Harmonization of Natural and Urban Structures in The Danube Region

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Abstract. The deteriorating state of the environment over the last half century has resulted in the current climate and environmental crisis, which is conditioned by the unbearable exploitation of the natural environment. One of the activities that plays a key role in this situation is urbanization with a constant occupation of the landscape, increasing emissions from traffic and buildings. A well-thought-out and consistent strategy for the harmonization of natural and urban structures can mitigate the negative climate impacts in the residential environment. The harmony of natural and artificial elements has a positive impact not only on the environmental but also the aesthetic quality of the urban environment. It can significantly help to strengthen the character of the cities. It was the landscape that significantly influenced their location and characteristic image. The research focuses on the evaluation of the quality of the urban environment with emphasis on the interaction of urban and landscape structures. The presented research is aimed to the connection of the city with the river and the surrounding landscape. It analyses and evaluates the impact of characteristic natural elements on the formation of urban structures during their development to the present day. It traces significant "traces" of the landscape in the urban structure of selected cities and their evolution. The research is focused to significant Slovak settlement on the Danube.

1. Introduction: Image of the city and the surrounding landscape
The environmental characteristics of the settlement and its structures have an impact not only on the ecological carrying capacity of the area but also on its aesthetic quality. However, the surrounding landscape also fundamentally affects the character of the seat - its external and internal image. Therefore, within the development and transformation of the settlement, the character and potential of the country should be fundamentally taken into account and reflected in the spatial plans of the cities and in their internal structure, as well as in its extra-urban area.

Significant landscape elements and the dominant character of the landscape represent the "cosmic order" [1]. This is a determining factor to which both the "secondary country" and the urban structure are subject. The dominant character of the landscape thus conditions the formation of the agricultural landscape, location, shape, type, settlement, its possible growth, interaction with the landscape. Its openness or closeness of the urban structure to the surrounding nature [1].

Therefore, we consider the characteristic type of landscape to be an "important element" [2], which significantly shapes settlement systems and urban structures, but also the character of the cultural landscape.
Kevin Lynch describes his perception of spatial structure in his book The Image of the City. His surveys point to a differentiated perception of the urban structure by residents and visitors as follows:

- The visitor who does not know the seat, describes his experiences in relation to the large city of the city, reflects in particular the general character of the seat;
- Anyone who knows the city a little better - can describe the characteristic parts of the city, the main urban areas, lines and their connections;
- The city dweller focuses on small significant elements of the urban fabric [2].

Kevin Linch lists five basic elements of the urban structure that help in orientation a person in space. These element are represented by roads, edges, areas, nodes, significant elements. In the analysis of these elements of urban as well as landscape structure, the place and routes of the observer are also important.

When planning, creating and transforming urban spaces, it is important to take into account and harmonize different aspects. A comprehensive approach makes it possible to create a sustainable urban structure, based on functionality, ecological stability, suitable climatic conditions, as well as of preserving historical values and supporting social, economic and cultural activities.

For the identity of the city, for its genius loci, the legibility of the urban structure are significant dominants, accents and characteristic areas, which reflect the natural elements and areas from which they grow and which conditions and shapes them, is important.

In this context, it is necessary to emphasize that the character of the seat and its penetration with the landscape is influenced not only by the qualitative but also by the quantitative side of the natural structure. That’s why, during the process of planning and shaping settlements and their urban structures, we take into account the character and identity of the municipality and surrounding landscape (natural and cultural landscape).

We investigate and follow the following questions:

- What are the predominant characteristics of landscape and urban structures?
- Are these characteristics optimally used to benefit the uniqueness of the area and their sustainability?
- How to approach the evaluation of its true values when planning a seat?

These questions help us to create a picture of harmonies or disharmonies - the diversity or homogeneity of the extra-urban and urban areas of the city.

2. Devin - as an example of harmonization of the country and the settlement structure.
An example of the projection of a characteristic landscape and dominant natural elements into an urban structure is the Devin - the city district of Bratislava. It represents a model area within which we have carried out research aimed at shaping its image and the importance of a place formed by natural conditions. At the same time, we examined the development of harmonization of natural and urban structures.

2.1. Determining landscape-settlement conditions
The character of the Devin locality determinated by geomorphological conditions. Its surroundings represent the areas that´s are characterized by valuable natural and cultural-historical values. It lies on the important European river Danube and its confluence with the river Moravia and at the same time on the border of two important European mountains - Alpine and Carpathian. It forms a gateway between the Záhorská and Pannonian lowlands.
In this area, forested mountain massifs alternate with the cultural-agricultural landscape of lowlands and floodplain forests around the Danube and Moravia. It is a unique combination of differentiated landscape types with a settlement structure.

