

# STATE OF GREEN AREAS AND ANALYSIS OF COVERAGE IN THE AREA OF BANJA LUKA

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**Abstract:** Urban forests are part of the public city space and have multiple significance. Various roles of greenery (health, social, aesthetic, cultural, educational, etc.) improve the quality of life in the city. Urban forests can play key roles in mitigate stormwater runoff, improve air quality, reduces noise level, store carbon, etc. The system of green areas in a continuous and dynamic interaction with the built structure in a city. Because of the above, subject of the research is determining the state of greenery in the Banja Luka area and the changes that accompany it and to suggest the planning of green areas and protect them.

**Key words:** urban greenery, parks, Banja Luka

## INTRODUCTION

The construction of human settlements, industrial sites and roads destroys natural ecosystems and their place is occupied by artificial ecosystems, which are often transformed into “urban deserts”. Infrastructure affects nature in both direct and indirect ways: The physical presence of roads and railroads in the landscape creates new habitat edges, alters hydrological dynamics, and disrupts natural processes and habitats. Road maintenance and traffic contaminate the surrounding environment with a variety of chemical pollutants and noise (Seiler, 2011).

It is a significant role of air pollution in climate change in urban areas. Air pollutants causing adverse effects, while plants act as accumulators of pollutants. Plants plants act both as “accumulators” and as “excluders”. Plants precipitate and absorbing atmospheric pollutants and affect the reduction of particles and gases in air (Braun et al., 2007; Ilić et al., 2009; Tangahu, 2011; Ilić, 2015; Glibovytska, 2017; Rostunov et al., 2017). Urban forests can perform three health-related functions: 1) disease prevention; 2) therapy; and 3) recovery from illness. They can reduce the direct and indirect causes of certain non-communicable diseases and urban stressors, such as ultraviolet radiation and air and noise pollution, and they can help in cooling the environment. The presence of, and access to, green spaces can promote active lifestyles and regular exercise, thereby reducing the risks posed by obesity, type 2 diabetes, coronary heart disease, respiratory disorders and some types of cancer (Salbitano et. al., 2016). Large trees are excellent filters for urban pollutants and fine particulates. They absorb pollutant gases (such as carbon monoxide, nitrogen oxides, ozone and sulfur oxides) and filter fine particulates such as dust, dirt or smoke out of the air by trapping them on leaves and bark.

Urban forests can play key roles in making cities more resilient to the effects of climate change. For example, they can mitigate stormwater runoff, improve air quality, reduces noise level, store carbon, decrease urban energy consumption by shading and cooling (potentially mitigating the urban heat island effect), and reduce the impacts of extreme weather and floods. As temperatures rise due to climate change, green spaces are likely to become increasingly important, especially for their direct ameliorating effects on

urban microclimates (Salbitano et. al., 2016, Jablanović et al., 2003). Beginnings of planting trees in Banja Luka date from the formation of the settlements (Došenović et al., 2013). In the beginning, home gardens were decorated with flowers. Later, in the period from 1882, in some parts of the city began planting trees. The most important Banja Luka avenue, built in 1885 in a length of 17 kilometers. During the 1930s, the City Park was formed (Park “Petar Kočić”), in the period between the two world wars intensively continues formation Parks. After World War II it was tried to solve the greenery of the urban matrix of Banja Luka according to contemporary urban concepts, often unsuccessfully. During 1975 began the construction of the park “Mladen Stojanović” (Došenović et al., 2013).

## OBJECTIVES

City vegetation can play an important role in increasing urban biodiversity, providing plants and animals with a favourable habitat, food and protection. Represent the most important elements of the city that extend ecological diversity. City vegetation makes cities and urban regions more suitable for housing.

Subject of the research is determining the state of greenery in the Banja Luka area and the changes that accompany it and to suggest the planning of green areas and protect them.

## MATERIAL AND METHODS

Subject of the research is monitoring the inventory and coverage of urban areas green areas in Banja Luka, which is located in the northwestern part of Bosnia and Herzegovina (BiH) and in one of the two entities in BiH. Also, it was done a final analysis of the problem in order to find solutions for the future development of green areas. We used to all available publications included in the electronic databases for city of Banja Luka, in area urban greenery, parks, protected areas etc.

## RESULTS AND DISCUSSION

Banja Luka has always been “a paradise valley” with a lot of greenery, water and fruit as described by many travel writers who have visited Banja Luka. Banja Luka is now known for a large number of green areas (parks and tree-lined roads) because of which is called “a city of greenery”. The most common tree in the urban green space is a horse chestnut tree, but there are also linden, plane tree, spruce and many other species of ornamental woody plants. In the city and its vicinity there are three spas (Srpske toplice, Slatina and Laktaši) with mineral water, whose healing properties were used even in the ancient times. There are 22,000 trees in the city in alleys, parks and settlements, 150 hectares of lawns, 40 kilometers of green fence, 31,000 pieces of ornamental shrubs and 5,000 roses, and a large number of seasonal flowers.

Because of the problem of decay of old trees caused by pollution and physical damage, Institute for the Protection of Cultural, Historical and Natural Heritage of Republika of Srpska has prepared a 2006 Study of the health condition of trees with remedial measures. There are about 2180 endangered trees in the area of the city where protective measures have to be implemented.

In the area of Banja Luka is currently under legal protection are two objects (Table 1).

