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GREENWAYS AS AN ELEMENT OF URBAN PLANNING: BANJA LUKA CASE STUDY

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Abstract. *The continuous presence of the landscape concept in planning and design of the Banja Luka area until the end of the 20th century influenced the formation of the identity of Banja Luka as a green city. However, in the last twenty years, there is an absence of the green city concept from planning and designing of Banja Luka's area. In order to improve the state of urban greenery and achieve the satisfactory condition of the endangered landscape elements, this paper re-examines their significance for the city. The green infrastructure has ecological, social and aesthetic functions and it becomes an imperative in defining the strategic goals of a sustainable city. The study showed, that there are possibilities of increasing the size of green areas and improving the quality of green areas in the built city tissue. One of those possibilities is transformation of the existing brownfields into green areas. From the perspective of urban planning, the purpose of this paper is to point out the possibility of implementing the greenways in the city structure for the case study in Banja Luka. In this context, the research focuses on the area of the former Incel factory and the ability to transform the abandoned railways into a greenway. In this research, the sustainable spatial development context of Banja Luka is regarded as a permanent category which includes, among the others, the ambient values, the spirit of the place and the features of a green city are important for the city's inhabitants.*

Key words: *urban planning, brownfields, green city, greenways, Banja Luka, Incel factory*

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1. INTRODUCTION

An awareness of the need to preserve natural ecosystems and of their adequate treatment, both in the urban context and wider, is becoming an imperative of human activities and spatial development. Green spaces of a city are important ecosystems that can provide more utilitarian functions, both in terms of infrastructure and ecology. In order to improve the city's life quality, it is necessary to raise the issue of green spaces' presence, the way of their future use and adequate landscaping. The natural context of cities should be preserved in all future visions of their development and arrangement.

The urban design of public open spaces in Bosnia and Herzegovina is currently focused on transforming the city's natural resources to the built environment. We are witnesses of an increasing degradation of the natural context of cities, including the city of Banja Luka, which is our case study. Banja Luka is the largest city in the western part of Bosnia and Herzegovina and in Republic of Srpska. The city developed on the Vrbas river banks in the Banja Luka basin, which represents the transition zone from the Dinara-mountain areas to the Pannonian-lowland areas (The Urbanisation Plan of Banja Luka from 1975). Banja Luka is characterised by road connection with the region and the countries of the Western and Eastern Europe, as well as the rail transport connection through the Novi Grad – Banja Luka – Doboj railroad with Zagreb and the Central Europe (Official Gazette of the Republic of Srpska, No 05/2011).

Banja Luka has built its recognisable identity of the green city over centuries and it possesses a specific landscape structure following its urban environment and vice versa. However, the image of Banja Luka as a green city is becoming increasingly lost because green urban spaces have often been considered as potential building plots. Due to the expressed needs for building land, green spaces are increasingly receiving the treatment of spatial resources for new construction. This is a big problem, which needs to be solved. An evidence for this is in the frequent changes of the Regulatory Plans of the central zone of the city, where green spaces are lost in order to get land for constructions of new residential and business buildings, which are densely allocated without green infrastructure around. The origin of the urban forms of green spaces can be searched in "layers" (Tjallingii, 2005), which do not have linear chronology. In the process of urban planning, these forms need to be upgraded in order to increase the number of green spaces as well as to increase their quality and design.

The research problem was initiated by the decrease of green areas and increase of brownfields, which has not been substantially explored in the Republic of Srpska. Brownfields are the locations which „have been affected by the former uses of the site and surrounding land, are derelict or underused, may have real or perceived contamination problems, are mainly in developed urban areas and require intervention to bring them back to beneficial use" (CABERNET, 2006: 23). The potentials of these spaces in Republic of Srpska have not been recognised yet. There is no single database, records, categorisations and classification with all the necessary information that are crucial for taking the steps towards their renewal. Furthermore, the Spatial Planning and Construction Law (Official Gazette of the Republic of Srpska, No 40/2013) does not recognise the term brownfield as a special land use category. Currently, the term brownfield is recognised only in the Spatial Plan of the Republic of Srpska until 2025 (2013: 182). In the past 20 years, illegal construction and expansion of civil land are noticeable, which has had a negative impact on nature and the environment. The Plan aims to establish a system of measures for the

development of built-up areas in a sustainable manner. This implies a more rational construction of urban settlements in the Republic of Srpska by directing the development of urban settlements to already equipped land with the necessary infrastructure, by activating brownfields, balancing with green fields etc. However, the current legislation represents a formal obstacle to the inventory of brownfields. The practical problems of brownfields are mainly solved at the level of local communities because there is still no clear official strategic and management platform at the state level that would stimulate significant investment in brownfields and promote sustainable development. Creating a Strategy on the Regeneration of Brownfields in the Republic of Srpska would enable a complete overview of the problems and potentials of these areas and offer directions for their renewal (Trkulja, 2015). Therefore, there is no clear methodology for addressing the problems of these areas. Apart from the above mentioned problems, there is not enough education and awareness of the stakeholders involved in the brownfield regeneration process, nor are there institutions for their renewal and development. It is important to note that there is no urban planning documentation that has considered the brownfields subject (Trkulja, 2015). Brownfields are often inadequately exploited regardless of their potential to become the bearers of the city's identity, key symbols and visual dominants, as places of social interaction and a positive ecological effect with an increased quantity of high-quality greenery.