Devin lies on a wider strip of territory in the south-western part of Bratislava. For Devin are typical river (coastal) corridor along the Danube and Moravia and urbanized areas along the Devínska road, as well as the south-western slopes of the Devin Carpathians. The harmonization of the natural and urban environment with regard to the uniqueness of the territory is based on the level of both international and national and strategy regional documents and contexts.

**International context**

From the international context it is necessary to focus on:

- The "phenomenon of water" and the values of the natural environment of the city in the development of attractions of international tourism in the field of recreation;
- The basic framework of ecological stability in the broader relations of the Central European area of interest;
- The system of the European ecological network - EECONET, the national ecological network NECONET, supra-regional ÚSES SR, RÚSES Bratislava and the city area, elements included in NATURA 2000, including habitats of European and national importance, the territories defined by the Ramsar Convention [3].

**National and regional context:**

From the national and regional aspect it is necessary to focus on:

- The development of Bratislava as a nationwide cultural and social center and the support of recreational potential of the area along the Danube;
- Protect and enhance immovable sites of cultural heritage and cultural-historical and social environment, as well as the image of the city and the surrounding landscape;
- Preserve forest areas with priority for their importance as a basic landscape-creating, hygienic, recreational-relaxation and eco-stabilization element;
- Develop cultural and natural conditions for domestic and international sustainable tourism;
- Respect the declared protected natural values: protected nature areas, PLA Malé Karpaty, PLA Dunajské luhy, sites of the Ramsar Convention, sites included in NATURA 2000 and elements of ÚSES;
- Support Respect in the environment, in nature protection, in the creation of the landscape and in ÚSES: - areas of vineyards and gardens on the slopes of the Little Carpathians as part of the historical landscape image of the district [3].

2.2. Theoretical background

Kevin Lynch dealt with the peculiarity of the character of urban structures in his theoretical work. Lynch defined the term "imageability" (image-able), ie able to create, leave in memory an image, thanks to which a person is better oriented in space. The mentioned image of the city is shaped by its structure, its meaning and peculiarity - identity " [4].

To assess the quality of the urban structure, Lynch defined five basic elements: the paths, edges, districts, nodes, landmarks - important elements that fundamentally shape the image of the city. The districts are defined by edges, interwoven with paths, while important elements as well as nodes play an orienting role in space.
The districts represent homogeneous spatial structures within the city with the same, clearly legible character.

The edges represent the interface between the individual areas.

The nodes in the settlement structure form important spatial landmarks. These are mainly their nodal spaces - squares.

The landmarks - represent important elements that help identification and orientation in the urban structure. These are usually easily distinguishable objects - landmarks, important buildings, but also elements that help fixed the memory of the city and their places, associated its image.

The paths represent a system of linear spaces in the urban structure - streets, traffic arteries, but also rivers, water canals that can lead us through the urban fabric [2].

As part of the evaluation of the urban structure, Lynch also evaluated other characteristics of the urban structure, such as: uniqueness, simplicity, complexity, directions, continuity, dominance, visual range... He explored these properties in their synergies.

Christian Norberg-Schultz focused on assessing the "spirit" of the country. It divides it into: romantic, cosmic, classic and complex. It identifies the architectural structure, which grows out of the characteristic landscape. Schultz points out that the genius loci manifests itself especially where the settlement is intertwined and strongly conditioned by the primary landscape. The determining factor is the so-called a natural element - the "cosmic series", which is permanent, unchanging and dominant. It represents a kind of existential anchor (large river, mountains, characteristic hill). The seat and its urban structure is subordinated to this superior natural environment. The character of the landscape and characteristic natural elements are transcribed into the urban structure of the seat [1].

3. Analysis of landscape and urban structures in the Devín area
The aim of our research is to evaluate the genius loci of the Devín area in the application of the methodology of landscape evaluation according to N.-Schulz and the methodology of urban space evaluation according to Kevin Lynch.

According to Schulz, the first methodology helps to determine the predisposition of the zone to global and local landscape structures. Lynch and Jehlík's methodologies, in turn, help to identify the strengths and weaknesses of the urban structure. The implemented analyses thus reveal the potential of individual locations of the settlement and make it possible to determine the basic building elements (natural and urban-architectural) and their parameters for strengthening the genius loci - a harmonious and sustainable urban structure of the 21st century.

Within the evaluation of the "Image of the city" in the context of the landscape, it is important to perceive characteristic areas - homogeneous areas, both landscape and natural structures. These are homogeneous medium to large parts of the town or landscape. These are territories that have a specific and integrated structure [2 p47].

