Structural and Spatial Characteristics of Panel Housing Estates in Brno

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Abstract

S Approximately a quarter of the Czech population lives in panel housing estates. Despite such a large residential structure, some data are difficult to trace. The article focuses mainly on panel housing estates in Brno. It aims to make the available data (Czech Statistical Office, cadastre, vector data, etc.) more transparent, even in graphical maps. The panel housing estates Kohoutovice, Lesná, Starý and Nový Lískovec, Vinohrady, and Komárov are described. The selection was based on the maximum possible variety of urban structures and constellations. The main topic of the text is the structural systems of Brno's panel housing estates (Series G, T0xB, VVÚ-ETA, B70, OP, etc.), and their impact on the form of public space is examined. Among other things, the ratio of built-up and unbuilt-up areas, the percentage of transport, greenery, and the representation of public amenities within a particular panel housing estate were investigated. It also describes the possibilities of adaptation of a specific structural system and the extent of current reconstructions in a given panel housing estate. On the scale of an apartment (layout changes), an apartment building (extensions, additions), and the whole housing estate (adaptation to increased traffic load, etc.). The most widely observed reconstruction element is the addition of higher floors, mainly in Brno-Kohoutovice. The ownership structure is also described as houses and public spaces, where the owner can be either a private owner (residents of the house, co-owners, or investors) or public ownership (the city or municipality). Among the analyzed housing estates, it is possible to observe the representation of land owned by the city of Brno. A trend abroad and slowly in the Czech Republic is the comprehensive revitalization of panel housing estates in terms of buildings and public space. Data can indicate the potential development of panel housing estates and the future usability of individual structural systems.

Keywords: *Structural Systems, Panel Housing Estates, Urban Structures and Constellations, Brno*

1. Introduction - Structural Systems of Brno Panel Housing Estates

According to the latest census of population, houses and flats of the Czech Statistical Office (2021), there are 209,587 flats in Brno, of which 163,438 are in apartment buildings and more than a third of all flats are prefabricated (1). Due to such a large urban structure, these are units that have a major impact on the majority population. From this perspective, the data collected within these structures have the potential to be used in a wide range of urban, sociological, economic and environmental analyses. This information can serve as a basis for urban development planning, housing quality assessment, study of social and economic trends or for strategic decision-making in the field of infrastructure and environment. Among other things, they can be decisive in the potential development or revitalisation of existing housing stock.

Despite the extensive range of possible uses, some data are difficult to track. The aim of the text is therefore to clarify the available data on prefabricated housing estates on the example of the city of Brno, specifically the used construction systems and spatial characteristics, which are also graphically displayed in the schwartzplan of the city of Brno for selected housing estates.

The structural systems are the central theme of the text. The individual sources do not agree on the specific number of construction systems within the Czech Republic, this is due to the gradual development of the individual types and the allocation of regional variants of some systems. Within Brno, for example, the B60 system is unique, conceptually based on the original design of the G57 house. However, the following systems are mostly represented in Brno:

G40, G57, G58, G59 T01B, T02B, T03B, T06B, T08B, VVÚ-ETA, B70, OP) (2) and a few experimental structures. The table below shows a comparison of the individual settlements.

Tab. 1. Brno housing estates - predominant structural systems and current capacity of apartments.

The name of the housing estate	Prevailing structural system	Year of construction	Current capacity of panel apartments
Fučíkova čtvrť	B60 (regional variant G57)	1960 - 1963	446
Staré Brno - sever	B60 (regional variant G57)	1961 - 1963	220
Staré Brno-jih	B60 (regional variant G57), T08B	1962 - 1965	1410
Černá Pole	B60 (regional variant G57)	1962 – 1965	1258
Lesná	B60 (regional variant G57), T06B	1962 – 1970	5466
Žabovřesky	T06B	1966 – 1972	3777
Královo Pole	T06B	1968 - 1975	2202
Komín	T06B, B70	1969 - 1975	2110
Kohoutovice	T06B	1970 - 1981	4640

Tab. 1. Brno housing estates - predominant structural systems and current capacity of apartments.

