2000 Management programme, 2015)</li> <li>• Conservation of protected areas within the city</li> </ul>
Stakeholders	COL, forest owners, The Institute of the Republic of Slovenia for Nature Conservation, SFS
Bases	Decree on the Tivoli, Rožnik and Šišenski hrib Landscape Park, 2015; Odlok o razglasitvi srednjeveškega mestnega jedra Stare Ljubljane in Grajskega griča za kulturni in zgodovinski spomenik ter naravno znamenitost, 1986; Decree on ecologically important areas, 2004; Decree on the categories of valuable natural features, 2002; Decree on special protection areas (Natura 2000 areas), 2004

<b>Guideline 2</b>	<b>Protection of cultural heritage sites</b>
Detailed guidelines	Preforming measures for the restoration, maintenance and functionality of cultural heritage sites
Stakeholders	COL, Institute for the Protection of Cultural Heritage of Slovenia, The Institute of the Republic of Slovenia for Nature Conservation, SFS
Bases	Decree on the Tivoli, Rožnik and Šišenski hrib Landscape Park, 2015; Odlok o o razglasitvi srednjeveškega mestnega jedra Stare Ljubljane in Grajskega griča za kulturni in zgodovinski spomenik ter naravno znamenitost, 1986; FMP FMU Ljubljana, 2015; Nature Conservation Act, 2004; Cultural Heritage Protection Act, 2008
<b>Guideline 3</b>	<b>Interpretation of areas that are important for nature conservation and cultural heritage</b>
Detailed guidelines	Improved interpretation of nature and cultural heritage in urban forests. Interpretation will be carried out in the form of: <ul style="list-style-type: none"> <li>• Interpretation of trails</li> <li>• Guided tours</li> <li>• Games and stories</li> <li>• Mobile applications</li> </ul>
Stakeholders	COL, Institute of the Republic of Slovenia for Nature Conservation, Institute for the Protection of Cultural Heritage of Slovenia, SFS
Bases	Decree on the Tivoli, Rožnik and Šišenski hrib Landscape Park, 2015; Odlok o o razglasitvi srednjeveškega mestnega jedra Stare Ljubljane in Grajskega griča za kulturni in zgodovinski spomenik ter naravno znamenitost, 1986; Decree on ecologically important areas, 2004; Decree on the categories of valuable natural features, 2002
<b>Guideline 4</b>	<b>The purchase of land in areas that are of key importance for critically endangered species and species that are important in terms of conservation by the COL</b>
Detailed guidelines	The gradual purchase of land where measures for the conservation of species and the maintenance of a favourable conservation status are of the highest priority
Stakeholders	COL, forest owners, Institute for the Protection of Cultural Heritage of Slovenia, SFS
Bases	Decree on the Tivoli, Rožnik and Šišenski hrib Landscape Park, 2015; Provisional management guidelines for the governance of the Tivoli, Rožnik and Šišenski hrib Landscape Park, 2018; Rules on the inclusion of endangered plant and animal species in the Red List, 2002

## **OBJECTIVE 5: Creation of a stimulating environment for the sustainable management of privately-owned forests**

### **Main issues**

In the past, forest management objectives in the forests with a special purpose were highly directed towards ensuring social functions. Inactive management in private forests caused an increased growing stock and an increase in the proportion of old developmental phases of forest. Only rarely, large-diameter trees have been systematically preserved. In recent years, there have been several natural disasters that significantly decreased the stability of the forests. Restoration of damaged forest stands after natural disasters is still being carried out. The biggest obstacles for the implementation of restoration of forests are fragmented ownership structure, small properties and consequent reticence of forest owners towards forest management.

For some urban forest owners, the income from forests represents an important source. The income is generated exclusively from the sale of wood. Smaller forest holders usually keep their forests due to family tradition, self-sufficiency and personal pleasure, and for them, forests do not represent an important source of income. For some forest owners, ownership could be a burden.