This research emphasises the abandoned industrial railways, which represent a special category of brownfields and spatial resource of a city with significant reserves of infrastructure, land plots and greenery. In the focus of the empirical part of this paper is the regeneration of the selected brownfield: the former Incel factory in Banja Luka. The study searched for the formation causes, problems and advantages, which are associated with this area at different spatial levels. Regeneration is encouraged as a method, which pays a special attention to the identity of the green city. In that context, guidance and solution are given in the spirit of contemporary redesigning tendencies. Planner settings indicate the definition of new spatial patterns as there is an increasing interest in the policy of urban environment quality management in relation to land use.

Given its importance in the region, Banja Luka has recently experienced the significant transformation in functional and institutional contexts. The process of city's urbanisation and development into the leading social centre of the Republic of Srpska, establishing the institutions of the entity and state level significance, influenced the increased intensity of private capital investment in development. Demographic factor is a powerful urban matrix development incentive. Today, about 200,000 inhabitants live in the wider city area and they gravitate towards Banja Luka in order to satisfy 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. 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 new urbanisation plan, although the activities for preparing it have already been underway for a long time. The current urbanisation plan has its roots in 1975. One of the important preconditions for sustainable spatial development of the city, which the city has not provided yet, is creating a medium-term development strategy with the necessary development guidelines for numerous activities that are having spatial implications. How much Banja Luka has been changed during the last development period, this is the past two decades, and whether the quantity and quality of the transformation of

physical and green structures have been harmonised concerning the development of city functions, are the research questions of this study (Došenović, Trkulja, Sekulić, 2017).

The first part of this paper gives a general overview of the green spaces in Banja Luka, their development flows, spatial organisation and structure. The Urbanisation Plan of Banja Luka from 1975 (still valid) served as a basic source of data in determining the general representation of the presence and functional organisation of green spaces in the urban area. The emphasis of theoretical research includes the elaboration of definitions, functions, divisions and benefits of greenways. It primarily relates to the promotion of preservation of cultural, natural and landscape heritage, healthy lifestyles and sustainable ecological tourism. The second part of the paper focuses on the case study and consideration of the process of designing one part of the area of the former Incel factory in Banja Luka by transforming the abandoned railway into a greenway. The phases of designing and formulating the concept as well as some elaboration details have been analysed. Thus, the paper completed the process that indicates how contextual conditions (natural, created and general) with different intensity may affect the design of the greenway.

2. Objective and Methods of Paper

The aim of this paper is to point out the possibility of improving the quality of environment and living conditions in the city by applying the concept of green infrastructure and the application of greenways into the city tissue. The appropriate changes in the way of using, designing and developing green spaces contribute to it. One of the goals of sustainable urban development should be the improvement of the green matrix. Consequently, the intention is to point out the extent of the transformation of the green infrastructure in the context of the urban planning and development processes in Banja Luka. As elements of the urban matrix, green spaces rapidly lose their quantitative and qualitative value, disappearing in the long run of urbanisation. The influencing factors that defined morphogenesis of the Banja Luka green spaces were analysed in the light of the changes mentioned above. The results of this research are applied to a specific case study. The selected area could be incorporated into the Banja Luka green matrix supporting the complementarity of the process of brownfields regeneration. In this way, in the process of urban planning, it is possible to improve the existing urban patterns of development and distribution of green spaces.

These lead to the division of research into two parts: theoretical and empirical. Several methodological procedures have been applied in this paper, targeting specific phases. The definition, divisions, functions and benefits of greenways are explained in the first part of this research. This research suggests the state of existing green spaces, possibilities for new planning as well as the tendency of renewal and preservation of such vulnerable urban structures. This part of research is based on the method of critical content analysis: the study of the available literature systematically presents the relevant data of the subject area.

The second part of the research applied the empirical method of data collecting and processing by analysing the case study of the former Incel factory, which is carried out in the field of appropriate monitoring. The field research and processing of collected data are determined through: the methods of structural, functional and causal analysis of relevant data from professional, scientific literature and appropriate planning and programming documentation. By analysing the facts and field research with the in situ method, the study enabled the mapping of industrial railways in the form of catalogue forms, as a modern tool

for brownfields mapping (see more in Trkulja, 2015). In this part of research, the method of scientific analysis was applied (method of analysis of archive material and primary sources, and method of critical analysis of secondary sources content). The results of the scientific analysis are narratively presented and synthesised with valid arguments.

3. THEORETICAL SETTINGS

The purpose of this part of the research is to explain the definition, function and benefits of greenways. It gives a general overview of the system of the green matrix in Banja Luka, its development flows, spatial organisation and structure.

3.1. Definition, function and benefits of greenways

Planning guidelines that include urban environmental quality management policy indicate the interest in the adequate use of devastated land. Brownfields have the potential to contribute to increasing the amount of quality greenery by their regeneration.