The name of the housing estate	Prevailing structural system	Year of construction	Current capacity of panel apartments
Řečkovice	T06B	1970 - 1977	2055
Jundorv	T06B	1970 - 1974	846
Bystrc	T06B, B70	1971 – 1984	3607
Bohunice	T06B, B70	1972 – 1983	6020
Starý Lískovec	B70	1972 - 1981	3377
Jabloňová	T06B	1974 - 1976	296
Stará osada	T06B	1973 - 1979	688
Slatina	T06B	1977 - 1980	1588
Lišeň	B70	1975 - 1985	6998
Nový Lískovec	T06B, B70	1980 – 1995	3932
Vinohrady	B70	1981 – 1989	5295
Bystrc	T06B, B70	1984 – 1991	5809
Komárov	T06B	1985 - 1987	1056

The largest housing estate in Brno in terms of the number of flats is the Lišň housing estate with a capacity of 6,998 flats (6), where the number of inhabitants as of 1 January 2020 is 26,687, of which 12,057 men and 13,250 women + 1,380 foreigners with permanent residence (806 men, 574 women) (7). However, the original planned capita was twice as high and was expected to accommodate about 60,000 people.

1.1 Selected housing estates and a more detailed qualitative description of their structural systems and main compositional principles

The selection was made based on the maximum possible variety of urban structure and constellation systems - the settlements Kohoutovice, Lesná, Starý and Nový Lískovec, Vinohrady and Komárov are described. The individual construction systems are shown on the maps.

The ownership structure is also described as houses and public spaces, where the owner can be either a private owner (residents, co-owners, or investors) or public ownership (the city or the municipal district). The maps below show public ownership - land and buildings owned by the City of Brno (excluding share ownership).

Housing estate Lesná

Urban planners/architects: František Zounsek, Viktor Rudiš, Miroslav Dufek, Ladislav Volák (Stavoprojekt) (9)

The composition of the urban structure is situated on gentle southern slopes. The park landscaping "Čertova Rokle" has supplemented the housing estate, which functions as a pedestrian road and an element connecting almost all adjacent streets. A ring road serves the traffic, creating a large, quiet pedestrian zone. A complementary network of streets serves individual houses.

The population of Lesná is characterized by a higher proportion of older residents (60+), single-person households, and higher levels of education (8).

The amenities within the prefabricated low-rise buildings with concealed openings in the 6 x 7.2m module (3). The area[1] of the Lesná housing estate is approximately 1.539 km^2 - of which the area built up with houses is 0.153 km^2 - i.e. 9.9% of the area is built up with buildings (figure 1).

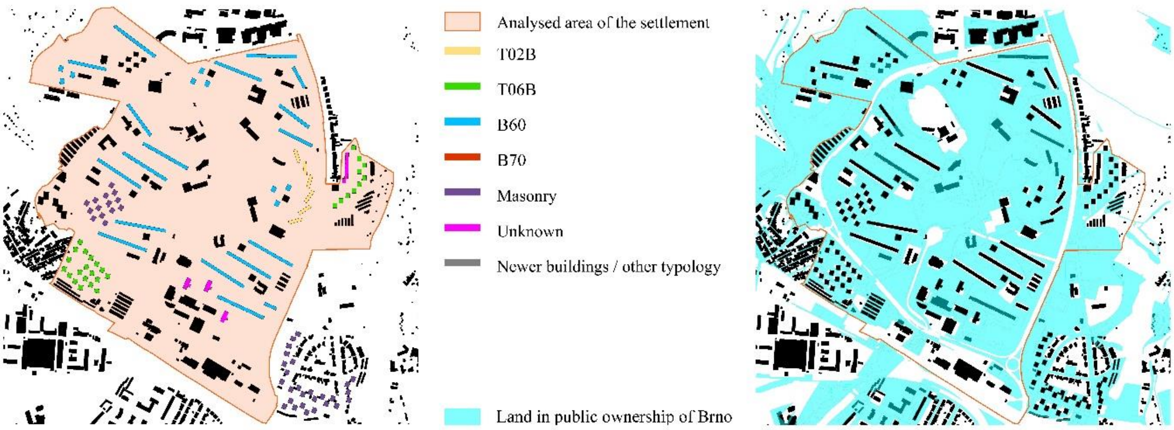

Fig. 1. Structural systems of the Lesná housing estate and property of the City of Brno

Housing estate Kohoutovice

Urban planners/architects: František Kočí, Jaroslav Černý, Jaromír Kurfürst (9)

The housing estate is built mainly around the backbone road "Libušina třída", which bypasses the original development. The houses are always in the T06B construction system , ranging from 5 to 13 stories. The civic amenities are situated in the lower part

[1] Settlement area defined by the boundary of the "basic settlement units" (determined by the ČSÚ) or, in the case of larger undeveloped plots, a maximum of 100m from the boundary of the last house

of the development (an exception is the sightseeing restaurant - Grand Prix).

