The Potential of Urban Transformation of the City Radial Route in Bratislava, Slovakia

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Abstract. The city, as a stratified urban structure, spread over time and in social coordinates, has its solid and spatial substance for the life of its inhabitants and visitors. The wider city center continues from the central city zone to the peripheral and often developing parts of the city. As a rule, ballast, uncoordinated and disarranged urban structures are usually increasing in this area. The urban explosion in the 20th century has caused oversized systems of housing estates, industrial zones, traffic lines and nodes in cities, forgetting quality, scale, functionality, and beauty. The transformation of these territories is first and foremost a question of a proper understanding of the compositional, social, ecological and economic issues and principles of the sites. Bratislava, due to the terrain morphology, developed further from the center along several main urban radial routes. The Bratislava Eastern Axis, formed by the Ružínov City Radial, binds to itself the entire transport structure of the Bratislava city part - Ružínov, its nodal spaces, major amenities (culture house, the marketplace, sports facilities, etc.), brownfield sites, parks and residential zones in a regular geometric grid. The urban and green changes in Ružínov have been studied, in relation to the main nodes and the main pedestrian lines, as well as the potential for optimal intensification and transformation of the territory, through strengthening the identity of the housing estates by the involvement of the memorable locations such as lakes, marketplace, hospital or linear park of Andrej Hlinka. Such changes are shown in the case studies of Bratislava - Ružínov on its axis in the locality of the marketplace Miletičova, Papánkovo Square and industrial zone Pošne. The emphasis on pedestrian and public spaces, the vitality, and identity of urban areas, the strengthening of blue and green infrastructure and the ecological principles of residential courtyards are possible only in the context of a lively society of the housing estates, dialogue and implementation of transformations with residents and local governments.

1. Introduction
The growth of towns in the 20th and 21st centuries is typical especially for big cities and metropolises. Changing the lifestyle of the population also changes their demands on housing, work, availability of work, leisure and socio-cultural destinations in the city. Nowadays, the city is no longer graspable by foot and traffic, the digital dimension of work, transport, entertainment and communication has increased, urban life has moved into new technological possibilities, but man has moved away from real social contacts, the city and nature. He entered new social and environmental problems and demands. The consequences of climate change, energy and environmental issues have become determining requirements for urban areas. Despite this situation, the city remains a real spatial
structure, a place to observe public life. The interaction between "city life and public space" [1] leads to the recognition of the city’s space, which becomes a real meeting place, home and work place for its inhabitants, a place of free movement of citizens and visitors. The composition and hierarchy of the urban fabric derive from its historical core through the wider center, residential zones to peripheral locations, to suburban and rural-urban zones [2].

The compositional principles of the compact city of Bratislava continue to a wider center in the structures of city axes and city blocks, nodes, squares, embankments and parks. Through the expansion of the city, new structures emerged that crossed the boundaries of the wider center and its administrative delimitation. Bratislava became a large urban unit, marked by the socialist development of housing estates and production up to the periphery and rural suburban zones. The development lines of Bratislava have developed into three basic directions according to the geo-morphological characteristics of the city. The wider center expanded into the city-wide envelope of the agglomeration and continued into the radial-circular system. At this stage, urbanization was losing the city-forming principles of compact streets and squares, parks and city blocks. The city was dominated by cars and its new parts are pouring into development sites. After 1989, Bratislava was transformed under the influence of market economy and globalization [3] by the construction of shopping centers, administrative buildings, new housing, the verticalization of the center on the Danube embankment, strengthening of car traffic, the transformation of public spaces into road intersections and transformation of the areas of socialist mass housing estates [4]. Against extensive settlement expansion, new forms of concentration and greening of buildings are looked for. There is increasing interest in the sites of the wider center with environmentally disadvantaged areas, fragmentation of settlement structures, and weakened social cohesion. The potential brownfields are considerable [5]. The research focused on the transformation of housing estates and dilapidated zones in the wider center of Bratislava in the city district Ružinov, in relation to its main radial axis. The point is to find a town-forming, urban hierarchy and quality in this area. New urban quality should increase the vitality of the environment through mixed forms of built-up densities, vital public spaces, increase livability through traffic calming, pedestrian priority, the centrality of neighborhoods and inclusion of nature.