This research focuses on abandoned industrial railways, which have the potential for being transformed into greenways, in this way enriching the city green infrastructure. Green infrastructure is viewed as „an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human population" (Benedict and McMahon, 2002: 5). Greenways are a constituent part of green infrastructure. They cover a wide range of green spaces as they can be long-distance, local and urban. Firstly, greenways are recognised as linear open spaces established along either a natural corridor (riverfront, stream valley or ridgeline), or overland along a railway and a canal, altered for recreational use. Secondly, greenways include any natural or landscaped hiking or cycling route. Thirdly, they are open-space connectors that link parks, nature reserves, cultural assets or historical sites with each other and with populated areas. Finally, greenways can also be linear parks marked as parkways or greenbelts (Little, 1990). According to the European Greenways Association (EGWA), they are new-built communication routes reserved exclusively for non-motorised journeys, developed in an integrated manner to enhance both the environment and quality of life of the surrounding area (Lille Declaration, 2000). They are often initiated by the local community in order to meet the needs of the local population and visitors, as well as to encourage healthy lifestyles, nature protection, preservation of cultural heritage, sustainable tourism and mobility (Sopron Declaration, 2006).

According to the Central and Eastern European Greenways (CEG), greenways have four basic functions. The first function is related to sustainable transport and safety, as they promote non-motorised forms of transport and mass transit, encourage mobility and tourism related to hiking, cycling, horse-riding, boating etc. The second function represents promoting healthy lifestyles, as greenways contribute to improving the quality of life of local residents and visitors by encouraging active tourism, recreation and sports in the open air and natural environments. Greenways contribute to development of different types of environment-friendly tourism (including creation and promotion of environmental tourist products) and support grassroots and regional initiatives aimed at cultural, natural and landscape heritage conservation. Therefore, development of eco-tourism and natural and cultural heritage conservation represent their third function. The fourth function is supporting economic and

social development of communities, including enterprise development, because greenways contribute to development of local economies and encourage enterprise among local people.

The greenways functions are directly connected to their benefits, so they have environmental, economic and social benefits for both the individual and the community as a whole. Ecological benefits relate primarily to improving water and air quality, noise absorption, high temperature mitigation – improving the microclimate and preserving the biodiversity by keeping the natural linear habitats (such as the coastal habitats). The economic benefits of greenways relate to the increase of the value of real estate in their vicinity, the increase of the local economy and enterprises as well as the state and local governments. The profit of a community as a whole is linked to the creation of new markets within the community, initiated through the development of tourism and outdoor recreation that contribute to the implementation of new contents in the settlement (restaurants, motels, hotels, rent recreational equipment, etc.). The greenways enable the local people interaction, socialising and occasional encounters. Spending time in nature and greater physical activity has positive effects on both physical and mental health. Namely, the modern way of life, initiated by a massive use of cars, created the problem of inactivity which, combined with the lack of proper nutrition, has led to 'epidemic of obesity'. Also, traffic jams on the roads make the movement of pedestrians and cyclists unsafe. On the other side, greenways make it safe and easier. In urban design, greenways are a constituent part of planning the walking paths and bicycle commuting. They enable mobility and recreation of different users and thus promote the healthy lifestyle of local residents and visitors. Public health experts believe that using greenways as an alternative form of transport or for short day trips would lead to significant improvement of mental health by reducing anxiety and alleviating symptoms of depression. Whether a pristine nature or an urban park, the source of greenery provides the same therapeutic effect. Urban greenways provide additional benefits of fleeing from the noise, and other stresses of the city life (Little, 1990).

Greenways can be planned at the site of devastated railways, because they usually re-use the existing urban infrastructure (Baker et al., 2009). Therefore, the aim of this paper is to point out in the area of urban planning the possibility of implementing the greenways in the process of development of urban matrix of the city of Banja Luka.

3.2. The green matrix system in Banja Luka

The need to preserve the existing and to create the new green spaces in connection with the further development of the city of Banja Luka is obvious and represents the part of the strategy outlined in the previous Urbanisation Plans. The spatial and functional analysis of green spaces in Banja Luka has indicated the essential features of the present development. In The program of City Regulation (Kirjakov, 1952) the author lists out three guidelines (of nine) dedicated to green spaces: two to natural features of green structure and one to the role of landscape architecture objects in the formation of the city's identity. This emphasises the importance of urban greenery and coast of the Vrbas river as structural elements of the urban planning concept and organic links between the city and the river. It also points out that development trends should change the direction of the longitudinal expansion of the city.

The core analysis of the Urbanisation Plan of Banja Luka from 1975 shows that the optimal conditions for a healthy and pleasant life, the establishment of creative harmony of natural and built values as well as the environmental protection were the starting point for defining the basic planning guidelines. It is understandable that the development projection

is followed by all the undesirable emerging processes of transition, urbanisation and population growth. It is therefore concluded that it is necessary to take measures for ensuring enough efficient green infrastructure in order to mitigate the negative consequences and contribute to the protection and improvement of the environment.