The area of the Kohoutovice housing estate is approximately 1.102 km^2 - of which the area built up with houses is 0.09 km^2 - i.e., 8.2% of the area is built up with buildings (figure 2).

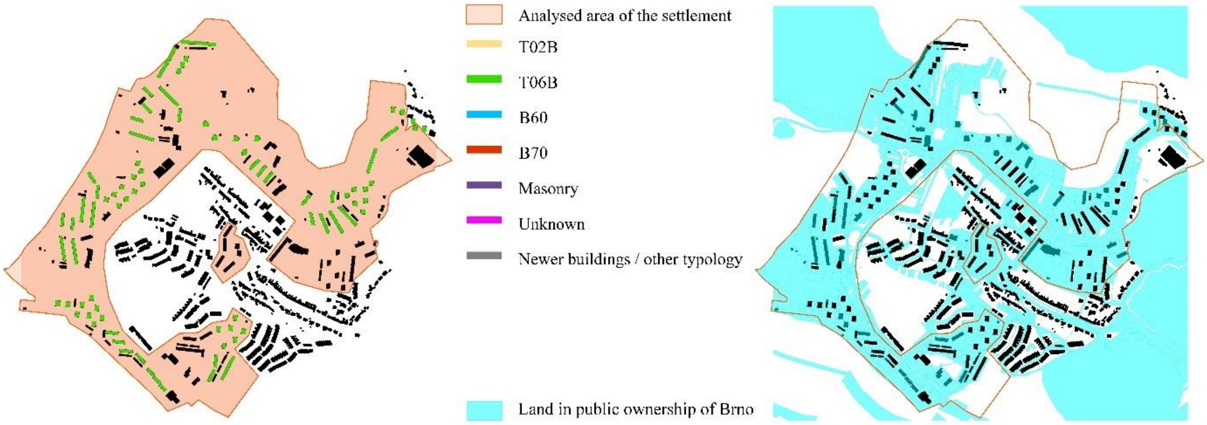

Fig. 2. Structural systems of the Kohoutovice housing estate and property of the City of Brno.

Housing estate Starý Lískovec

Urban planners/architects:: Jaroslav Ryška, Pavel Krchňák, Mečislav Borecký, Antonín Mikulec, Jaroslav Pípa, Ladislav Volák, Roman Zajíc (9)

Starý Lískovec has a connection to the nearby housing estate in Bohunice. In history, these housing estates even had a common name "Sídliště československého-sovětského přátelství". (3)

The settlement is located between very busy sections of roads (D1 motorway and Bítešská expressway), but these roads do not serve the settlement. A network of streets serves it, along with the main road in Jemelkova.

The area of the Starý Lískovec housing estate is approximately 0.924 km^2 - of which the area built up with houses is 0.089 km^2 - i.e., 9.6% of the area is built up with buildings (figure 3).

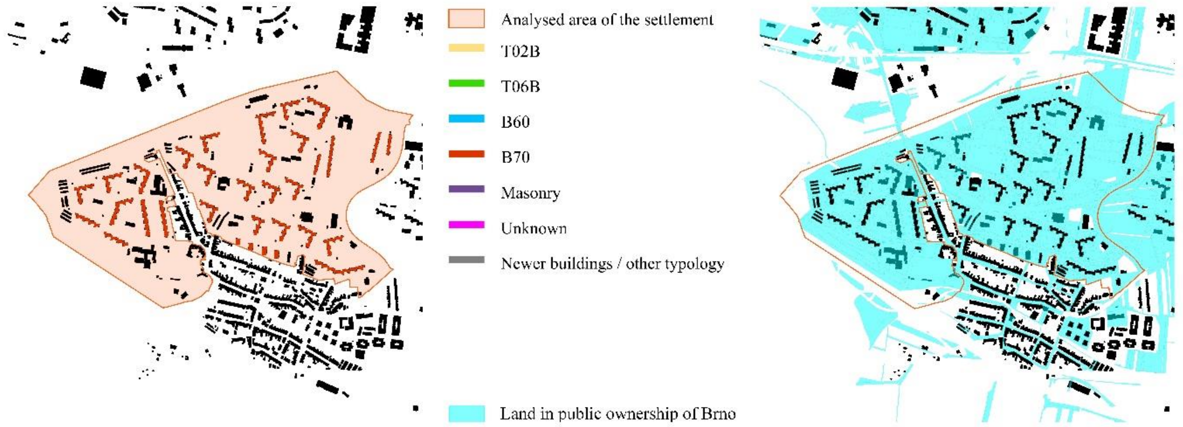

Fig. 3. Structural systems of the Starý Lískovec housing estate and property of the City of Brno.

