Search for the Synthesis of Cultural Heritage and Modern Architecture in Multi-Storey Residential Areas: Example of Jelgava / Mitau

Aija Ziemeņiece¹, Una Īle¹
¹Latvia University of Life Sciences and Technologies, Rīgas iela 22, Valdekas pils, Jelgava, LV-3002, Latvia
una.ile@llu.lv

Abstract. Jelgava (Mitau), the former capital of the Duchy of Courland and the Russian province, was a flourishing town until WWII and post-war period when it experienced enormous devastation. Before WWII the town embodied a strong influence of German cultural environment in architecture, art and science, which was wiped out by the Soviet totalitarian regime in 1940. It is possible to conclude that after the turn of the 21st century Jelgava has taken rapid steps towards modernism in urban development. It is due to the prospective development of new multi-storey residential areas and solutions that can be integrated in the city of Jelgava from the experience and practice of the Nordic region. The build-up areas of the city are surrounded by several small rivers. This ecological factor could be used for the formation of large blue-green recreational areas, which is a high-quality indicator for the creation of multi-storey residential areas in the future. The research explores and analyzes the synthesis of nature, cultural heritage and modernism development tendencies in the 21st century.

1. Introduction
The research focuses on the search of synthesis of the urban environment in the city of Jelgava based on exploration of the current situation, cultural and historical heritage and the experience of the Nordic countries, their solutions in residential areas. With the rapid growth of residential building, demand and desire for safer, higher quality, healthier and more sustainable living spaces which create proportions and structures comfortable for people in the urban environment have increased [1]. In order to evaluate architectural forms in modern residential areas, it is necessary to perform the analysis of the architectural-spatial structure, get acquainted with the basic principles of sustainable development and the context of landscape space in contemporary residential areas. Urban development in the 21st century is a hallmark of developing countries. Around 90% of the world’s urban development takes place in the cities of developing countries. Urban building development is expected to triple between 2000 and 2030 [2; 3]. Economic development and innovation in all regions promoted growth in the structure of the urban environment, but simultaneously created and developed environmental, socio-economic problems and climate change along with a rapid increase in pollution [4; 5]. The structure as a concept is a system of discrete element relations determined by the rules of unity, transformation and self-regulation having a relative stability over time. But the unity is the subordination of the parts to the whole. Transformation is an organized interconnection of separate structures and a visual transition from one to another, but the stability of self-regulation of internal relations within one structure. Thus, if the relations of the structural elements are balanced, then a corresponding degree of space and structural unity is formed. One of the
types of relationships is the scale relevance between structural elements and spatial elements, which form basic units of the spatial scale that are organically related to the urban environment. As a result, the relationship becomes indifferent because the defined structure forms a new quality as a complex dynamic structure that develops with a diverse nature and is influenced by various factors over time [6; 7]. Architectural spatial structure techniques in scientific literature are described as a combination of different systems that acquire specific features in areas of residential buildings. Any form of an architectural spatial structure is neither conceptually nor spatially separable from the respective part of urban environment or landscape. Urban environment or a part of it is compared with the surrounding landscape quite unconsciously from the point of view of visual aesthetic evaluation. It is possible to organically integrate any urban structure into a specific urban landscape space, thus transforming it together with a new spatial structure and obtaining a much higher degree of harmony. Thus, both spatial structures, their equivalent components and aspects are able to create a common feeling providing and developing urban areas of high quality. The analysis shows that new residential building have been developing according to the above mentioned principle in Sweden, Denmark and Finland. It is often difficult or even impossible to draw a line between these two types of visual information in the process of perceiving complex spatial structures. Using a conditional division, a person creates a model of the perception according to the laws and approaches of an organic world. The frame or skeleton and its defined function is semantic information, but the outer layer with its unique form is visually aesthetic information. A spatial structure plan is characterized by the organization of spatial environment of residential buildings with the location and mutual interaction of centres of services, transport infrastructure, utilities, green structures and other zones. The findings reveal that any architectural spatial structure in the urban environment, regardless of whether it is a separate building, a group of buildings or architectural spatial ensemble, has a surrounding spatial landscape which is visually connected in an indivisible unit, which is evidenced by both real perception and diverse design practice [8; 9; 10]. That is why the emergence of multifunctional outdoor space in residential areas has become a topical trend in recent years highlighted by the development of excessive office functions creating the demand for new offices and commercial premises, increased traffic problems due to limited land plots. In recent decades, there has been a need to use the premises for 24 hours a day in order to be able to provide and perform various functions [11]. Based on the scientific literature, it can be concluded that architectural spatial structures in urban environment determine and influence many important functions, which are related and used according to different principles. Today structured planning is promoted through the use and integration of both multifunctional vertical and horizontal building types in projects, and interconnection between pedestrian areas and multifunctional outdoor spaces is actively developed thus ensuring convenient and safe movement in the urban environment. The multifunctional use of residential areas marks a new development strategy, which, having overcome various obstacles, has and will have an important role in the development of urban environment by consequently creating and providing both high-quality architectural spatial solutions and multifunctional outdoor spaces and taking into account modern design approaches and sustainability principles. Sustainable development planning must include the improvement of green structures in residential areas, but, more importantly, overall tasks of sustainable development should be defined for the development of outdoor space. In residential areas all tasks are aimed at balanced economic development, social system, environmental impact and rational use of resources. Consequently, sustainable development planning in residential areas is a complex and multifaceted set of measures that forms the basis for rational and responsible development, equally promoting long-term economic growth. For example, the Swedish city of Malmö has implemented the programme of sustainable development in residential areas for 20 years. A variety of activities that ensure and develop sustainable, modern multifunctional outdoor space have been implemented continuously in Malmö. Designs of modern architecture were used in residential quarters, greenery corresponding to urban conditions was created and arranged as a part of a blue-green network (Figure 1 and 2). At the same time Malmö urban planners work on concepts of comfortable walking and cycling routes in neighborhoods, recycling of bio-waste into biogas for public transport, use of the wind
energy, use of organic farm products for schools. Relevant institutions in Malmö promote and educate society about the basic principles of sustainable development planning.

