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RECREATION FUNCTION OF FOREST COMPLEXES AS AN ELEMENT OF URBAN PLANNING: A VIEW FROM REPUBLIC OF SRPSKA

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Abstract. *The issue of recreation in a broad sense and from the aspect of urban planning is related to other urban functions, as well as to certain functional and ecological principles of spatial organization of cities (Douglas, 2000). The research presented in this paper indicate that the recreational function, as an urban planning category, receives inadequate treatment in the spatial, regional, and urban plans in Republic of Srpska, that is not proper for the new approach to evaluation and defining of important elements of urban planning, such as forest areas. Obscure urban plans do not allow concrete actions in terms of better planning of such spaces, and it hinders supervision of their sustainable development. Urban forests are key elements of green infrastructure and they provide essential ecosystem services (Capotorti et al., 2015). Current city development process in Republic of Srpska is characterized by an increase in number of buildings where economic factors impact the urban structure and share of open recreational spaces in the total area despite their increased functional and ecological justification. The process of intensive construction endangers natural resources such as forest complexes, thus they are becoming more and more valuable.*

In this paper, forest complexes will be regarded as a spatial category on example of the case study of Banja Luka. Seeking new solutions in order to obtain primarily qualitative then quantitative changes in representation, manner of use, and arrangement of forest complexes within the green matrix of Banja Luka, is an imperative. Whether these special and functional green structures would be designed for recreational or strictly protective functions, perhaps as a cultural landscape, or a green structure of polyvalent character, depends on many factors. This research focuses on fifteen forest management units (MU) that were selected by a method of separation of gravitational area and recreational zones in the city of Banja Luka. The method, besides its originality, contains BITTERLICH's

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ratio of population separation for needs of forest complexes, which increases with the increase of population density and decrease of the distance from a forest area. This method for determining recreational value within a gravitational area is used to define the value of the forest complex location factor, as well as the value of its natural characteristics, i.e. whether the forest is suitable for recreation (Medarević, 1993). Evaluation postulates are presented numerically and graphically by use of GIS technology for Republic of Srpska municipalities based on the previously prepared data model. The research results indicate that their practical use is possible in the domain of planning, designing, and organization of forest complexes to accommodate urban recreational needs.

Key words: *urban planning, forest complexes, recreational value, gravitational area*

1. INTRODUCTION

Recreation is one of the main urban functions that determines the quality of contemporary life in the city. The way and the intensity of use and the organization of recreation spaces are the indicators of a city's specificities and its identity. Recreation is long defined as "refreshment of body or mind by activities, or a planned inactivity, undertaken because one wants to do it, without any moral, economical, social or other pressure" (Van der Zee, 1990: 225). This definition of recreation comprises a large variety of activities that take place near home or in natural landscapes (Van der Zee, 1990). Therefore, recreation is one of the various benefits of ecosystems (Zandersen, Tolc, 2009).

Because of the urbanization, people have become distant from forest complexes, and it has changed their personal experiences of forests. People's personal relationship with urban forests, as part of the social and experiential design dimensions of urban forests, noticed in actively engaging in recreational activities (Eriksson et al., 2012). Also, over the last decades following the increasing public health concerns related to physical inactivity in the population, the relationship between outdoor recreation and public health has been acknowledged. In order to improve public health, planners and policy-makers want to have good accessibility to recreational areas to facilitate outdoor recreational activity (Koppen, Sang, Tveit, 2014).

Thus, natural potentials such as forest complexes become more and more valuable planning item. This implies defining them, not only through their relation, distance and form, but in a full, functional and spatial meaning (integrating urban forests into other city facilities). The significance of forest complexes in achieving higher humanization and urban environment quality, landscaping a city and the availability of natural values in a city is evident (Konijnendijk, 2008).

Recreational spaces of a city are usually parts of the city that are designed for recreation, with appropriate arrangement and equipment, satisfying human needs, and used for daily or occasional recreation. There is a variety of forms of urban recreation: psychical, physical, psycho-physical; active and passive recreation and they are dissimilar in the level of organization of the recreational activities, degree of psycho-physical strain, and manner of partaking and course of the recreational activity. The recreational activities may be organized, partially organized and unorganized (spontaneous), and the recreational spaces may be open and closed (Mitković, Bogdanović, 2004). Whether a certain forest complex would be designed for recreational needs, or as a protective corridor, cultural landscape, or green structure of polyvalent character, depends on many factors. Planning preferences are

context for the mutual relation and mutually conditioned relation of complex structural elements of an urban matrix and the recreation structures' specificities (Vesnić-Nađeral, 2003).