Housing estate Nový Lískovec

Urban planners/architects:: František Kočí, Miroslav Kolofík (9)

The estate is divided by a four-lane road lined predominantly with B70 houses (4 and 8 stories) supplemented by T06B spot houses (also 4 to 8 stories). This is the backbone road from which the other areas of the estate are subsequently served.

Characteristic of the population of Nový Lískovec is a larger number of people in the youngest age group (up to 29 years) and at the same time in the age group 45 - 59. At the same time, a higher proportion of families with children is observed. The part of Nový Lískovec called "Kamenný Vrch" is characterized by a higher proportion of cooperative flats than other parts of the town. (5)
The area of the Nový Lískovec housing estate is approximately 0.631 km^2 - of which the area built up with houses is 0.070 km^2 - i.e., 11.1% of the area is built with buildings (figure 4).

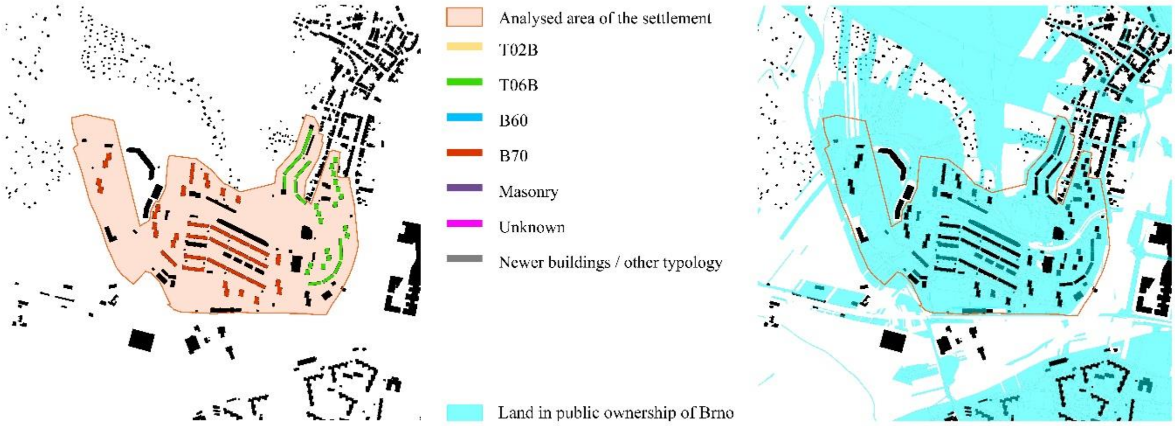

Fig. 4. Structural systems of the Nový Lískovec housing estate and property of the City of Brno.

Housing estate Vinohrady

Urban planners/architects:: Miroslav Dufek, Aleš Jenček, Jan Doležal, Pavel Plšek, Vítězslav Vaněk (9)

The population of Vinohrady has a higher proportion of people in the youngest age group (up to 29 years old) and a higher number of multi-person households (more than three persons in an apartment) (8) Within the so-called "basic settlement units" defined by the CSU, Vinohrady with its 12,836 inhabitants is the largest settlement unit (1).

The form of Vinohrady is, to some extent, determined by the collectors - it is an orthogonal grid of streets, following the example of Lesná, where a ring road supplements the settlement. The area of the Vinohrady housing estate is approximately 0.717 km^2 - of which the area built up with houses is 0.106 km^2 - i.e., 14.8% of the area is built up with buildings, which is the most densely built-up of all the estates studied (figure 5).