The focus of the concept of the Urbanisation Plan of Banja Luka from 1975 represents the introduction of forest massifs into the urban tissue through the greenways of primary roads and the watercourse of the Vrbas and Vrbanja rivers. The green of the southern and south-western forests is introduced through the longitudinal corridor highway, western and eastern transit (main street) continuously throughout the urban area. This plan suggests arranging open green spaces on the green spaces of residential blocks, work zones and recreational spaces. It would be obtained through connecting them into a unique network of urban greenery, forest areas and agricultural landscapes. The existing forest areas have been treated as a category of protected forests. Some of their individual parts are defined as protected forest parks with the area of 1,860 ha.

The concept of the Urbanisation Plan of Banja Luka from 1975 in the domain of the spatial-functional organisation of the urban green area shows the intent to establish a unique system for the whole city territory, which should satisfy the criteria of an even, continuous and homogeneous distribution of green spaces. The comparison of the planned development of green areas to the present situation has shown that a unique system of green spaces has not been established in the entire urban area, but only in its narrow part. Many efforts have been done in order to solve the greenery issue according to modern urban concepts that have only been partly implemented with tremendous difficulties. Namely, the planned concept and green level has been changed by the new regulatory plan. Consequently, the continuity in the system of city's green spaces is also disturbed.

Besides the lack of connection between greenways, there is also a problem of river regulation and open spaces in the city centre that could be integrated into a unique greenery system. Newly-designed green spaces by dimensions, function and spatial form do not correspond to the category they used to belong to. They are often formed without a plan concept, and their contribution to protecting and improving the environment is minimal. Park areas with their dimensions and functions today do not allow the versatile recreational activity of visitors of all ages.

Under the greenery system in the Urbanisation Plan of Banja Luka from 1975, green spaces are a medium of permeation, connecting all other functional systems that are clearly separated. The theme of integrating the green spaces has been set as "a unique system of greenery that in the spatial organisation of urban territory makes the connecting element of the composition of urban structures and essential ecological factor" (pp. 141), pointing to the developmental processes that follow. The concept of green spaces is referred to as the instrument of the city matrix design and is considered to be important for the city planning. The basic network of green areas of the narrow urban area in the raster of corridors' longitudinal and cross networking is immediately followed by the system of parks and recreational centres of general or regional importance to the basic parks, squares and green areas of multi-dwelling housing. Then, there is also a network of urban tree avenues as vegetative nerves of urban tissue and all other green spaces of public, restricted and protective categories.

The last period of green infrastructure development refers to the current, transitional period. During this period, the regulatory plans of individual urban units were drafted. Also, the draft of the New Urbanisation Plan was adopted after the adoption of the Spatial Plan of the Republic of Srpska until 2015 (2008). Urbanisation and all the changes (demographic, sociological, cultural, ethnic and others) that have been happening in the last fifteen years in the Republic of Srpska have had a significant impact on the changes in the design of green infrastructure. The demographic factor (permanent population growth) has led to an increased demand for housing. The transformation process of the urban matrix has become increasingly difficult and contributes to the extension of rural-urban patterns of physical structure. Unfortunately, green areas get the treatment of spatial resources for new construction. This is a major challenge of the future spatial development of the city. Banja Luka goes deep into natural areas, protected green spaces, forest parks, thus creating a peri-urban zone with morphological features without a clear meaning. It is important to point out the appearance of unplanned or illegal construction (without building permits) as a result of slow resolution of housing needs.

Protection of the existing greenery will not be possible without the implementation of various measures in the legal, organisational or financial domains. Also, the citizen's awareness of their living space is not sufficiently developed. The ecological approach is not satisfactory, as evidenced by numerous examples in the context of the protection of cultural-historical and natural heritage. Attempts to solve some of these problems have also appeared in the form of the tenders that the Banja Luka City Administration had called for urban-architectural solutions of certain parks.

4. CONTEXT ANALYSIS

4.1. Contextual issues

Banja Luka has had a dynamic historical development, but in relation to the subject of this paper, it is necessary to address the development of the railway transport and economy. At the very end of the Turkish occupation (1871–1873), the railway Dobrnjin – Novi Grad – Prijedor – Banja Luka was constructed. The railway was intended to be a part of the future Ottoman Transbalkan Railway which would connect Turkey with the Western Europe through Bosnia as the shortest route (Ševo, 1996). Industrial railways of the former Incel factory are selected as a topic of a case study analysis in this paper.

In the Vrbas Banovina of the Kingdom of Yugoslavia, which was established in 1929 having Banja Luka as its most significant city, railway traffic used the 350 km long state lines and 400 km long industrial railways (Vidaković, 2006). During the socialism, Banja Luka was extensively spread to the contact zone with the narrow city centre. The process of industrialisation resulted in the construction of major manufacturing industrial zones: east extending from Vrbanja to Predgradje (which includes a testing grounds of empirical research) and north-west which was located between Zalužani and Ramići. However, The Civil War (1991–1995) has significantly influenced the industrial development of the entire Republic, thus including the city of Banja Luka.