The aim of this paper in the domain of urban planning is to facilitate seeking better solutions for their use and organizing these spaces in the process of developing the urban matrix of RS cities. Banja Luka, the only big city in RS, presents the framework for the research as a model of an urban structure with forest complexes. The evident increase of interest for space in Banja Luka, the conflict of interests for the same locations, poses the need for efficient planning. Connecting the city with the surrounding environment as ecological contribution to the improvement of environmental quality is a necessity (Vujković, 2008), but also the planning forest recreation areas that is based on a large number of criteria, different aspects and the aims of perceiving them. The common base for forming all the baselines is coordinating natural and created values in the process of sustainable development in Banja Luka. The needs and ambitions for faster and better realizations of these aims pose more and more complex demands on the process of planning urban forest functions, alongside with the changes already happening and expected in the further expansion of Banja Luka. Planners' postulates certainly have a large political dimension, presenting a challenge for the responsibility of local, regional and state authorities.

2. SETTINGS THE CONTEXT

2.1. Contextual issues

The existing forest complexes of urban matrix of Banja Luka and their recreational functions are the framework of this research. They are defined as the elements of the spatial and functional structure of the city according to their size, morphology and characteristics. The results of the research certainly contribute to the theory about modern science on landscape (the methods for planning recreation in a city and around it). The focus is on the fact that such an issue has not been studied in a complex way so far, at least not to an extent which would suit the new approach to defining important elements of urban planning – urban forests. This is an attempt to show on the example of the only big city in RS - Banja Luka (about 200.000 inhabitants) that, in the conditions of intensive urbanization and social relations development, a new approach to solving the problems concerning the relation between the city and its structural elements is possible in principle.

The subject of this paper is an attempt to examine the place and importance of recreational function of forest complexes in the process of developing cities in RS. Planners' postulates, as the basis for defining the spatial context of urban forests, should be (Bell, Apostol, 2007) as follows: the result of a complex analysis of the long-term and sustainable economic, technical and social development in a certain city (regional economy and social awareness, where the correlation of development processes in the city and the region is the starting point). The research presented in this paper point to the fact that the recreational function as a planners' category receives inadequate treatment in the spatial, regional and urbanization plans of RS. Recreation phenomenon, as a space consumer, is not given the significance typical of other urban functional systems. As a rule, urbanization plans define recreation from the standpoint of satisfying short-term population needs, and they are shown on the graphic and numerical level, isolated and by sectors. The analysis of the functional and spatial organization, the ratio between the quantitative and qualitative representation and the evaluation of the creative forest complexes on RS city territories

requires a new planning strategy which could solve numerous problems, among which is the degree of the realization of the planned context.

Also, the intention of this research is to indicate to the possibility of improving the quality of living conditions in the cities in RS and that, among other things, contribute to corresponding changes in the way of design of urban forests, which are updated and formed as a living natural structure. Urban forestry is generally defined as "the art, science and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic, and aesthetic benefits trees provide society" (Konijnendijk et al., 2006: 93). Urban forests may hold different meanings for different people but they comprise four different design dimensions of urban forests: the social dimension (e.g., urban forests as a setting for social activities), the experiential dimension (e.g., esthetics), the functional dimension (e.g., accessibility to people), and the ecological dimension (e.g., ecological concerns). These dimensions are connected and they might be more or less dominant in different contexts (Eriksson et al., 2012). In this study, emphasis was placed on the social / recreational function of urban forests as an element of urban planning. The social function is also a component of development of social and political framework.

2.2. Context of urban planning and development of recreational functions of forests in Banja Luka

Banja Luka is the biggest city in the RS which has undergone a significant transformation functionally and institutionally, considering its significance in the environment. Historical roots of the development and planning of the recreational function of Banja Luka forest complexes date back from 1933. The prefecture authorities of the former Vrbas Prefecture raised the issue of separating a forest complex reserved for tourism, by directing the act no. 11.027/32 to Banja Luka Directorate of Forests. The Directorate of Forests started with its activities back in 1933, by defining the complex, setting a nursery and starting the afforestation (Došenović, 2006).