Forest management comes with significant expenses for the owners due to the limited infrastructure usefulness, higher costs of dealing with logging residues and challenging conditions during felling and extraction because visitors rarely respect the restrictions on movement during the performance of works in the forest. Visitors often show improper behaviour towards forest owners or contractors and underestimate the risk of accidents at the forest working sites.

Works in the forests are being performed by different contractors and the quality of their work differs as well. Some are prudent and diligently arrange the felling sites and forest infrastructure, while others leave behind untidy felling sites, overly damaged trees, damaged roads and skid trails. Currently, the supervision of forest work performance is lacking.

Silvicultural work lacks proper implementation as well. In the past, thick stage forests have been predominant on Golovec and therefore, the planned silvicultural works have been carried out less frequently. After the latest natural disasters, the forests have opened up and regenerated and the need for silvicultural works has grown. Throughout the history, the TRŠ LP has received different levels of intensity and quality of forest care as well.

## Guidelines

<b>Guideline 1</b>	<b>Promoting forest owners associations for more effective forest management</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• The promotion of association of forest owners in a way that will ensure cost-efficient and guided forest management</li> <li>• Support of the COL in the joint organisation of works in the forests</li> <li>• Taking advantage of subsidies for funding the establishment of forest owners associations</li> </ul>
Stakeholders	Forest owners, owner associations, COL, SFS
Bases	/
<b>Guideline 2</b>	<b>The COL taking over forest management from owners who lack interest</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• The preparation of organisational and financial scheme for private forest management by the COL</li> <li>• The preparation and conclusion of multi-annual management-rental contracts with individual forest owners</li> <li>• The regular implementation of necessary sanitary cuts and silvicultural work</li> </ul>
Stakeholders	COL, forest owners
Bases	/
<b>Guideline 3</b>	<b>Drafting of standards for urban forest management and work activities performed in urban forests</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Implementation of measures that ensure safety of visitors along the routes and infrastructure</li> <li>• Implementation of above-standard forest rules and reduction of the amount of timber and logging residuals left along the organised and marked paths after felling in the area of recreational infrastructure</li> <li>• Determination of the machinery used for extraction and transporting of timber</li> <li>• Determination of the requirements for infrastructure restoration following completion of works</li> <li>• Determination of the procedures for marking and informing the public about working sites in forests</li> <li>• Training contractors for carrying out work in urban forests</li> <li>• Education regarding the presence of invasive non-native species</li> <li>• Public evaluation of contractors in the field of forestry (e.g. through the portal Moj gozdar (My Forester))</li> </ul>
Stakeholders	COL, SFS, forest owners, forest contractors
Bases	FMP FMR Ljubljana, 2012; FMP FMU Ljubljana, 2015; Decree proclaiming forests with a special purpose, 2010

<b>Guideline 4</b>	<b>Establishment of a compensation system due to restrictions regarding forest management</b>
Detailed guidelines	<ul style="list-style-type: none"> <li>• Designing a scheme of restrictions regarding forest management and the management of individual forest trees</li> <li>• Establishing measures for forest owners that are carried out by the COL in an above-standard manner</li> <li>• Determining activities that forest owners can perform on behalf of the COL</li> <li>• Designing a scheme for defining compensation</li> </ul>
Stakeholders	COL, forest owners, SFS
Bases	Decree proclaiming forests with a special purpose, 2010
<b>Guideline 5</b>	<b>Public awareness of the importance of active forest management</b>
Detailed guidelines	Informing the public through various channels that urban forests are also commercial and private forests, that they are actively managed by their owners and that this is important for ensuring the various functions of the forest
Stakeholders	COL, forest owners, SFS, Institute for the Protection of Cultural Heritage of Slovenia, Institute of the Republic of Slovenia for Nature Conservation, Ljubljana Tourism
Bases	FMP FMU Ljubljana, 2015; Environmental Protection Act, 2006

## OBJECTIVE 6: Promoting a circular economy

### Main issues

A circular economy addresses the movements of goods and services with the aim of maintaining and improving the natural, social and human capital. It maintains the added value of products and materials for as long as possible and then removes them, enhances them and returns them to use.