2. Context and transformations of the main urban radials
Like many European cities, which are characterized by urban radials and circuits, and by radial-circular systems of composition and operation of the city, Bratislava has established a radial-circular transport system, too. These systems, connected to the spatial net, are capable of growth and intensification, and their legibility helps to bring order and orientation to the urban organism in large cities. Paris, Berlin, Lyon, Vienna, Barcelona, Lisbon and many other cities benefit precisely from the main and secondary radials and their importance for the urban fabric and for the identity of their image.

One of the most important urban radials in Europe is the main Paris radial. This impressive development axis from the Louvre towards Défense was based on the city's main royal axis. It is in symbiosis with the natural axis, with the Seine River. To this day, it is the most important compositional axis and the pulsating radial of the city, in constant development. At the northwest intersection of this radial through the open object of Arch, it continues to infinity. This is where the Nanterre district of Paris is currently being formed, readable by new skyscrapers and a multifunctional sports arena. At the opposite, south-eastern end of the Paris axis and in the direction of its extension, a new zoo park is in contact with the Bois de Vincennes forest. This extended compositional link of the dominant axis gives the city readability, openness, spatial identification and clear visibility. In this way, the historical radial is continuously extended in both directions and is opened to new concepts.

The main avenue of the inner city of Berlin, the Unter den Linden boulevard with the Brandenburg Gate and the intersection of the two Spree River lines is also exceptional. From Brandenburg Gate, the
radial is extended by continuing across the large Zoo - Grosser Tiergarten to Berlin's Westend. The original street Unter den Linden was historically built from a 16th century horse path, later becoming the most famous and largest Berlin street. In the years 1934-35, most of the linden trees were decapitated and renewed planting was realized in the fifties of the 20th century.

Large city axes, their shape and spatial connections affect the generation of pedestrian movement and traffic to the site. The formation of the radial road and its associated urban space is the primary principle for the priority of pedestrians over heavy road transport [6]. Today's cities are transforming large axes into pedestrianized boulevards, opening up more space to pedestrian traffic, cyclists and green spaces.

3. Ružinov radial route in Bratislava

3.1. Urban preconditions of Ružinov radial route in Bratislava

We focused our research on the eastern development axis of Bratislava, Ružinov radial route, whose hierarchy and compositional syllabus is a prerequisite for understanding its place in the chaotic development of the city (Figure 1). Originally, on the place of the current Ružinov district, meadows, pastures, floodplains and groves were interspersed with islands and branches of the Danube. At the end of the 19th century, the agricultural character of the area gradually began to change to industrial. The eastern part of Bratislava was important particularly in terms of transport development – railway, later air transport and industrial production [7]. There was a cable factory, Apollo refinery, Dynamit Nobel, Cvernovka, Danubius and other factories. Since the mid-20th century, intensive housing construction began, which was concentrated in four residential areas.

![Figure 1. City part Bratislava – Ružinov, Ružinov radial route in the context of surrounding urban fabric of housing, public amenities, and industry (Archive of authors)](image)

The urban concept of Bratislava Ružinov was based on the free arrangement of buildings, using various heights, lots of greenery and playgrounds. However, public spaces are poorly articulated, they do not create a clearly differentiated hierarchical system and a clearly defined central public space. The residential structures were revived by local centers, with basic amenities, in integration with specific higher amenities, in each district of different priority function [8]. The traffic was concentrated on the edge of the housing groups and into the main traffic line - Ružinovská Street. This radial was created in the 1960s on the continuation of Miczkiewiczova and Záhradnícka streets and established the residential zones of Štrkovec, Ostredky, Trávniky and Pošeň. A new urbanization with typical geometrical arrangement around Ružinovská Street was established. From the compositional point of view, its advantage is its straightness – the line runs from the final tram stop with a view to the center, with the air axis directed to the Slavin memorial. The water surface of the Štrkovec lake and the Rohlík lake was created here by excavating gravel sand and created local recreational areas.
The changes after the 1989 revolution and the new era of construction of Bratislava from the 1990s up to now have only a minor impact on the urban complex of the Ružinov residential quarter. In the era of the last decades, the construction of smaller residential groups, new administrative offices, business units, companies, churches and sports complexes were completed, which added missing functions and accentuated spatially. The inhabitants of the Ružinov housing estates defend their territory against intensification for fear of losing a stabilized residential environment with plenty of greenery. This is why the current Ružinov radial route is an ideal model for transformation. It has the potential to be a generator of changes in urban and landscape quality, with the completion of parks, squares, with an emphasis on walking, cycling and greening the area.