The focus of the city urban development moves northwards following the first urbanization plan, which is significant for forest complexes and their protection from degradation which could not be avoided during the Second World War. Banja Luka and its immediate and peripheral surroundings were exposed to massive depredations of war. The dynamic post-war economic development is followed by demographic changes (in 1948 the city had 41.882 inhabitants, in 1961 it had 66.638 inhabitants). It was not until 1952 that the first program for Urbanization Plan was defined (the author was the architect Anatol Kirjakov with his associates from Bosnia and Herzegovina Department of Urban Development). Urbanization Plan for Banja Luka was finished in 1975 and is still in effect, although the planners' intended period for it was to be in effect until 1991 (Urbanization Plan for Banja Luka, 1975). In addition to action to ensure planning documents, Banja Luka has not yet received the new Urbanization Plan, although the activities to prepare plan are well underway.

Urbanization plan for Banja Luka (1975) defines forest complexes, as natural spaces of great significance, in the context of spatial organization in the following way: *recreation, as a system of activities, is organized in the forest parks and protective forest belts surrounding the city; Trapisti Forest, the slopes of Starcevica, Sehitluci and Sibovi with the Suturlija river valley, as well as the banks of the river Vrbas. The program for*

regulating these forest parks provides activities for active and passive recreation of the citizens, such as small sport and recreation centers, picnic places, memorial complexes, monuments, arboretums, lookouts and similar places. The process of planning urban recreation in forest complexes on the city level ends with this Program, which is unfortunately insufficient.

How much Banja Luka changed during the last development period and whether the quantity and quality of the transformation of physical and green structures were harmonized concerning the development of city functions, are the questions whose answers are in the domain of this research. The process of city urbanization and development into the leading social centre of RS, establishing the institutions of entity and state level significance, influenced the increased intensity of private capital investment in development investments (Fig. 1). Based on the valorization of individual influencing factors for city planning, the list of problems are determined and it represents the initial research framework. It is understandable that such a projection of development to follow all the side effects of economic trends, demographic growth and rising living standards.

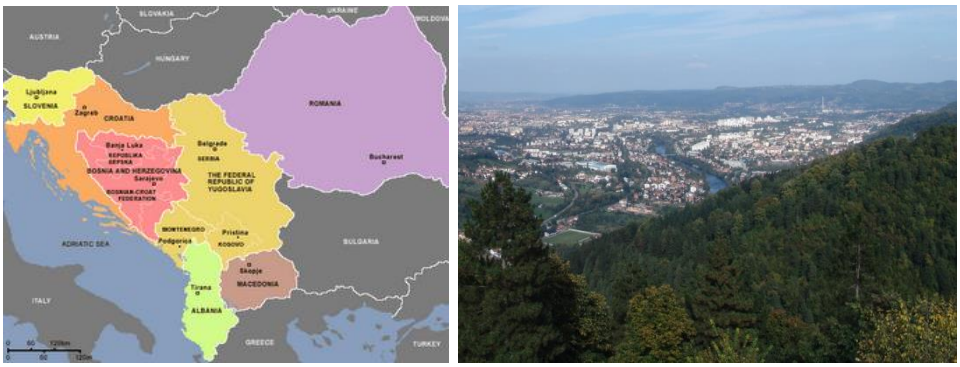

Fig. 1 Position of Banja Luka in surrounding area (left) and valley of Banja Luka with surrounding urban forests (right)

Demographic factor is a powerful urban matrix development incentive (according to data of Urbanization Plan – 1991 census, 149.526 inhabitants lived in the urban area of Banja Luka, and according to the estimate from 1991, 182.500 inhabitants lived there). Today, about 200.000 inhabitants live in the broad city area and they gravitate towards Banja Luka, concerning satisfying their educational, healthcare, cultural, commercial, administrative and other needs. The intensity of urban planning in the area of Banja Luka is the best indicator of the city development dynamics (Milić, 2001) and the dynamics of changes and users' needs are the continuous regulators which influence the process of constant plan changes). Besides the activities aimed at providing planning documentation, Banja Luka still has not got its Urbanization Plan, although the activities for preparing it have already been underway for a long time. One of the important preconditions, which the city has not provided yet, is creating a medium-term development strategy with the necessary development guidelines for numerous activities having spatial implications.

3. METHOD OF PAPER

The method of *gravitational area and recreational zones separation (primary separation)* was applied in this research for determining the value of the recreational function of forest complexes. Recreational value of a forest complex in the gravitation area is determined by use of two evaluation aspects, and those are: position of a forest complex in regards to the urban core, and natural characteristics of a forest complex suitable for recreation.