The national roadmap towards a circular economy includes forest value chains among the four circular economy priority areas. The area includes all stages of preservation, production, processing, transport, sale of wood, waste wood treatment, wood products and, more widely, also the fields of nanotechnology, tourism and construction.

The wood from urban forests must be used for the development of the economy and self-sufficiency in the city municipality and for the benefit of its residents to a greater extent, and thereby strengthen the role that Ljubljana's urban forests have in the development of a circular economy.

When deciding on promoting the use of wood biomass as an energy product on the local level, it is important to know the air quality. In the COL, the energy potential of wood biomass totals 108 GWh annually. The wood biomass potential can be used especially for heating smaller units in areas that lack district heating or gas pipelines.

The benefits of the promotion of a circular economy can be an increased interest of forest owners in forest management, the creation of new green jobs, increased cooperation with research institutions and the development of eco-innovations, while the danger might be a changed composition of forest species.

### Guidelines

Guideline 1	Seeking added value from wood biomass
Detailed guidelines	<ul style="list-style-type: none"> <li>• Establishing connections with the paper industry</li> <li>• The production of (nano)pulp, the production of green chemicals</li> <li>• The use of liquidised wood for coatings</li> <li>• Sales of slash</li> <li>• Donation of slash after skidding</li> <li>• Eco-design of new wooden products</li> <li>• LES UGL trademark/certificate</li> </ul>
Stakeholders	COL, forest owners, SFS, research institutions
Bases	/
Guideline 2	Sale of wood and the promotion of wood construction
Detailed guidelines	<ul style="list-style-type: none"> <li>• The use of local wood for urban equipment (e.g. benches, tables, playthings) and equipment on paths (e.g. signpost, steps, embankments)</li> <li>• The promotion of wood construction (e.g. the Pedenjped nursery school, Pedenjcarstvo unit)</li> <li>• The promotion of the re-use of wood and the repair of wooden products</li> <li>• The COL helps with wood sales in the local area</li> <li>• For satisfying its need for wood, the COL prefers to buy wood from the Ljubljana urban forest area</li> <li>• The arrangement of recreational infrastructure by interested groups of residents and associations on the basis of agreement with the COL – use of their own equipment and local materials</li> </ul>
Stakeholders	COL, SFS, Chamber of Agriculture and Forestry of Slovenia, associations
Bases	Decree on green public procurement, 2017

## OBJECTIVE 7: Comprehensive governance

For high-quality management of Ljubljana's urban forests, cooperation with all interested stakeholders (COL, SFS, state, various institutions, private forest owners and users) is needed, the activation of uninterested stakeholders and the coordination of different interests is of key importance. In Ljubljana's urban forests, the COL will take on the role of coordinator and interest coordinator for the benefit of the local community together with the SFS who is a key carrier of forest development planning and the implementation of forest work, and together they will guide and coordinate activities associated with management for ensuring the ecological and social functions of the urban forests of Ljubljana. The COL will offer support to the SFS in the effective implementation of forest management plans (forest owners associations, arranging infrastructure, informing users about works in the forest etc.) and implement activities that are outlined in the strategy and the Arrangement and equipment plans for forests with a special purpose. The COL will also include interested organised target groups, such as representatives of urban districts, associations of forest owners, representatives from the education sector, Slovenian scout associations, recreational and sports associations and other non-governmental organisations in the urban forest management. Each organised group will be able to take on a specific volume of tasks and implement them in line with the operational plan for individual urban forest areas. The objective for including such groups in management is to enable city residents to actively take part in co-designing their own environment, acquiring additional knowledge and skills and acting as guardians of Ljubljana's urban forests by setting an example to others.