Jehlík also uses a similar method of evaluating the image of the city in his research of urban structures. Autors of this book also defines units of a similar city structure [5].

When we talk about Devín and its areas, it is necessary to state that the whole Devin, in the scale of the metropolis of Bratislava, is already a separate area, but in the scale of the solved zone it is possible to divide it into several urban-landscape areas:

- The area of the Danube and Morava rivers, their confluence and the accompanying floodplain forest;
• The area of the Carpathian Massif and the accompanying forest stand;
• The area of agricultural land, especially vineyards, but also fields, which can be perceived mainly from elevated positions;
• Urbanized area.

In terms of the intersection of landscape and urban structure and the perception of their interaction, several positions are important:
• Waterfront locations;
• Elevated castle structure;
• Slopes of the Little Carpathians above the city.

Perception of the environment from the flow of the Danube it is particular important.
The openness of the Devin zone to the watercourse contributes to the identification of the human with the surroundings.

3.1 Dominant water element
Water, bodies of water and watercourses of various dimensions have their own identity, and strengthen the image of the city. Devin was historically founded on the Danube, as a strategic point supported by a castle at the confluence of the rivers. The Danube and the Devin Castle are the dominant and determining elements for the settlement itself, both in terms of the image of the Devin and in terms of its historical significance for the entire territory of Slovakia.

The openness of the settlement to the watercourse contributes to the identity of this area.

3.2 Landscape forest habitats and morphology of the area
The Devin area surrounding the dominant nature creates the image of the city. It mainly includes landscaping massifs of supra-regional and regional significance, which stabilize this area from an ecological point of view. At the same time, they are an attractive spatial elements. In the southwest, Devin is surrounded by a bio-corridor of floodplain forests, on the north-south side there is an inundation zone - the floodplain of Moravia and the Devin alluvium of Moravia. To the northeast, the village is surrounded by forests and the Devínská Kobyla massif with its characteristic geomorphology (Figure 1). Diverse landscape delimits and defines the spatial development of the Devin [6 p97].
Figure 1. Geomorphological structure of the Devín settlement. Source: Olena Lemak

The image of the Devin is also illustrated by the cultural landscape in the form of gardens and vineyards, which has historical value (Figure 2).

Figure 2. The Devin structure according to Kevin Lynch methodology. Source: Olena Lemak
3.3 Settlement structure
The settlement structure can also be divided into characteristic areas such as: the core of the settlement formed by the historic centre, compact and more intensive residential development. On the side of the settlement there are areas of family buildings and areas of gardens with holiday cottages. The gardens areas of the family houses as well as the cottage area represent a natural transition to the surrounding landscape.

4. Conclusion
The presented research focused on the analysis of the interaction of landscape and urban structures. It presents selected principles of the analysis of the landscape and urban structure of the settlement focused on the evaluation of the identity of the settlement, through the assessment of spatial quality. These analyses help us to specify the peculiarities of the spatial structure of the seat in relation to the surrounding landscape, to define their strengths and potential that should be developed and the factors that need to be suppressed.

The harmonization of urban structures and their spaces with the surrounding landscape is the basis of the city's sustainability and at the same time the basis of its genius loci, co-creating its identity. It was formed during the historical development of the city, as well as events, technical progress and knowledge. Identity is connected with a special image of city or place.

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References
[1] Ch. Norberg-Schulz, “Genius loci. Krajina, misto, architektúra,” “Genius loci. Towards a phenomenology of architecture,” Praha : Dokořan s. r. o. 2010. Druhé vydán., p. 219, 2010 (in Slovak).
[2] K. Lynch, “Obraz města – The Image of the City”, Praha: Polygon., p. 202, 2004 (in Slovak).
[3] D. Kostovský, “Územný plán zóny Devin I., Smerná časť”, Bratislava: AUREX spol. s.r.o., ss. 161, 2018 (in Slovak).
[4] L. Vitková, and O. Lemak, The character of the landscape as a starting point for the transformation of the urban structure In: ALFA. FA STU Bratislava., 2021 (in Slovak).
[5] J. Jehlík, and M. Drdácký, Skrytý řád a vnitřní podstata jedinečnosti historických měst ČR, ČVUT Praha [Online] 2020, Available at: https://www.fa.cvut.cz/cs/studium/obecne/doktorske-studium/puvody-a-atributy-pamatkovych-hodnot-historickych-mest-ceske-republiky (in Slovak).
[6] O. Lemak, and L. Vitková,“Harmonizácia prírodných a sídelných systémov v Podunajsku“, In: Budoucnost venkova, Akademické nakladatelství CERM, s.r.o., Brno 2020, p.164, pp. 86 – 100, 2020.