The method with its originality contains BITERLIH *quotient of population separation* for the inhabitants who need forest complexes, which rises with the increase of the population density and the decrease of the distance from a forest area. The size of the spatial evaluation context ranges from 50 to 500 ha.

The method identifies the characteristics of the area, such as traffic network development, concentration of industrial hubs, how much the terrain is built and the characteristics of the border zones (the position of certain forest complexes in relation to the centre of the recreational traffic, and the connection between a forest complex and space users). This method was first applied by Rupert (1971), where he names the FRITAG models for Paris, and, according to the same author, Bichlmaier applied the same method for Münich. Later, Medarević (1993) developed this method, while determining the recreational function of urban forests in Belgrade. Finally, this method was improved by this research with use of GIS technology, because, from planning perspective, a geographic information system is the most valuable tool. To confirm this allegation, Kienast et al. (2012) use GIS model for their research in order to support identification of recreational hot spots in a neighborhood, therefore, the model was tested on Swiss towns with 10,000–200,000 inhabitants. It was shown how urban planning and design affect recreation using certain preferences, i.e. distance to residence, open water, forests and avoidance of major roads. Spatially identification the recreation value of a forest is an important part of any GIS-based benefit-cost analysis, and a needed part of overall planning and management efforts (van der Horst, 2005), but researchers have only started to research methodologies for doing so (Baerenklau et al., 2010).

3.1. Position of a forest complex within a gravitational circle (first aspect of evaluation)

In the above-mentioned way (Fig. 2), the separated gravity area provides the basic matrix of desired elements of urban planning, which are total size of the space, defined by the radius of the gravity circle (A) which is calculated as follows: $A=1.4\sqrt{E}$, and the size of the forest complexes (W) and their layout in the space of gravity circle.

For evaluating scantiness, Rupert (1971) introduced *scantiness factor* (Kn) which is calculated in this way: Kn=F/W [F is size of the radiation circle of the recreational traffic in a settlement (km^2) and W is size of the forest in the radiation circle (km^2)].

The fact is that the intensity of use will be higher in closer recreation spaces (the rate of frequenting forest complexes decreases from the periphery of the gravitation circle), but it also depends on the change of the population size in a settlement. So, *availability factor* (Er) is calculated as follows: Er=E/D [E is the size of the settlement unit in thousands and D is aerial distance between the centre of the populated unit and forest edge].

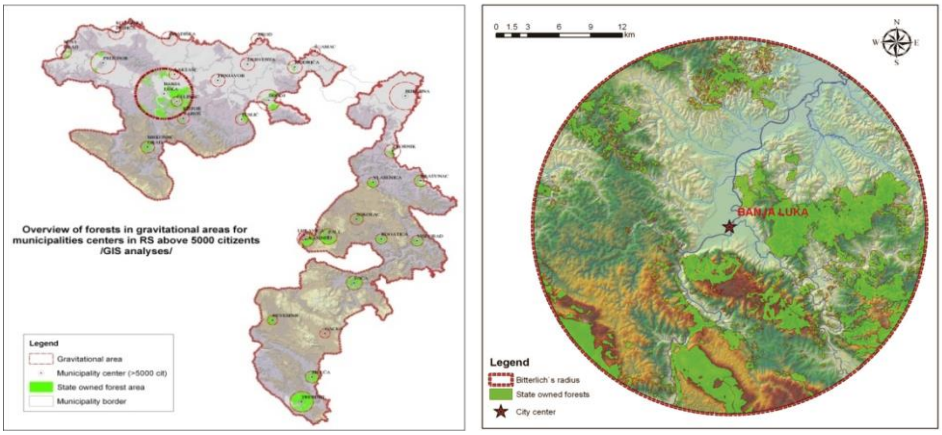

Fig. 2 Overview of state owned forests within gravitational circle of Municipality centers (left) position of a state owned forest complex within a gravitational circle of Banjaluka above 5000 citizens (right)

Following the adopted evaluation method, both influence factors (*scantiness factor and availability factor*) determine the position of one forest complex related to the gravitation center. Actually, the value of *position factor* (L), directly depends on *availability factor* and *scantiness factor* and is calculated as follows: L=Er x Kn/100.