Figure 1. Residential area Bo01, in Malmö [author’s photo, 2018]

Figure 2. Storm drain solutions Bo01, in Malmö [author’s photo, 2018]

Figure 3. Residential area Hammarby Sjöstad, in Stockholm [author’s photo, 2018]

Figure 4. The pedestrian bridge Hammarby Sjöstad, in Stockholm [author’s photo, 2018]

Another example in Sweden of using basic principles of sustainable development planning is a residential area Hammarby Sjöstad in the south of Stockholm. The rational development of a residential area has improved the quality of living space in Sweden, including preservation of water resources, the recycling of waste, the reduction of using hazardous materials in construction, and the use and integration of renewable energy sources into infrastructure solutions. Hammarby Sjöstad (Fig. 3, 4) area is a model for the implementation of sustainable methods in the context of the urban environment [12].

2. Materials and Methods
The aim of the research is to evaluate the transformation processes in Jelgava city-building and modernist approach to contemporary multi-storey residential building areas in the last century. The objectives of the research is to explore: architectural stylistic features of Jelgava historic buildings from the 80s of the 19th century; trends of socialistic realism in buildings of the 50s of the 20th century; standard projects of reinforced concrete large panel buildings (the zone of historic buildings) built in the 70s-80s of the 20th century; trends in free-plan multi-storey residential buildings at the turn of the 21st century. The research method is a comparative method: a comparison of changes in density,
height and silhouette in city-building was conducted on the basis of the visual analysis of historic building materials.

3. Results and Discussions

The aspects of flexibility and variability provide an opportunity to change the quality of living space during its existence in accordance with the new requirements. These aspects can be used when designing urban areas for current and future needs of residents. Residential areas should be functionally convenient and they should be able to provide high quality infrastructure and interconnections, such as public transport stops, shopping zones, parks, educational institutions, retail outlets within 5 km radius. Currently, in the context of intensive urban development, in order to create a rationally comfortable and functional residential neighborhood, the aspect of spatial concentration based on a compact distribution of population in the urban environment should be taken into account [13]. The authors found out that institutions engaged in urban research develop and operate with different approaches, therefore one of the current issues is the development of the right methods and the search for rational techniques to create a comfortable urban environment. The compact distribution of residents marks the development of a new trend creating mixed-use centers in the urban environment meant to improve the quality of living space [14; 15; 16].

Jelgava, the former capital of the Duchy of Courland and the Russian province, was vividly characterized by a strong German environment, which made a financially important contribution to the city's economic prosperity. The last 200 years of the city’s urban building development may be divided into 4 time periods: wooden buildings up to the first half of the 19th century; masonry buildings up to the 40s of the 20th century; buildings of standard projects (reinforced concrete large panel buildings) from the 50-80ties of the 20th century; trends in the construction of free-plan multi-story residential buildings at the turn 21st century. Construction of multi-story residential buildings in Jelgava started in the 80s-90s of the 19th century with the first build-to-rent houses of apartments in Akadēmija street (former Alexander Boulevard) and Katoli street. The construction started to develop rapidly at the beginning of the 19th century after the demolition of a medieval rampart. Wooden buildings were gradually replaced by masonry buildings starting from the 80s-90s of the 19th century. It was caused by rich clay mining sites upstream of the river Lielupe and with the formation of brick kilns. Even today, small ponds along both banks of the Lielupe have remained as witnesses of former clay deposits.