The basic characteristic of the current economic development in Banja Luka is exemplified by the reduction of economic activity and a radical change in the economic structure. It is reflected in a large reduction of the share of manufacturing activities attained

through employment and incomes. During the transition period (from 1995), there has been a decrease in industrial production capacities and significant growth of service industries. A large number of industrial complexes in the city have remained non-functional, leaving over 53% of the city area abandoned, neglected and unused. Furthermore, there is an evident presence of industrial railways that are no longer in use. The economic, ecological, social and cultural potential of these locations indicate their importance to the urban community, thus indicating the necessity of their renewal (Đukić et al., 2014).

4.2. Case study - urban planning context and development of former Incel factory

Based on our practical experiences we noticed, that the spatial resources of Banja Luka, as well as of the entire Republic of Srpska, are used recklessly and inefficiently in the process of its development and expansion. In order to avoid this 'trend', it is necessary to renew the brownfields and reduce the 'pressure' on the green city matrix. The first phase of the renewal process involves the identification, mapping and proper analysis of the problems and potentials of brownfields on the basis of which it is possible to define guidelines for their regeneration.

The analysis of the case study in the Republic of Srpska is preceded by the definition of methodology for identification and the appropriate level of mapping of these areas. The methodology should enable a simple analysis and evaluation of the collected data, as well as the definition of adequate guidelines for regeneration of railway brownfields. We used the methodology, which was by Trkulja (2015). A catalogue form for mapping industrial railway brownfields has been selected as the most appropriate tool for carrying out the set tasks. The catalogue form includes a set of parameters and criteria that enable a detailed analysis of railway brownfields. These parameters and criteria are defined within the ecological, regulatory, cultural and social aspects, and individually for the railways, the green structure, the traffic infrastructure buildings and developed open space (see more in Trkulja, 2015, pp. 133–134).

The former Incel factory is located in the eastern industrial zone of Banja Luka, where the Vrbanja river flows into the Vrbas river. It is about 2 km away from the administrative centre of the city (Figure 1). Incel factory was founded in 1954, and the whole complex was established until 1981 (“Business Zone” Banja Luka, 2011). The Incel factory in Banja Luka was the main stakeholder of the development of chemical and pulp and paper industry. By implementing the programmed capacities, Banja Luka became the largest producer of chemical fibres and pulp in Yugoslavia and one of the major manufacturers of chemical fibres in Europe (The Urbanisation Plan of Banja Luka from 1975).

The latest Civil War (1991–1995) slowed the development path of the Incel factory until its plants stopped operating in 1992 (Djukić et al., 2014). Restructuring and privatisation process followed in 2000 (Mišeljić, 2014). The consulting, mediation and service company “Business zone” Banja Luka has operated the former Incel factory since 2009. The business activity in this area was performed by another 14 business entities that have had the ownership over the facilities and 90 other business entities that have leased and used the office space of the business zone (“Business zone” Banja Luka, 2011).

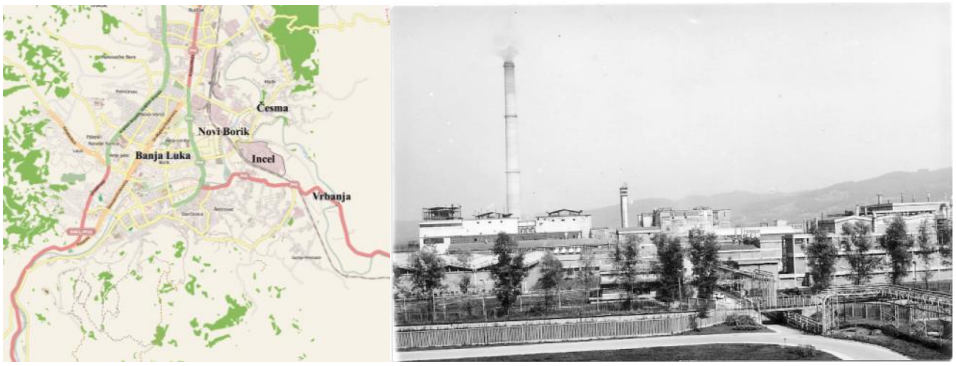

Fig. 1 Present position (left) and the 1979 photograph of the former Incel factory (right) (Source: Authors (left) and http://banjaluka.net/veliki-foto-vremeplov-sta-se-sve-nekad-proizvodilo-u-banjaluci/ (right)).

Regulatory plan of business zone "Medenopolje" in Banja Luka (Official Gazette of the city Banja Luka, No 9/2002) which included the area of former Incel factory, was completed in 2005 (Figure 2).