3.2. Characteristics of forest complexes suitable for recreation (second aspect of evaluation)

Recreational characteristics of forest complexes for evaluating natural suitability include four elements. The first element is forest edge whose value (FR) consists of the total absolute length of the forest edge of a forest complex (W1a), value number for the effect of using the zones along the forest edge (W2a), and the value number for the ambience quality of the green, developed forest edge (W3a). The second element is biodiversity and number of tree species whose value (FB) is determined by two equal value numbers: value number for the overview of the structure of a stand (W1b) and value number for the overview of the changes in tree species in different units in the domain of the spatial context (W2b). The third element is vertical development of a forest whose value (FW) is made of the value number for calculating the visual effect of a forest complex development (W1c), and the value number for calculating the change in the development form in the evaluated complex (W2c). The fourth element is terrain configuration whose value (F0) is characterized by sense effects, defined by height difference (W1d) and tonic effects, characterized by the absolute height position (W2d). The above-mentioned four elements merge in a cumulative *factor of natural suitability* (N), which is accepted as their arithmetic mean.

The factors related to the recreational character of forest complexes which have a diminishing character for evaluating the effects of the created influence factors are: optical obstacles whose value (SO) depends on the presence of different physical structures (constructions or industrial objects, especially those which do not fit into the landscape);

and acoustic nuisance whose value (SA) depends on the extent to which a forest complex is disturbed by the noise from different sources, most often traffic or industrial buildings. The above-mentioned two elements merge into the *factor of decreased natural suitability* (M). *Landscape factor* (G), or the value number for natural suitability (N), reduced by the cutoff decrease factor (M), is calculated by multiplying them (G=NxM).

Each evaluation element can have the value expressed by a relative number from 0 to 6 points, depending on the pre-existing state. The method is simple to apply in the process of planning the forests recreational function and it determines the potentials of forests at the moment of evaluation. Particular values can point to a certain problem and to what should be influenced on to improve the function of recreation.

According to the adopted evaluation method, *position factor* (L) and *landscape factor* (G) make the value of the recreational function of a certain forest complex (E) is calculated as follows: (E=LxG).

4. A VIEW FROM REPUBLIC OF SRPSKA: FOREST COMPLEXES IN BANJA LUKA

The analysis of the functional and spatial organisation, the ratio between the quantitative and qualitative representation and the evaluation of the recreational forest complexes in Banja Luka demands a new planning strategy which could solve a lot of problems, one of which is the use extent of the planned objects. In that context, the above-mentioned BITERLIH method for determining *the radius of the gravitational area* was used, which rises with the increase of the population density and the decrease of the distance from a forest area, and parameters from KIEMSTED *characteristic number*, which is determined by the value of *position factor* of a forest complex in the gravitation circle, and the value of *natural suitability factor* of recreation forest complexes. Based on the number of inhabitants in the nuclear urban area of Banja Luka, the radius of the recreational traffic in the vicinity is 18.7 km ($A = 1.4\sqrt{E} = 1.4\sqrt{179.1} = 18.7$ km), and the size of Banja Luka gravitational area is 1098 km^2 ($F = A^2\pi = 18.7^2 \times 3.14 = 1098$ km^2).

Scantiness factor (Kn), for fifteen management units of forests (224 departments valued forest complexes in the recreational gravitational area of 1098 km^2) is equal and it is 5 (Kn = F/W). *Availability factor* (Er) and *position factor* (L), L=Er × Kn/100, mentioned evaluated forests indicate that depending on their position and distance from the gravity centre, all forest complexes can be put into three main categories: nearby recreational forest structures, structure for a daily or half-a-day stay and structures for weekend recreation. Based on the research, relative value of *position factor* (L) for nearby recreational forest complexes shows values in a wide range from 7.8 to 12.5; from 3.6 to 7.5 in the second group and from 0.7 to 3.6 for the weekend recreation structure.

The graph (Fig. 3) shows only parts of MU that were the subject of the research, and it clearly shows the position of Stačevica and Crni vrh - Trapisti urban forests, which, according to the Urban Development Plan for Banja Luka (1975), are the only ones defined as recreational forest parks. The results indicate that postulates of this UDP need to be redefined because they do not include all forest complex departments that should be parts of the recreational zone of the abovementioned spatial units. Urban forest surface norm for a visitor ranges from 500 to 1000 m^2, with medium coefficient of exchange of 1.5 (Vujković, 2008). The preservation of vegetation and of landscape does not depend only on the norms of surface, but significantly more on the uniformity of distribution of

visitors and the level of planning, i.e. from proper organizational and functional solution of the whole territory, from skillfully programmed organization, a network of roads and trails that guide the basic mass of visitors.