The implementation of the strategy and the coordination of interests in the urban forests within the COL will be monitored by a working group, which consist of representatives of COL (establisher and coordinator), SFS, private forest owners, the Institute of the Republic of Slovenia for Nature Conservation, The Institute for the Protection of Cultural Heritage of Slovenia, urban districts, educational institutions, non-governmental organisations and users. The group will prepare proposals for improving the management and be responsible for the further development of activities in urban forests.

### **The key tasks of the COL in managing the Ljubljana's urban forests are as follows:**

- A. Helping forest owners with forest management, which includes the following:
- informing visitors about the performance of works in forests and the arrangement of temporary path closures during the performance of works in the forests
  - the purchase of urban forests
  - support in establishing forest rules in the area of recreational trails
  - support in maintaining forest infrastructure
  - cooperation with the SFS in directing the forest management



B. Organising forest owners for joint forest management encompassing the following:

- the organisation of joint management for interested forest owners
- communication with the owners
- communication with the SFS and other competent institutions on behalf of the owners
- carrying out work in forests

C. Organisation and performance of works in urban forests, which would mainly include the following:

- construction and maintenance of recreational infrastructure (trails, signage, urban equipment, etc.)
- organising and cooperating with other target groups that are included in the management and supervision of implemented activities

D. Informing and raising the awareness of forest owners and users of the Ljubljana's urban forests

E. The organisation and coordination of contractors of the COL for carrying out necessary measures in privately-owned forests

- Conducting regular checks of the condition of trees and forest stands along the marked and organised forest trails
- Performing clearance or maintaining potentially dangerous trees along forest trails with the consent of the forest owners and upon the issuance of the SFS's decision
- Carrying out sanitary work at the sites of bark beetle attacks with the consent of the forest owners and upon the issuance of the SFS's decision

For carrying out the envisaged tasks, the COL is allocating €0.1 of the tourist fee and funds acquired from the management of forests owned by the city and other acquired public funds. The funds will be used on the basis of the annual work programme in accordance with the operational plans for the urban forests of the city of Ljubljana. Arrangement and equipment plans for forests with a special purpose and the recommendations of the working group for the management of Ljubljana's urban forests.

## 6 REFERENCES

Act on forests (Official Gazette of the Republic of Slovenia, No. 33/93 et seq.).

Bachmann, P., 2005. Forstliche Planung I/III. Skript für die Lehrveranstaltungen 'Gründzüge der Planung', 'Forstliche Betriebsplanung' und 'Waldentwicklungsplanung'. Zürich, Professur Forsteinrichtung und Waldwachstum ETH.

Bončina, A., 2009. Urejanje gozdov: upravljanje gozdnih ekosistemov : učbenik za študente univerzitetnega študija gozdarstva. Biotehniška fakulteta, Oddelek za gozdarstvo in obnovljive gozdne vire.

Bončina, A. (ed.), 2013. Razvoj večnamenskega gospodarjenja z gozdovi: funkcije gozda, ekosistemske storitve in prednostna območja. Ljubljana, University of Ljubljana, Biotechnical Faculty, Department of Forestry and Renewable Resources, Slovenia Forest Service: 31–36.

Costa, C.S., Šuklje Erjavec, I., Mathey, J., 2008. Green spaces – a key resources for urban sustainability. The GreenKeys approach for developing green spaces. Urbani Izziv 19, 2: 199–211.

Cultural Heritage Protection Act. (Official Gazette of the Republic of Slovenia, No. 16/08 et seq.).

Decree on driving in natural environment (Official Gazette of the Republic of Slovenia, No. 16/1995 et seq.).

Decree on ecologically important areas (Official Gazette of the Republic of Slovenia, Nos. 48/04 et seq.).

Decree on protective forests and forests with a special purpose (Official Gazette of the Republic of Slovenia, No. 88/05 et seq.).

Decree on special protection areas (Natura 2000 areas), 2004. (Official Gazette of the Republic of Slovenia, No. 49/04 et seq.).