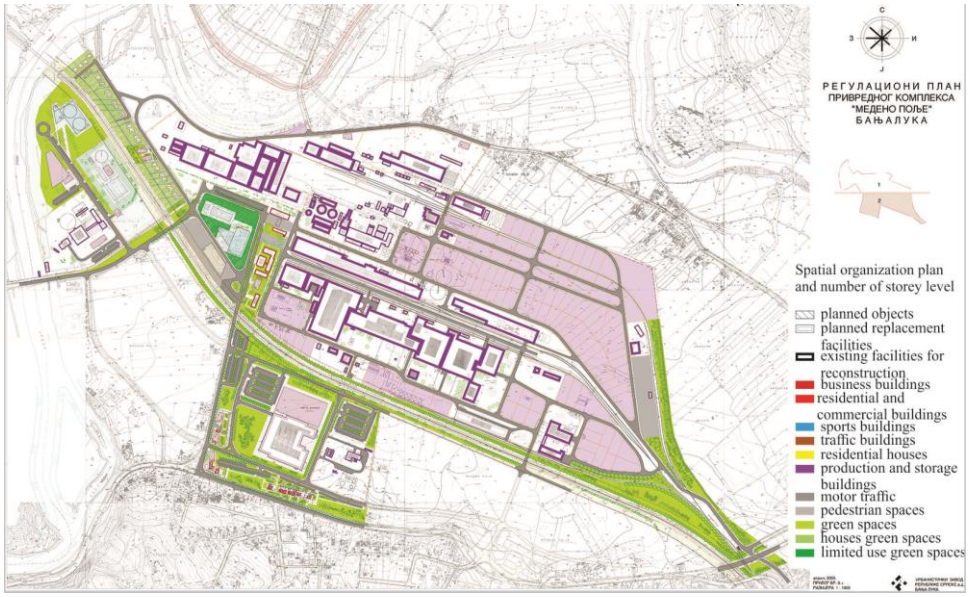

Fig. 2 Regulatory plan of business zone "Medeno polje" in Banja Luka (Official Gazette of the city Banja Luka, No 9/2005)

This Plan predicts the removal of some existing buildings and building of new ones for business, housing, warehousing, sports and parking garages. The plan predicts the construction of a sidewalk of 27,023 m² and bicycle trails of 669 m². When it comes to a green matrix, the Incel as a corporate entity used to pay great attention to the design of its

environment. This is evidenced by numerous plants, groups and individual trees that are 15–40 years old within the whole complex. Within the analysis of the situation, valuable individual examples of trees have been found. This Plan predicts the planting of 1431 decorative trees, such as avenues along the parking space and the railway. One of the basic goals of greening is the binding of the proposed greenway in the green infrastructure network. In relation to all the above, the idea of transforming abandoned railways into the greenway was logical.

The network of industrial railways was about 8 km long (Djukić et al., 2014) and it consisted of 18 routes. The catalogue analysis of railways has showed that 8 routes are still in function (eastern and northern railways). Two are partially in function, six are out of function and two southern routes are dismantled and removed, and the space they took up is either overgrown or filled with gravel (see more in Trkulja, 2015: 143-179). Central industrial railways are non-functional. Their route exists but is not maintained. That is why the location of the central railways has been chosen for the position of the greenway. Despite the many companies that operate at the site of the former factory, large areas are unused and undeveloped, green spaces are neglected and facilities of the old plant are empty. In that sense, Incel disrupts the appearance of the surroundings and represents an environmental problem (Figure 3). Therefore, it is necessary to regenerate the Incel testing grounds and arrange the green spaces in order to solve the ecological problem.

Fig. 3 Analysis of green spaces (left) and industrial railway (right), 1:10000
(Source: Matić, 2017)

4.3. Conceptual design of greenway

Research of resources and potentials of the former Incel factory established the position of greenways at the site of the central railways. Analysis of structures showed that in the north and south of the greenway are the structures with mixed functions that are partially or completely in use. On the west side of the greenway, there are the Independent University of Banja Luka, the Agency for Medicines and Medical Devices of Bosnia and Herzegovina, The Republic Administration for Geodetic and Property Affairs of the of the Republic of Srpska, The Republic of Srpska Institute of Statistics. On the south side, there are The Official Gazette of the Republic of Srpska and the Lanaco Information Technology Centre. These functions and the proximity of the Vrbanja, Česma and New Borik settlements require the public space to be tidy and green, which can be organised in the form of a greenway. At this moment, opportunities for the realization of the optimal system of urban greenery are not great. However, in the planning we should strive for the creation of

mutually connected entities, which is proposed by solution proposed by this text. The greenway connects the surrounding settlements and introduces parts of the protected park-forest into a city green matrix.

Therefore, the concept is developed on the basis of contextual conditions and influences, and the intervention is given on the level of buildings, open spaces and context of the communion (Figure 4).

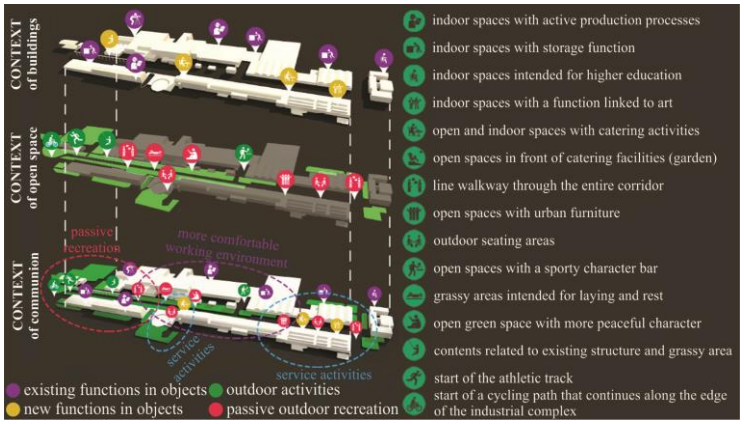

Fig. 4 Intervention in the selected polygon
(Source: Matić, 2017).