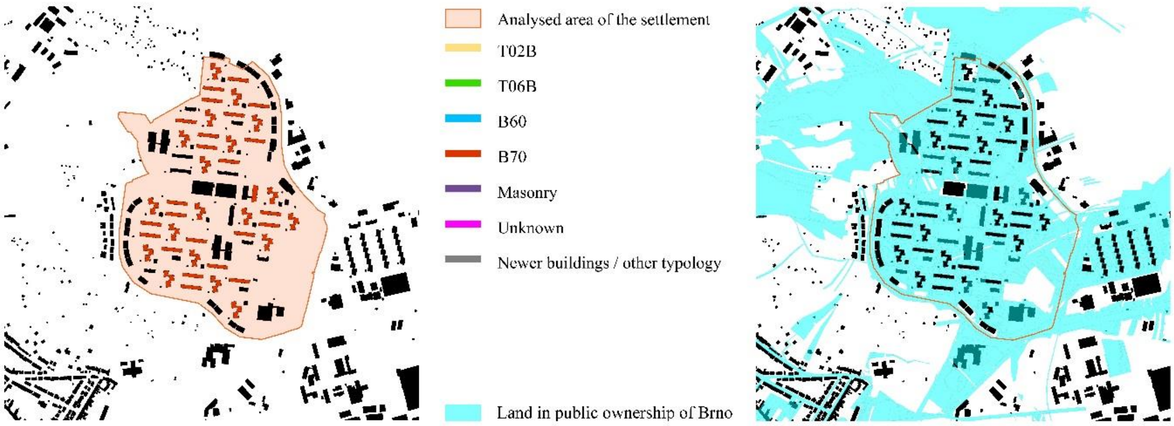

Fig. 5. Structural systems of the Vinohrady housing estate and property of the City of Brno.

Housing estate Komárov

Urban planners/architects: Jana Lakomá (9)

The Komárov development is one of the last prefabricated buildings in Brno. The estate was built on the land of the original development of low-rise houses in an unusual layout. See the maps below. The complex consists of only one type of house - an eight-story slab panel house T06B. The public space is arranged in semi-enclosed squares.

There is little traffic within the estate. However the development is close to a busy road and industrial estates, which brings higher noise and smog pollution.

The population of Komárov is more than 80% adults (15 to 64 years old), which is above average both among the settlements and within the statistical regions of Brno. The majority of residents (74%) live in rental housing.

The area of the Komárov housing estate is approximately 0.135 km^2 - of which the area built up with houses is 0.011 km^2 - i.e., 8.1% of the area is built up with buildings. At the same time, however, it should be added that this settlement has a tiny area and is not a suitable example for comparing housing density with others (figure 6).

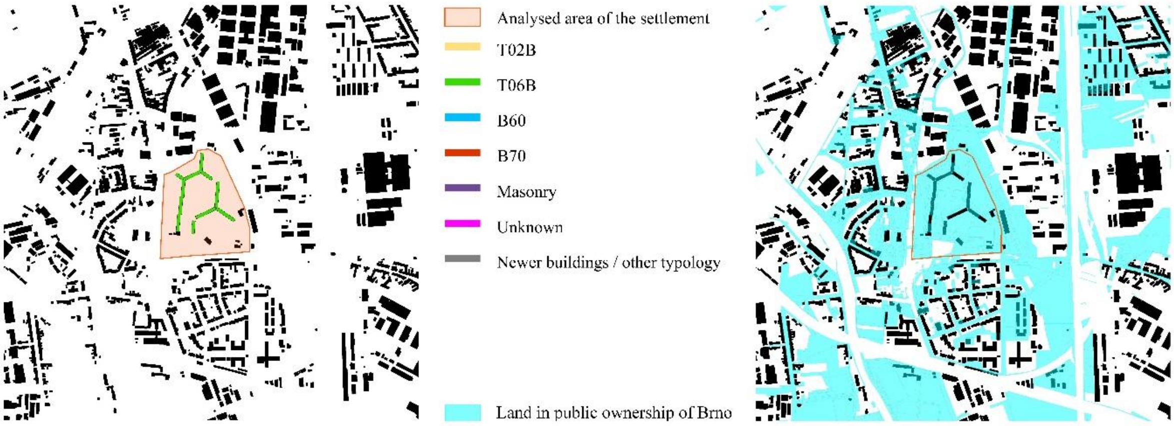

Fig. 6. Structural systems of the Komárov housing estate and property of the City of Brno.

2. Possibilities of Adaptation of a Specific Structural System and the Whole Housing Estate

The possibilities of adaptation of the specific structural system (4) and the extent of the current conversions are also evaluated. On the scale of the apartment (layout changes), the apartment building (extensions, additions), and the whole housing estate (adaptation to increased traffic load, etc.).

The reconstruction of an apartment is an individual matter of the owner, and it is complicated data to access, it is possible to find incomplete information about partial reconstructions, but it is not possible to generalise to the whole estate. However, one of the most important points of reconstruction is the potential changes in the layout and positioning of the load-bearing walls, which greatly affects the house's structural system. Within the compared housing estates, mainly structural systems of the type T02B, T06B, B60 and B70 were represented - an example of an adaptation of an apartment can be, e.g., the modification of the layout of flats of the structural system T06B below.