**Table 1.** Categories of protected areas

Name and categories	IUCN categories	Surface area (ha)	City	Manager	Type of protection	Protection Act
“Cave of Ljubačevo”	III	45,45	Banja Luka	City of Banja Luka	Permanent protection	Decision (Official Gazette of Republic of the Srpska, No. 36/08)
Resource Management Area “University City”	VI	27,38	Banja Luka	Institute of Genetic Resource	Permanent protection	Decision (Official Gazette of Republic of the Srpska, No. 53/112)

The cave Ljubačevo is located in the southern portion of a quarry at 420 above sea level. The length of the cave was 700 m before the quarry opened; now it is only 338 m long, since a part of the underground system has been permanently destroyed due to the quarry construction works. The cave is unique for its extremely rare decorative formations (helictites), and other cave decorations such as stalagmites, stalactites, columns, large flowstones. The cave consists of the entrance passageway, high ceiling chamber, a dead-end passageway, a stalagmite chamber, a calcite chamber, a collapse, the “last horizon chamber“.

Three different species were identified, two *Rhinolophus* species and one *Miotis* species. Several *Troglophilus* insects and few *Coleoptera* species were also identified. Cave Ljubačevo is under protection, as a natural good of the I and II categories. Was declared a natural monument in April 2008 Decision (Official Gazette of Republic of the Srpska, No. 36/08).

The “University City” complex of the University of Banja Luka, occupies a total area of 27.38 hectares. Ministry of Spatial Planning, Civil Engineering and Ecology of the Republic of Srpska, in the declaration of a protected area, at the request of the University of Banja Luka, and having obtained the opinion of the Ministry of Agriculture, Forestry and Water Management of the Republic Administration for Geodetic and Property Affairs rendered a decision of complex “University City” in Banja Luka under the protection of a protected area for resource management (Decision (Official Gazette of Republic of the Srpska, No. 53/112). In 2016, the Assembly of Banja Luka declared the complex a protected area with sustainable use of natural resources in category VI. Then certain measures of improvement and protection of the area as well as protection zones. Today in this area, there are a total of 2500 specimens of trees and shrubs (Bodružić et al., 2017). Institute of Genetic Resources is defined as manager institution of protected area.



**Picture 1.** Cave of Ljubačevo and University city

In the plan is the zoning of the forest park “Stračevica”. Forest Park should cover an area of 1.222,99 ha. The plan provided for the development of tourist facilities (picnic places, hiking and hunting lodges and

catering facilities) which should not endanger the natural environment. As part of a larger whole of the park of Starčevica forest, a monument to the fallen Krajišnici in World War II in Banj brdo (V category according to the IUCN classification) and should cover an area of 2,725.89 ha.

Starčevica Forest Park is surrounded by large settlements and in this forest complex anthropogenic impact is large.

Currently there is no facility for the city of Banja Luka for which an initiative for placing under protection has been initiated. Only the zoning procedure for Starčevica forest park was launched.

The main problems that tree-lined paths and green areas have been facing in the City of Banja Luka are the following:

- Construction works during the construction of residential and commercial buildings, where low quality construction materials have been disposed at the parcels intended for green areas,
- Lack of inventory ie. the cadastre of tree lines and green areas in the city,
- Lack of comprehensive valorization of the health condition of tree lines and green areas in the city,
- Construction activities/digging for sewerage, water supply and heating, during which the roots and tree lines are being damaged,
- Not planned irrigation when planting new tree lines and green areas in the complex of new residential and commercial city zones,
- unfavorable age structure of the avenue and
- adverse health status of the avenue.

Today, green areas in the Banja Luka area are maintained according to the implemented maintenance program for each year. About 2,000 trees are planted annually. Regional Plan for the city of Banjaluka provides for the protection of natural values of the total area of 22,605.84 ha or 18.24% of the territory of Banja Luka.

**Table 2.** List of the most significant areas and nature objects planned for establishment of protection (SPRS, 2008 & 2013)

NO	Type protected areas (IUCN clasification)	IUCN categories	Name	Surface area (ha)
1.	Nature Park	V	Krupa na Vrbasu	1.702,86
2.	Nature Park	V	Osmaća - Tisovac - Čemernica	6.011,72
3.	Nature Park	V	Starčevica	2.725,89
4.	Nature Park	V	Kozara - Potkozarje	1.466,00
5.	Nature Park	V	Šibovi - Suturlija	2.282,69
6.	Protected Natural Landscape	V	River Vrbas - canyon Vrbas - Tijesno	1.785,62
7.	Protected Natural Landscape	V	Rivers Gomjenica and Subotica	790,86
8.	Protected Cultural Landscape	V	Watercourse and the coast of the river Vrbas in the urban area	440,93
9.	Protected Cultural Landscape	V	Stričići - Dobrnja	3.242,96
10.	Protected Cultural Landscape	V	Zelenci	753,02
11.	Protected Cultural Landscape	V	Monastery Gomionica with its surroundings	143,52
12.	Forest park	V	Ada in Vrbas	2,36
13.	Forest park	V	Trapisti	345,49
14.	Forest park	V	Šibovi	64,97
15.	Forest park	V	Forest Park around Banja Luka	568,62

In Banja Luka 89 areas have been envisaged for which valorization has been determined to have a basis and have the potential to be placed under protection (SPRS, 2008 & 2013). Spatial plan also provides for the protection of individual valuable trees as well as groups and which are listed in the Catalog of the largest trees of the Republic of Srpska.

## CONCLUSIONS

Park and street greenery represents the most important categories of greenery in the city and settlements. In order to use the potential of green areas in the city more efficiently, it is necessary to fill the existing tree lines, as well as to arrange them equally and connect them with the green areas outside the city. By the general plan, public green areas – city parks and other areas should remain the same and any kind of construction should be restricted, while new appropriate park areas should be planned in the new parts of the city. As soon as possible, it is necessary to conduct the study of green and recreational areas by creating a new categorization using new norms and standards.

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