In the 90s of the 19th century countless boats with brick went down the Lielupe to be used in building of new Art Nouveau buildings in Riga. Build-to-rent apartment houses which had 3 – 5 floors were built very fast also in Jelgava. In the 30s of the 20th century Jelgava was proud of densely built housing areas in Alexander Boulevard, Katoli street, Pasts street, Svēte street, Pils street, etc. The rapid boom in urban development stopped and its architectural and artistic values disappeared at the end of WWII during the Russian military aviation airstrikes on the city in 1944. Only walls of some residential houses as the fingers of some giant stood against the sky along the streets of Akadēmija, Pasts, Katoli, Svēte, Uzvara, Dobele. In the 50s-60s of the 20th century new buildings with different concept of the urban planning scale appeared next to the undamaged historic houses, emphasizing the political greatness of that time. Empty places along the streets were filled with schools, a hospital, two-story office buildings. The post-war construction did not take into account the historically determined building line and new buildings were placed at a larger distance from the street. It was based on a constructive considerations. Due to economic collapse after the war, ruins were dismantled and removed, but the foundations of houses which had been made of giant granite blocks were left in the ground and levelled, then covered with black earth or soil ready for planting trees and shrubs. In this way, visually orderly urban environment was quickly restored and places of former buildings burned during the war were hidden. Planting materials were obtained by digging tree seedlings at the forest edges. The new buildings were built at a larger distance from streets or the old (buried) foundations, moving buildings into the areas of the former courtyards. Thus gradually historical building line was replaced by green wedge-shaped areas. The study compares historical building areas and contemporary multi-storey residential building areas of former Alexander Boulevard as a vivid example. In the given scheme (Figure 5) the areal photo from the 30s
of the 20th century was used to mark the places of vanished buildings, where either green areas or large areas with hard coating have been formed. Historical photo fixation was used for the application of the comparative method. In addition, photographic material was used to characterize the historic buildings.

**Figure 5.** The vanished built-up areas today with historic building line in Akadēmija street/Zemgale Boulevard.

The vanished sections of build-up areas:
1. Lielā street – Academia Petrina; 2. St. Simeon and St. Ann Orthodox Cathedral – S. Edzus street; 3. Vaļņi street – Jānis street. The east side of Akadēmija street / Zemgale Boulevard: 4. The building of a bank – Akadēmija street 7; 5. Ķūdens street – Vaļņi street; 6. Vaļņu street – Zemgale Boulevard 7; 7. Sport street – the station.

**Figure 6.** Ķūdens street (30s of 20th cent.). The view from the tower of Academia Petrina. At the end of the street – a synagogue with the garden (now: LLU Faculty of Engineering). At the right edge of the picture – an inside yard with the garden (now: the place of LLU Forest Faculty). The buildings were burnt down in the summer of 1944 [Jelgava History and Art Museum]

**Figure 7.** Ķūdens street (2010). The view from the tower of Academia Petrina. In the centre: the building of Forest Faculty in the 50s of 20th cent., the former place of a yard [author’s photo, 2020]

**Figure 8.** 30s of 20th cent., the deviation from historic building line. Akadēmijas street 19 [author’s photo, 2020]

The former Alexander Boulevard has acquired two street names: the north part is Akadēmija street, but the south part is Zemgale Boulevard. The line that divides the street into these two parts is Vaļņi street which creates a sharp turning point highlighted by two apartment houses: one’s address is Akadēmija street 28 and it has a vertical Art Nouveau style (the beginning of the 20th century), and another one is located in Zemgale Boulevard 2 with eclectic features (the 80s-90s of the 19th century). The above-mentioned street was the first 19th century street in Jelgava where multi-storeyed apartment buildings were started to build creating a wide boulevard pattern with linden alleys on both sides of the street. Alexander Boulevard was intended as the main traffic line between the city center (the Market square) and the new railway station. In the post-war period the previous buildings were partially preserved, creating a peculiar canvas character of an urban space, the integrity of which was suppressed by a chaotic height of the tree crowns and the post-war zig-zag pattern of buildings along the historic building line of the street. The first impression is that the street is very green due to hidden vanished
building sites that are sometimes even 60-80 m long. The gap at the apartment house in Akadēmija street 27 is a clear indication of it. Uninterrupted compositional form of a continuous build-up has been lost near the apartment building in Akadēmija street 7 and across the street forming a strange wedge-shaped zone in the city center. The areas are repeated after 30 m distance in Akadēmija street 10 (the area around the monument to G.Elias) and Akadēmija street 1 (the area around the monument to J. Čakste). Thus compositionally and functionally awkward and unbalanced character of street planning has been formed here. Tendencies of socialist realism in the 50s of the 20th century added several houses of a public character to the street in Akadēmija street 25, Zemgale Boulevard 3, 11, 4, 8. They are built nearby or opposite historic buildings at the end of the 19th / beginning of 20th centuries [17; 18; 19; 20], Figure 6-21.