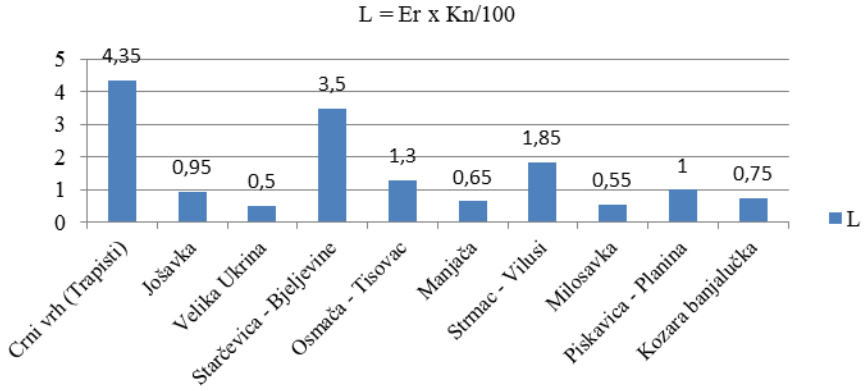

Fig. 3 *Position factor* (L) for evaluated forest complexes (forest districts) in Banja Luka Forest Management Unit

By considering planners' regulations and the total space provided for recreation according to Urbanization Plan for Banja Luka (1975), which is about 1.150 ha, we can calculate that the provided space of a forest complex per visitor is 320 m^2, with the fluctuation coefficient 1.5. So the provided space for urban forests Starcevica and Crni vrh - Trapisti does not completely satisfy the needs of Banja Luka inhabitants for leisure time or for recreation. Preservation of vegetation and landscape depends not only on the surface norms, but, to a considerable extent, on equal distribution of visitors and the level of planning, i.e. on proper organizational and functional solution for the whole territory, and on skillfully programmed organization, a network of roads and trails which direct the basic mass of visitors.

If we consider the fact that Banja Luka is the generator of development, alongside with all the problems that urbanization brings, the analysis of the city influence on the process of urban planning should be observed in the context of preserving natural components, primarily in the domain of their sustainability. Since forest complexes are renewable natural resources they could serve as an example of the correlation specified in the previous explanation, also the basic indicators of future population structure of Banja Luka support the integral method for evaluation of recreational functions of forests. In doing so, all sociological, cultural and economic demands for creating the necessary recreation spaces are taken into consideration.

Not only does the recreational value point to the value of the position of particular complexes, but it also indicates the achieved level of all the characteristics of the natural suitability of the pre-existing state. Recreational features of forest complexes for evaluation of natural advantages include four elements detailed explanation of which was given in Chapter 3. Evaluation elements can be put into two main groups concerning the possibility to change their value: variable evaluation elements and invariable evaluation elements. The *terrain factor* is an invariable evaluation element, or the element whose value cannot be considerably influenced by certain measures. The research results indicate the potentials of

forests at the moment of evaluation, but also the individual values of forest complexes, which can be modified by planners' postulates with the aim to improve the function of recreation. Two evaluated spatial units of forest complexes – Starcevica and Crni vrh - Trapisti were chosen for monitoring the possible influence on certain evaluation elements (Table 1) because they are only ones so far with planning settings specified for recreation.

Table 1 Characteristic parameters for evaluated forest complexes

	W_{1a} W_{2a}	FR	W_{1b} W_{2b}	FB	W_{1c} W_{2c}	FW	W_{1d} W_{2d}	FO	N	SA	SO	N	G
	91.52		3.66		3.23		3.85						
Starcevica	1.25	3.80	6.00	4.83	1.26	2.25	2.20	3.02	3.47	0.99	0.95	0.97	3.36
Crni vrh -	77.96		2.10		4.17		1.00						
Trapisti	1.29	3.50	2.08	2.09	1.69	2.93	1.00	1.00	2.38	1.00	1.00	1.00	2.38

Potential influences on certain evaluation elements are given as follows.

The increase of the total length of the edge (external and internal) of Starcevica forest complex, by influencing the way of use in contact spaces, by creating new free spaces and by creating small water reservoirs.

The increase of the total length of the edge of Crni vrh - Trapisti object due to the higher effect with design and the transformation of the existing forest edge to obtain effective lines and shapes.

Tree species diversity factor of Starcevica forest complex has quite unacceptable value thanks to a relatively significant biodiversity. It is necessary to interpolate some indigenous species of forest trees. Bringing a single species into each of the pure stands would increase the total value of diversity factor and quality of ambience.