3.2. Landscape planning preconditions of public greenery of Ružinov radial route in Bratislava

Greenery, in the wider context of the city, is increasingly associated with environmental protection, which in the urban environment differs considerably from the surrounding landscape. Increased built-up areas and polluted air increase the temperature in urban agglomerations. The "cold park effect" is beginning to be used, and it is recommended that more urban and linear green areas should be found in cities in the public environment, for example, large and small parks, accompanying greenery along with traffic and pedestrian roads, greenery along cycling routes, sports and play areas, greenery in car parks, residential greenery, water areas. Emphasis is beginning to be placed on increasing the area's retention potential and rainwater collection [8]. The aesthetic and socio-cultural functions of greenery in the context of the city's public spaces are also significant [9, 10].

The city district of Ružinov in contact with Ružinovská street is, in terms of the condition of vegetation elements, one of the areas with plenty of public greenery. Despite the large spatial areas of greenery, it does not use the potential provided by the territory. Green areas with increased planting of trees and shrubs are scattered throughout the premises. There is a lack of a clear concept that would define the functional use, the connectivity of the mosaic of green areas and their composition. The problem is the application of vegetation in the courtyards, on the premises of schools, kindergartens, on sports grounds and areas with leisure activities, where the greenery is not maintained. The current greenery is sufficiently represented in terms of quantity, but it no longer meets the requirements in terms of composition, hygiene, ecology, aesthetics, etc. Transformation of greenery requires to strengthen the line plantings along the Ružinov axis, addition and revitalization of greenery at junctions with traffic intersections, in parks and small parks, addition of green wedges of larger and smaller public areas of greenery. Revision and improvement must take place in the inter-residential green areas in the immediate vicinity of apartment buildings, school facilities, in relation to transport, recreational and sporting activities [8].

4. Methods

For the research of the Ružinov radial, the examined localities were selected from practice, on the initiative of the local municipality Bratislava - Ružinov. The research was verified in 3 focal points: Záhradnícka – Miletičova street, Tomášikova - Ružinovská street and Astronomic – Ružinovská street.

The following priorities were specified for the validation studies:
- to strengthen the compositional importance of the radial with the center of gravity for Ružinov and Bratislava to generate changes across squares, pedestrian lines with a parterre and vital greenery, parks, inner blocks,
- to achieve functional self-sufficiency of urban units (figure 2),
- add civic amenities, commercial poles, recreation and workplaces (figure 2, 5),
- lift the system of pedestrian knots and lines, enhance cycling (figure 2-5),
- to add new multifunctional and green structures to the dwelling units (figure 2).
5. Results
The comparison of case studies and synthesis of the evaluation of urban qualities resulted in the following requirements for further development:

- completion of the multifunctional character of urban radials,
- strengthening the centers of gravity, complementing civic amenities and pedestrian nodes and lines with high-quality greenery, shade and water features for a vital and safe urban environment,
- regulation and optimum densification of the existing residential structure,
- enhancing the functional diversity and self-sufficiency of mono-functional residential areas, complementing services, job opportunities and business opportunities with optimal spatial accessibility,
- improving housing by developing appropriate forms of multi-story and low-story housing, with a multifunctional parterre, community and rain gardens, green roofs and recreation,
- preserving and completing the greenery of parks and tree-rows linked to housing.

The development scenarios of the city district of Ružinov primarily focus on:

- strengthening of the main center of gravity, complementing Ružinovská street with civic amenities and multifunctional buildings, while preserving and completing the green boulevard,
- completion of the nodes of urban gravity, which are formed in the areas of the intersection of the composition axes of Ružinovská street with Bajkalská, Tomášikova street and at its eastern end, with a potential connection to Vrakunská road, supplemented by high-rise buildings or groupings, which should be supported by socially valuable public spaces and areas and elements of public greenery,
- cultivation of environment, creation of conditions for a pleasant, safe, rewarding and happy life for the citizens.