Furthermore, typical silicate brick and prefabricated reinforced concrete panel apartment buildings typical of the style of the 70s of the 20th century surround the historic buildings from the side of courtyards. As mentioned above, this is an area that does not have old foundations. Then 20-30 years after the war in the place of the destroyed buildings green areas have developed in the 60s-70s of the 20th century The new buildings were built with an apparent depiction of socialism victory in the nature of build-up: a nine-story university building in prefabricated reinforced concrete structure, implementation of a five-story standard school project adapted to the needs of the university, two-story court building according to the tendencies of socialist realism, four-story hospital building opposite the
former cemetery area. The old city cemetery was levelled after the war and turned into a park with a monument to the fallen Russian soldiers.

Figure 13. Apartment house with shops in Akadēmija street 22. Beginning of the 20th (photo, 80s of 20th cent.) [Jelgava History and Art Museum]

Figure 14. The approach of Akadēmijas iela 22 to S.Edžus street. The vanished house along the building line, giant tree crowns shadow historic buildings [author’s photo, 2020]

Figure 15. Linden alley in Zemgale Blvd, 3,5. [author’s photo, 2020]

Figure 16. Zemgale Blvd. 7, 9 on the left side (former Aleksander Blvd.). The 80s of 19th cent. – the vanished apartment house on the right side [Jelgava History and Art Museum]

Figure 17. Apartment house in Zemgale Blvd.5. The apartment house in the distance, Zemgale Blvd. 9 [author’s photo, 2020]

Figure 18. Apartment house in Zemgale Boulevard 5. The beginning of the 20th cent. [author’s photo, 2020]

Figure 19. The vanished apartment house at Akadēmijas street 27. The vanished building was replaced by a wedge-shaped green area [author’s photo, 2020]
Figure 20. The church is hidden in the buildings of 70s of 20th cent. The view at St. John’s church at Zemgale Blvd. 5 [author’s photo, 2020]
Figure 21. Apartment house in Pasta street (90s of 19th cent.) among standard residential houses [author’s photo, 2020]

The west side of Zemgale Boulevard in the zone of the railway station has preserved its historic green territory or the former cemetery until Jānis street. As regards Jānis street itself, old buildings were destroyed. A commercial building made of monolithic reinforced concrete was built instead, but its massive silhouette hides the bell tower and the altar of St. John's Church. Furthermore, the northern side of the church is shadowed by five-story residential buildings, their the scale even more squeeze the historical scope of the church. The 27 m high spire of the church has lost its dominant character from several viewpoints. This was a political position of the country which strongly violated cultural and historical values (Figure 20). A giant club building was built right next to the south side in the style of socialist realism. Stylistically different multi-story residential area was formed next to the historic build-to-rent apartment houses. The nature of spatial composition of Akadēmija street – Zemgale Boulevard preserves several layers of architectural styles in houses built in the time period from the 80s of the 19th century to the 21st century: the 30s of the 18th century – baroque tendencies (Academia Petrina in Akadēmijas street 10, St. Simeon and St. Ann Orthodox Cathedral on the corner of Akadēmijas – Raiņa streets); the end of the 19th / beginning of 20th century – Art Nouveau style apartment houses and eclectic trends; 30s–40s of the 20th century – functionalism; 50s of the 20th century – socialist realism; 70s of the 20th century – postmodernism architecture [20; 21; 22].

4. Conclusions
At the end of the 19th century Akadēmija street / Zemgale Boulevard was the first street where eclectic and Art Nouveau buildings appeared. Also after the war, in the 50ties of the 20th century, after the removal of the ruins, this street was the first to witness rapid construction of a new residential and public buildings with distinct features of socialist realism features.

The changeable and flexible structure of a living space offers an attractive and diverse combination of functions that can be linked in various ways to multifunctional, point-focused units, i.e., shopping centers, multifunctional complexes. Satisfying residents’ needs and desires refers to a wide range of factors that must be equally taken into account and included in any living space design. The creation of mixed-use centers with a proportional interconnection of the necessary amount of residential buildings, multifunctional outdoor spaces, workplaces, and public spaces forms a comfortable, pleasant living space for a larger amount of users and residents. Therefore, the design of residential buildings should be considered as a multifunctional unit, which consists of interconnected architectural spatial volumes and elements creating a high-quality cultural and social environment providing for the needs of each individual and the accepted standards in society that reveal and highlight lifestyles. Architects, urban planners, landscape architects have to be able to transform the needs and resources of society and individuals into physical solutions: in the forms of buildings, landscapes and cities that serve and express the ideals of a particular period.
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