Low value of the vertical development factor for Starcevica and Crni vrh - Trapisti is the result of the same age species in these stands. Establishing normal age proportions would increase the factor of structural development (planting young noble broadleaves**,** not conifers, in order to preserve the authenticity of the landscape appearance).

Acoustic nuisance in both complexes is easily mitigated by redesign the shape of the structure bordering roads and industrial buildings. Protective green corridors can provide the decrease of noise intensity. One of the solutions is positioning the active recreational zones deeper into the forest. Optical obstacles are easiest to mitigate (in case it is not possible to dislocate them) by disguising them with green structures.

Finally, we conclude that society demands concerning forest complexes in Banja Luka and their functions were differently formed during the time. Former production function which was the main reason for using forest complexes is transforming into multifunctional purposeful use of the forest complexes (or at least it strives for it). The research results indicate that we did not pay enough attention to urban forests. The types and categories of forest recreation spaces, their significance and role in the functional structure of the city are not clearly defined. Greater ambience diveristy of forest ecosystems is missing and besides that, an almost identical way of their recreational use and organisation are present. Unclear urban plans make it impossible to perform concrete activities for better organization of these spaces, and also makes it difficult to perceive their sustainable development.

There was no continuous and total engagement in applying the clear development strategy of the city forest recreation spaces (the way of planning, preservation and improvement

measures). Different institutions were in charge of organising particular categories of those areas on the city level. They partially took part in organizing, building, arranging, maintaining and using them (city, municipality, forest management units, sports associations) but individually and, very often, without coordination. Intensified negative influence of ecological factors on the environment quality can be diminished, even partly eliminated, by better coordination of the functional and spatial structure of the recreational forest complexes on the city territory with the natural and other created values.

Multiple year long development of Banja Luka, as an important major tourist destination with attractive recreational forest complexes, is not adequately represented in the complete tourist offer. Tourist activities depend on the initiatives untaken in favour of their development, promotion, and formulating concrete aims (Tošković, 2006). Above all, we should start from the point how much Republika Srpska, i.e. the whole region, are prepared to invest in tourism and recreation development in the forest complex spaces. Both tourism and recreation are limited by market trends and the available potentials. When the potentials of Banja Luka region are evaluated, it is necessary to evaluate the difference between the natural resources which should be protected and those which should be developed, with different priority and intensity degree.

5. CONCLUSION

Analysis of functional and spatial organization, the ratio between quantitative and qualitative representation, and evaluation of recreational forest complexes of the Republic of Srpska cities, requires a new planning strategy which could solve a lot of problems, one of which is the extent of use of the designed objects. This research focuses on recreational function of forest complexes on territory of Banja Luka city. Limitations and potentials of these spatial and planning categories are defined by the use of gravitational area and recreational zones separation method. By this method the recreational value of the existing forest complex within the gravitation area is determined by the location factor of a particular forest complex, and the value of natural characteristics, i.e. eligibility of the structure of the forest in question for recreation purposes (Medarević, 1993). Scantiness factor (Kn), for fifteen management units of forests in the recreational gravitational area of 1098 km^2 is equal and it is 5 (Kn = F/W). Based on the research, relative value of *position factor* (L) for nearby recreational forest complexes shows values in a wide range from 7.8 to 12.5; from 3.6 to 7.5 in the second group and from 0.7 to 3.6 for the weekend recreation objects. These results suggest to which category a forest management unit belongs to, i.e. whether it is a forest complex for a whole day or half-a-day stay, or a facility for a weekend recreation. Therefore we conclude that urban forests in Banja Luka, which are planned for recreation, could be used for everyday or occasional recreation, and that they have a different character, which requires an adequate planning and variety of facilities that could satisfy the human needs.

Not only does the recreational value point to the value of the position of particular complexes, but it also indicates the achieved level of all the characteristics of the natural suitability of the pre-existing state. Recreational features of forest complexes for evaluating natural advantages include four elements. Each evaluation element had, depending on the pre-existing situation, a value attributed to it expressed by a relative number ranging from 0 to 6, thus some fieldwork was required (fifteen forests management units include 224 departments and each of them was analyzed separately). Due to an abundance of given characteristics, a GIS model was used for identification and processing of data because it

was far more efficient than a conventional empirical research (e.g. distances lengths, lengths of management units boarders, etc.). This paper outlines forests potentials at the time of the evaluation, as well as individual values of forest complexes, which could be modified by planning settings to improve the recreational functions. Potential impacts on individual evaluation elements are shown on the example of two characteristic management units (Starčevica and Crni vrh - Trapisti), which are the only ones defined as forest parks by the Urban Development Plan for Banja Luka (1975). Lack of clarity on the level of the Plan hinders concrete actions in terms of better spatial and functional designing of these urban forests, and it reduces understanding of their sustainable development. The results indicate that the structure of the Urban Development Plan for Banja Luka (1975) needs to be redefined because it does not include all departments of forest complexes that should form part of the recreational area of the abovementioned spatial units. Therefore, the designated urban forests areas Starčevica and Crni vrh - Trapisti do not entirely satisfy the leisure and recreational needs of inhabitants of Banja Luka.