Figure 2. Revitalization of Ružinovská - Tomášikova street, adding new multifunctional structures to the city radial. Authors: P. Jackovič, M. Hrabovský, 2009 (Source: Archive of authors)
Figure 3. Revitalization of Mileticova - Zahradnicka axis, urban structure additions, strengthening of polyfunction and green axes. Authors: M. Lešková, L. Ladacsi, 2017 (Source: Archive of authors)

Figure 4. Revitalization of Mileticova - Zahradnicka axis, new market, enforcement of facilities, continuous system of greenery. Authors: M. Švec, M. Volná 2017, (Source: Archive of authors)

Figure 5. Revitalization of the axis in the position of the Ružinovská - Astronomical Street node, the concept of the new Poščen area and the Papánkovo Square, supplemented with the eastern closure of the axis, a reinforced system of greenery, walking routes and cyclists. Authors: A. Brna, S. Bertoková, 2017 (Source: Archive of authors)
6. Conclusions
The Ružinov radial with a new articulation of spaces and objects can become a driving force of the transformation of the city district and can act as a generator of priority for pedestrian, green and place-forming urbanization. It needs to complete the knots, strengthen the lines, the square, set up smart green solutions and complement the water regime with regard to climate change. Urbanization of empty spaces in terms of a hierarchy of lines and nodes, squares and parks, city blocks and additional spaces can bring higher quality to the original urban form of the housing estate and turn the territory into a vital quarter. A common four-lane traffic axis with tram lines can become a space with parterre alleys and cross connections in the spirit of “city friendly spaces”.

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References
[1] J. Gehl, and B. Svarre “How to Study Public Life” Island Press, pp. 12-13, 2013.
[2] A. Sedláková “Urbánny a suburbánny priestor – k otázke koncepcionalizácie prímestskej zóny - Urban and suburban space – towards the issue of conceptualisation of suburban zone” [Accessed 22. 06. 2019] Available at: http://www.akademickyrepozitar.sk/sk/repozitar/urbanny-a-suburbanny-priestor.pdf (in Slovak).
[3] L. Sýkora “Proměny prostorové struktury Prahy v kontextu postkomunistické transformace“ International Encyclopedia of Human Geography, vol. 8, Oxford: Elsevier, pp. 387–395, 2009.
[4] K. Kristiánová “Post-socialist transformations of green open spaces in large scale socialist housing estates in Slovakia“ In Procedia Engineering: World Multidisciplinary Civil Engineering – Architecture - Urban Planning Symposium 2016, WMCAUS 2016, Prague, Czech Republic 13. - 17. 6. 2016. Vol. 161, pp. 1863-1867, 2016.
[5] S. Bašová, and A. Sopirová “New nodal Spaces in Degraded Territories of the City,” M. Pefínková, S. Jüttnerová, L. Videcká Architecture in Perspective 2019. Ostrava: VŠB - TU Ostrava, pp. 160-165, 2019.
[6] A. P. Barros, L. M. Martínez, and J. M. Viegas “How urban form promotes walkability?” Transportation research procedia, Elsevier, pp. 138-140, 2017.
[7] A. Sopirová “Územný plán ako nástroj rozvoja mestskej časti Ružinov“ Bratislava MČ Ružinov - Location Pošenov Nové centrum. 1st edition. Bratislava: SPEKTRUM STU, 2018, ISBN 978-80-227-4810-0), pp.14-19, 2018 (in Slovak).
[8] K. Gécová “Zeleň v mestskej časti Ružinov“ Bratislava MČ Ružinov, Lokalita Pošen Nové centrum, Vydavateľstvo Bratislava: Spektrum STU, pp. 26-27, 2018 (in Slovak).
[9] K. Kristiánová, and D. Marcinková, “Aesthetic functions of urban greenery in the context of development of cities in Slovakia,” TEKA vol. 47, pp. 175-182, 2019.
[10] A. Jaszczak, and K. Kristiánová “Social and cultural role of greenery in development of cittaslow towns” IOP Conference Series: Materials Science and Engineering, vol. 603, art. no. 032028, 2019, doi:10.1088/1757-899X/603/3/032028.