Decree on the categories of valuable natural features (Official Gazette of the Republic of Slovenia, No. 52/02 et seq.).

Decree on green public procurement (Official Gazette of the Republic of Slovenia, No. 51/17 et seq.).

Decree on the Tivoli, Rožnik and Šišenski hrib Landscape Park (Official Gazette of the Republic of Slovenia, No. 78/15 et seq.).

Decree on the water protection area for the aquifers of Ljubljansko barje and outskirts of Ljubljana (Official Gazette of the Republic of Slovenia, No. 115/2007).

Decree on the water protection area for the Ljubljansko polje aquifer (Official Gazette of the Republic of Slovenia, No. 120/2004).

Decree proclaiming forests with a special purpose (Official Gazette of the Republic of Slovenia, No. 60/2010 et seq.).

Dieterich, V., 1953. Forstwirtschaftspolitik – Eine Einführung. Hamburg und Berlin, Paul Parey.

Environmental Protection Act (Official Gazette of the Republic of Slovenia, No. 39/2006).

Environment protection action programme for the City Municipality of Ljubljana 2014–2020, 2014.

- FAO/ECE/ILO, 2000. Public participation in forestry in Europe and North America. Report of the Team of Specialists on Participation in Forestry. Sectoral Activities Department INTERNATIONAL LABOUR OFFICE GENEVA.
- FAO, 2016. Food and Agriculture Organization of the United Nations (FAO), 2016. Guidelines on urban and peri-urban forestry by F. Salbitano, S. Borelli, M. Conigliaro and Y. Chen. FAO Forestry Paper No. 178. Rome, Food and Agriculture Organization of the United Nations.
- FMP FMU Ljubljana, 2015. Gozdnogospodarski načrt gozdnogospodarske enote Ljubljana 2015 – 2024. Slovenia Forest Service, Ljubljana Regional Unit.
- FMP FMR Ljubljana, 2012. Gozdnogospodarski načrt gozdnogospodarskega območja Ljubljana 2011 – 2021. Slovenia Forest Service, Ljubljana Regional Unit.
- Golob, S. (ed.), 1993. Mestni in primestni gozd – naša skupna dobrina. Zbornik. Ljubljana, Zveza društev inženirjev in tehnikov.
- Gozdarski vestnik, 2010. Tematska številka. Letnik 68, 5-6.
- Hanson, P., Frank, M., 2016. The human health and social benefits of urban forests. Dovietal Partners.
- Komac, B., Ciglič, R., Pavšek, M., Kokalj, Ž., 2017. Naravne nesreče v mestnih – primer mestnega toplotnega otoka. V: Trajnostni razvoj mest in naravne nesreče. Ciglič, R., Komac, B., Tičar, J., Zorn, M., (ur.). ZRC SAZU.
- McDonald, R., Kroeger, T., Boucher, T., Longzhu, W., Salem, R., 2016. Planting healthy air: a global analysis of the role of urban trees in addressing particulate matter pollution and extreme heat. The Nature Conservancy, Arlington, VA. <https://global.nature.org/content/healthyair>
- MEA, 2005. Millennium Ecosystem Assessment, 2005. Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.
- MSP COL SP, 2010. Decree on the municipal spatial plan of the City Municipality of Ljubljana – strategic part (OPN MOL SD) (Official Gazette of the Republic of Slovenia, No. 78/10 et seq.).
- Natura 2000 Management programme, 2015. Program upravljanja območij Natura 2000 (2015-2020), 2015. Projekt Program upravljanja območij Natura 2000 v Sloveniji 2014–2020 – SI Natura 2000 Management (LIFE11/NAT/SI/880).
- Nature Conservation Act (Official Gazette of the Republic of Slovenia, No. 96/04 et seq.).
- Odlok o razglasitvi srednjeveškega mestnega jedra Stare Ljubljane in Grajskega griča za kulturni in zgodovinski spomenik ter naravno znamenitost (Ur. l. SRS, št. 5/86)
- Provisional management guidelines for the management of the Tivoli, Rožnik and Šišenski hrib Landscape Park, 2018. Institute of the Republic of Slovenia for Nature Conservation, Regional Unit Ljubljana.
- Rules on forest traffic routes (Official Gazette of the Republic of Slovenia, No. 4/09).
- Rules on the inclusion of endangered plant and animal species in the Red List (Official Gazette of the Republic of Slovenia No. 82/02 et seq.).
- Strategy on development and marketing the Tourist Destination of Ljubljana for the period 2014-2020, 2014. Ljubljana. <https://www.visitljubljana.com/assets/Dokumenti-PDF/strategija-2014-2020.pdf>.