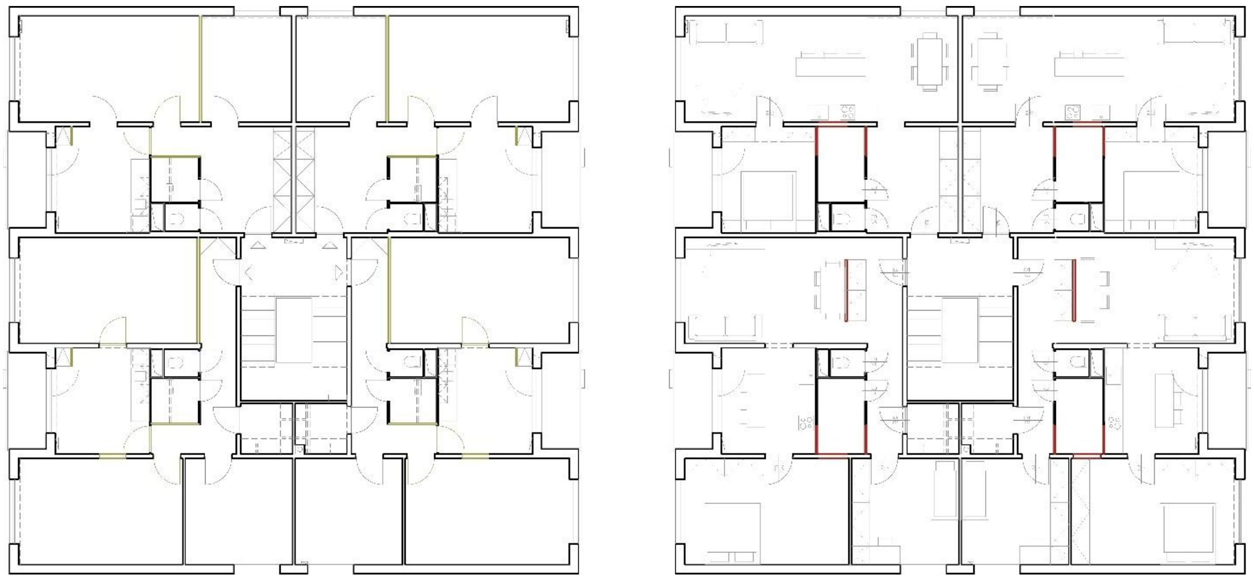

Fig. 7. Adaptation of the layout of an apartment in a residential building of structural system T06B

In terms of floor plan, the most adaptable is probably the T08B construction system - in Brno, for example, in the Old Brno South housing estate (Vídeňská Street) - this system has larger spans of load-bearing walls (6m) compared to the others. It thus allows for the creation of larger open spaces in the apartment. On the other hand, it is difficult to modify, e.g., B70, which has a segmented floor plan and does not allow for more layout options.

At the apartment building scale, the most widely observed element of conversion is the addition of upper floors - most commonly used in Brno-Kohoutovice. Another aspect is to increase the energy efficiency of buildings in the form of thermal insulation of the facade and roof used in most cases.

A current trend abroad and slowly also in the Czech Republic is the comprehensive revitalisation of housing estates both in terms of the buildings themselves and the public space. A successful example from Brno housing estates can be the renovation of the Nový Lískovec housing estate, where the revitalisation included both the reconstruction of facades and investments in public space.

3. Conclusion

As already outlined in the introduction to this article, approximately one-third of the population in Brno lives in prefabricated houses. Aggregate data on prefabricated housing estates may have potential for use in various fields.

The article focused mainly on the structural systems of prefabricated houses in Brno and associated spatial characteristics. Thus, it shows a clear summary of the data in graphical form using maps of structural systems supplemented by the ownership of public and private areas, where the apparent predominance of the city in land ownership is evident. The city also owns many urban dwellings in the prefabricated housing estates.

Furthermore, the relationship between the structural system and the public space was examined, where the structural system does not significantly affect the public space or its adaptation. The most crucial elements are the morphology of the terrain, location within the city, traffic, and other variables. On the contrary, they significantly impact the adaptation of the apartment building, especially the adaptation of individual apartments, which are directly dependent on the structural system.

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