The conclusion based on the research results shows that they can be applied in the field of integral protection of urban landscape by planning and designing forest complexes for urban recreation needs. Similarly, the results can also be the framework for reassessing and establishing the appropriate urban and technical regulations, organizing them, looking for new value evaluation methods and creating a unique information system for the network of recreation spaces on all levels. The research points to the increasingly significant role of forest complexes in modern living conditions and brings to the fore the question of adequate representation, way of use and the design of these spatial and functional units. The suggested method for evaluating the recreational function of forests is defined according to the principles of sustainable development and improving the environment quality, with the aim to find a solution for all complex demands which can be expected in the further development of cities in Republic of Srpska.

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REKREATIVNA FUNKCIJA ŠUMSKIH KOMPLEKSA KAO ELEMENT URBANOG PLANIRANJA: POGLED IZ REPUBLIKE SRPSKE

Problem rekreacije u širem smislu, sa aspekata urbanog planiranja, vezan je za druge urbane funkcije, kao i za određene funkcionalno-ekološke principe prostorne organizacije gradova (Douglas, 2000). Istraživanja u ovom radu ukazuju da rekreativna funkcija kao planerska kategorija nema adekvatan tretman u prostornim, regionalnim i urbanističkim planovima Republike Srpske, barem ne u meri koja bi odgovarala novom pristupu vrednovanja i definisanja važnih elemenata urbanog planiranja kao što su šumski kompleksi. Nejasnost na nivou urbanističkih planova onemogućava konkretne akcije u pogledu boljeg uređenja tih prostora, a i otežava sagledavanje njihovog održivog razvoja. Urbane šume predstavljaju ključne elemente zelene infrastrukture i pružaju osnovne ekosistemske usluge (Capotorti et al., 2015). Današnji razvoj gradova u Republici Srpskoj karakteriše sve veće povećanje izgrađenosti, pri čemu ekonomski faktori utiču na urbanu strukturu, zastupljenost otvorenih rekreativnih prostora i pored njihove funkcionalne i ekološke opravdanosti. Intenzivnom izgradnjom, prirodni potencijali kao što su šumski kompleksi su ugroženi, i postaju sve dragoceniji.

U ovom radu šumski kompleksi će se sagledavati kao prostorna kategorija na primeru studije slučaja grada Banja Luka. Traženje novih rešenja u postizanju kvalitativnih, a zatim i kvantitativnih promena u zastupljenosti, načinu korišćenja i uređenja šumskih kompleksa u sistemu zelene matrice Banja Luke je imperativ. Da li će ove prostorno-funkcionalane zelene strukture biti planirane za rekreativnu ili samo zaštitnu funkciju, možda kao kulturni pejzaž ili kao objekti polivalentnog karaktera zavisi od niza faktora. U fokusu ovog istraživanja je petnaest privrednih jedinica (PJ) šuma koje su određene metodom izdvajanja gravitacionog područja i zona rekreacije na području grada Banja Luke. Metod uz svoju originalnost sadrži BITERLIHOV količnik rastojanja stanovništva za potrebne šumskih kompleksa, koji se povećava sa porastom gustine stanovništva i smanjenjem rastojanja do šumske oblasti. Ovim metodom rekreativna vrednost u krugu gravitacionog područja određuje faktor položaja šumkog kompleksa i vrednost prirodnih karakteristika, odnosno podobnost šuma za rekreaciju (Medarević, 1993). Postulati vrednovanja su predstavljeni numerički i grafički primenom GIS tehnologije, na osnovu modela prethodno pripremljenih podataka. Rezultati istraživanja ukazuju da je njihova praktična upotreba moguća u oblasti planiranja i uređenja šumskih kompleksa za potrebe urbane rekrecije.

Ključne reči: *urbano planiranje, šumski kompleksi, rekreativne vrednosti, gravitaciono područje*