Strategija prostorskega razvoja Slovenije 2050. Osnutek dokumenta v javni razpravi, 2020. Ministrstvo za okolje in prostor.

URBforDAN Project report, 2018. Report on 1<sup>st</sup> Workshops with key stakeholders and forest owners in Ljubljana. Slovenia Forest Service, City of Ljubljana, Zavita d.o.o.

URBforDAN Project report, 2019a. Report on 2<sup>nd</sup> Workshops with key stakeholders and forest owners in Ljubljana. Slovenia Forest Service, City of Ljubljana, Zavita d.o.o.

URBforDAN Project report, 2019b. Report on 3<sup>rd</sup> Workshops with key stakeholders in Ljubljana. Slovenia Forest Service, City of Ljubljana, Zavita d.o.o.

URBforDAN Project report, 2019 c. Mapping ecosystem services. Ljubljana, Slovenia. Slovenia Forest Service, City of Ljubljana, Zavita d.o.o.

Vilhar, U., 2017. Water Regulation and Purification. V: The Urban Forest. Cultivating Green Infrastructure for People and the Environment. D., Pearlmutter, C., Calfapietra, R., Samson, L., O'Brien, S., Krajter Ostoić, G., Sanesi, R., Alonso Del Amo. Springer: 41-47.

Vilhar, U., Planinšek, Š., Ferreira, A., 2010. Vpliv gozdov na kakovost virov pitne vode Mestne občine Ljubljana. GV, 68(5/6): 310-320.

Zupancic, T., Kingsley, M., Jason, T., Macfarlane, R., 2015. Why Nature Matters to Health – An Evidence Review. Toronto Public Health, Toronto, Ontario.

**Published**

City of Ljubljana  
Commercial Activities and Traffic Department  
Trg mladinskih delovnih brigad 7, Ljubljana

**Authors**

Dr. Tina Simončič, Slovenia Forest Service, Central unit  
Matjaž Harmel, Zavita d.o.o.  
Jurij Kobe, City of Ljubljana  
Mag. Robert Hostnik, Slovenia Forest Service, Regional Office Celje  
Dr. Andrej Verlič, Tivoli, Rožnik and Šiška Hill Landscape Park  
Klemen Strmšnik, Zavita d.o.o.  
Luka Sešel, City of Ljubljana  
Mag. Rok Pisek, Slovenia Forest Service, Central unit  
Dragan Matijašič, Expert for forest management planning

**Revision**

Slovenia Forest Service, Regional Office Ljubljana  
Dr. Anže Japelj, Dr. Andreja Ferreira and Dr. Urša Vilhar, Slovenian Forestry Institute  
Dr. Andrej Bončina, Biotechnical Faculty, Department of Forestry and Renewable Forest Resources

**Design**

Tom Petruccelli

**Financing**

The City of Ljubljana Urban Forest Development Strategy 2020–2045 was prepared within the context of the INTERREG project URBforDAN - Management and Utilization of Urban Forests as Natural Heritage in Danube Cities. The project is co-financed by European Union Funds (ERDF, ENI, IPA).

Ljubljana, 2021



City of  
Ljubljana



ZAVOD za GOZDOVE  
SLOVENIJE