The aim is to provide the users of the space with a pleasant place for relaxation, socialising and entertainment. By retaining and 'coating' existing railways, rehabilitation and redesign of the surrounding buildings facades and transformation of the devastated canal for installation to a long waterway, created a space which testifies about the history of the industrial giants of the last century. At the same time, the space is further enriching with green structure giving the impression of space on a human scale and naturalness (Figure 5).

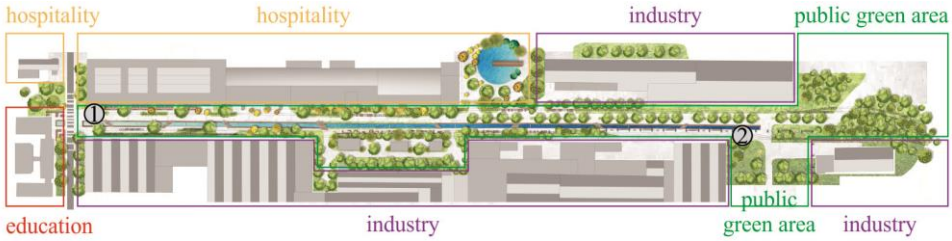

Fig. 5 Plan of the greenway, 1:6000
(Source: Matić, 2017)

The existing industrial artefacts, which testify the history and spirit of the place, are given the new functions that make them attractive and recognisable. The function of structures has changed, so the storage spaces have become home to art, work, recreation, relaxation and entertainment (Figure 6-1). This way, the space has been refurbished with new cultural and

hospitality contents complemented by the functions of the objects located on the west side of the greenway, especially education and administration. Thus, the greenway and its contents have been integrated into the environment and allow the adequate level of safety and comfort to the users of the space. The regeneration design has created an incentive space that can influence development of the site and increase in the value of land and real estate (Figure 6).

Fig. 6 Photomontages of the new design
(Source: Matić, 2017).

The regeneration project enriches the business area with new amenities. The former industrial plants and open spaces are enriched with cultural and hospitality amenities/finctions. Urbanisation of the area by improving the quality of the environment, the working conditions of the users of the space and the life of the inhabitants of the surrounding settlements can generate employment and construction works. Protection of existing biodiversity and interpolation of the new green structure, with a combination of nature, railways and art installations, provides safe, attractive and cost-effective places for work and active and passive recreation. Regeneration and preservation of industrial city giant keep the unique identity of space. Upgrading the ecological and aesthetic quality of environment will undoubtedly improve the quality of life of people living and working in this area.

5. CONCLUSION

The increase in the density of population in the centres of cities and their simultaneous expansion has become a threat to the existence of open and green spaces. In order to improve the condition of the green spaces and achieve the satisfactory efficiency of the endangered landscape elements, this paper re-examines their significance for the city as well as their ecological, social and aesthetic function, which has become an imperative in defining strategic goals of a sustainable city. There are opportunities to increase the greening and improve the

quality of green infrastructure in the built city tissue. One of them is the implementation of green structures at the brownfields.

The brownfields regeneration is an acceptable method in the function of comfort increasing in the narrow urban area of Banja Luka, and therefore provides the possibility of renewal of the green city identity. Forming greenways could mitigate or prevent environmental damage caused by intensive urban development. Exploring opportunities to improve the quality of the natural environment and life in the growing cities puts emphasis on expansion of green infrastructure by implementing greenways at the site of abandoned railways. Theoretical research emphasises the ecological, economic and health benefits of greenways. Furthermore, it points to the development flows and the condition of the existing green spaces of the urban matrix in Banja Luka, the possibilities of planning the new ones, as well as the tendency of regeneration and preservation of such vulnerable ambient units. In applied research, the emphasis was placed on the process of development of urban matrix of the city of Banja Luka and the spatial resources of the former Incel factory at the location of inactive industrial railways. Research has shown that the transformation of railways into greenway allows preservation of genius loci in the urban development process, and affects ecological, economic, social and aesthetic improvement of the area. The regeneration project initiates development of workout routine, leisure and work in the open, contributing to significant improvement of quality of life of the people living and working in this area.

REFERENCES

1. Baker, C., Mahe, R., Wiseman, K. (2009). *New Ways to Look at Old Spaces: A vision for green infrastructure networks*. Proposal for the 2009 TD Friends of the Environment Foundation Go Green Challenge.
2. Benedict, M. A., McMahon, E. T. (2002). *Green Infrastructure: Smart Conservation for the 21st Century*. http://www.sprawlwatch.org/greeninfrastructure.pdf, accessed 28. 12. 2017.
3. "Business Zone" Banja Luka. (2011). *Action plan for implementing measures for successful business operations and successful exit strategy.*
4. CABERNET. (2006). *Sustainable Brownfield regeneration: CABERNET network report*. UK: University of Nottingham.
5. *Decision of making the Regulatory plan of business zone "Medeno polje" in Banja Luka.* Official Gazette of the city Banja Luka, No 9/2002.
6. *Development strategy of small and medium enterprises in the city of Banja Luka 2010-2015*. Official Gazette of the Republic of Srpska, No 05/2011.
7. Došenović, Lj., Trkulja, T., Sekulić, M. (2017). Recreation function of forest complexes as an element of urban planning: a view from Republic of Srpska. *The Facta Universitatis, Series: Architecture and Civil Engineering* 15 (1), 103–115. DOI: https://dx.doi.org/10.2298/FUACE161125007D
8. Djukić, A. (Ed.), Vujičić, T. (Ed.) et al. (2014). *Manual for establishing of interactive database of brownfield locations*. Banja Luka: University of Banja Luka and Faculty of Architecture, Civil Engineering and Geodesy.
9. Kirjakov, A. (1952). *Generalni urbanistički plan Banja Luke.* Sarajevo: Urbanistički zavod glavne uprave za komunalne poslove Narodne Republike Bosne i Hercegovine.
10. *Law on Spatial Planning and Construction*. Official Gazette of the Republic of Srpska, No 40/2013.
11. *Lille Declaration*. European Greenways Association, 12th September 2000.
12. Little, C. E. (1990). *Greenways for America*. Baltimore: Johns Hopkins University Press.
13. Matić, N. (2017). *Parterre-landscape design of the linear park within "Business Zone" Banja Luka*. Banja Luka: University of Banja Luka and Faculty of Architecture, Civil Engineering and Geodesy.
14. Mišeljić, Lj. (2014). *Banjaluka industrial decay: manufacturing plants turned into wedding and funeral salons*. http://miseljic.blogspot.com/2014/10/propast-banjalucke-industrije.html, accessed 10. 1. 2018.
15. *Regulatory plan of business zone "Medeno polje" in Banja Luka 2002-2010*. Official Gazette of the city Banja Luka, No 9/2005.

16. *Sopron Declaration*. Environmental Partnership for Sustainable Development, 1st July 2006
17. Ševo, Lj. (1996). *Urban Development of Banja Luka*. Banja Luka: Institute for protection of cultural and natural monuments.
18. Tjallingii, S. (2005). Green Structure and urban planning, general outcomes of Cost C11. In A. C. Werquin et al. (Eds.) *Greenstructure and Urban Planning – Final Report 2005*. EuropenCommision, COST Action.
19. Trkulja, T. (2015). *Defining methodological principles for regeneration of abandoned railway corridors in the Republic of Srpska. Doctoral Dissertation.* Beograd: University of Belgrade, Faculty of Architecture.
20. *The Urbanisation Plan of Banja Luka* (1975). Banja Luka: Institute for urbanisam.
21. Vidaković, S. (2006). *Architecture of public buildings in Banja Luka (1918-1941).* Banja Luka: University of Banja Luka and Academy of Arts.

ZELENI KORIDORI KAO ELEMENT URBANOG PLANIRANJA: STUDIJA SLUČAJA BANJA LUKA

Kontinuirano prisustvo koncepta krajolika u planiranju i projektovanju područja grada Banja Luka do kraja XX vijeka uticalo je na formiranje identiteta Banjaluke kao zelenog grada. Međutim, u posljednjih dvadeset godina, prisutno je odsustvo koncepta zelenog grada u planiranju i projektovanju područja Banja Luke. U cilju poboljšanja stanja urbanog zelenila i postizanja zadovoljavajućeg stanja ugroženih elemenata pejzaža, ovaj rad ponovo razmatra njihov značaj za grad. Zelena infrastruktura ima ekološku, socijalnu i estetsku funkciju i postaje imperativ u definisanju strateških ciljeva održivog grada. Studija je pokazala da postoje mogućnosti povećanja zelenih prostora i poboljšanja njihovog kvaliteta u grđjenom tkivu grada. Jedna od tih mogućnosti jeste transformacija postojećih braunfilda u zelene prostore. Iz perspektive urbanističkog planiranja, svrha ovog rada je da istakne mogućnost implementacije zelenih koridora u gradskoj strukturi za studiju slučaja u gradu Banja Luka. U tom kontekstu, istraživanje se fokusira na područje nekadašnje fabrike Incel i mogućnost transformacije napuštene željeznice u zeleni koridor. U ovom istraživanju, kontekst održivog prostornog razvoja Banja Luke se smatra trajnom kategorijom koja uključuje, između ostalog, ambijentalne vrijednosti, duh mjesta i karakteristike zelenog grada koji su važni za stanovnike grada.

Ključne reči: *urbano planiranje, braunfildi, zeleni grad, zeleni koridori, Banja Luka, nekadašnja fabrika Incel*