A HOUSING CONSTRUCTION AS THE FACTOR IN TRANSFORMATION OF URBAN SPACE IN SAINT PETERSBURG

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The main topic of this work is exploring linkage between housing construction and transformation of urban space. For this we will identify and adapt the most representative methodology to study the relationship of residential construction and retail, including information availability, analyze major spatial and temporal changes in residential development and retail, visualize the results of the analysis. Received information, that housing construction increase the quantity, but don't improve diversity of retail.

Keywords: spatial analysis; retail; housing construction; urban space; GIS.

Research methodology and initial data: Urban environment is a composite object. One of the elements of the urban environment is urban retail, which fulfills the following functions in the urban "fabric": a place of economic activity; the "third" place of the citizens; improving the quality and diversity of life of the citizens.

Despite the huge arsenal of city directories with information about retail, not all of them are available for data uploading: more and more often complex web code is used that does not allow uploading the information displayed on the map, for example, as in Yandex [8] or "2GIS" [5]. One way to solve this is parsers that mimic the user and allow to automatically navigate between retail objects and collect information about them. In particular, this is possible in the 2GIS directory, where the query results display all objects in a list of 6 (e.g., 1821 objects for the query "restaurant" in St. Petersburg) and can be aggregated using a publicly available parser [4]. To collect the necessary objects, it is possible to apply selection by heading, and screening of duplicated objects can be done by Id in the 2GIS system (unique identifier). Data localization in GIS (transformation of data into spatial data) can be done through the available coordinates of each object. As an example, let's consider a card of one of the companies, the data about which is extracted with the help of a parser (Fig. 1). Accordingly, this is how the data on retail facilities for 2022 was collected. The situation with retrospective data is more complicated. Reference books nowadays more and more often provide data on the situation at a particular point in time, i.e. they are constantly updated.

Data processing (calculation of the Shenon diversity index and normalization by the Minimax formula) and their visualization were carried out through the open source software QGIS [6].

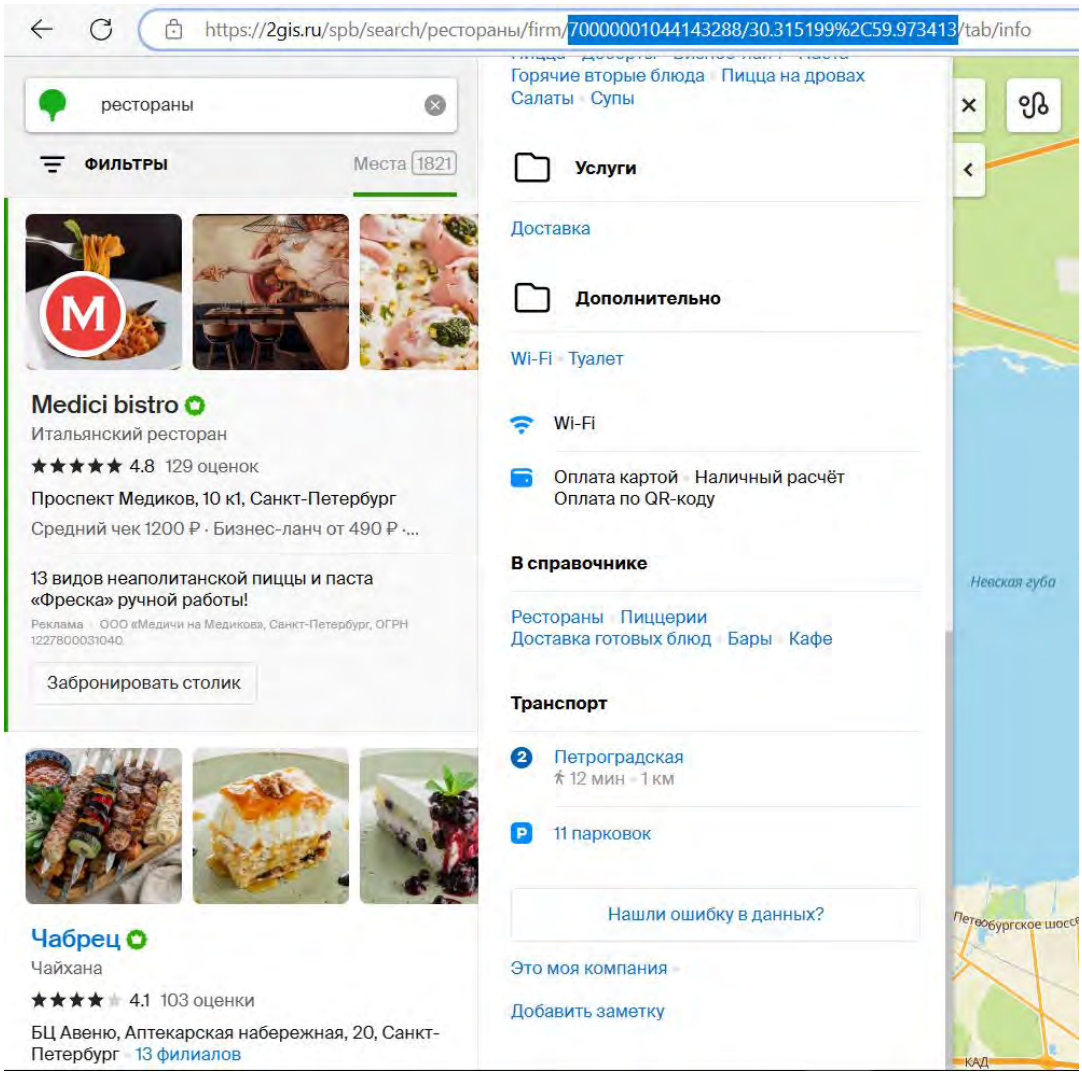

Fig. 1. Example of a card of a retail object from which data was collected: in the address line the Id of the object (70000001044143288), its geographical coordinates (/30.315199%2C59.973413) are highlighted, and at the bottom in the column "In the directory" - the headings to which it belongs, the first of which "Restaurants" corresponds to the highest match, compiled by the author according to [5]

Diversity of retail in urban neighborhoods: The situation of the emerging urban environment changes from one neighborhood with new housing to another. In order to consider local differences, neighborhoods with new buildings were identified. This was done on the basis of data from the Housing Reform website as follows: on the basis of heat maps of new housing and information on the year of construction of houses, we identified areas limited by the street and road network (without yard passages), in which all houses have a year of

construction younger than 2005. Accordingly, the number of retail facilities and the Shenon index were calculated for these neighborhoods (Figure 2).

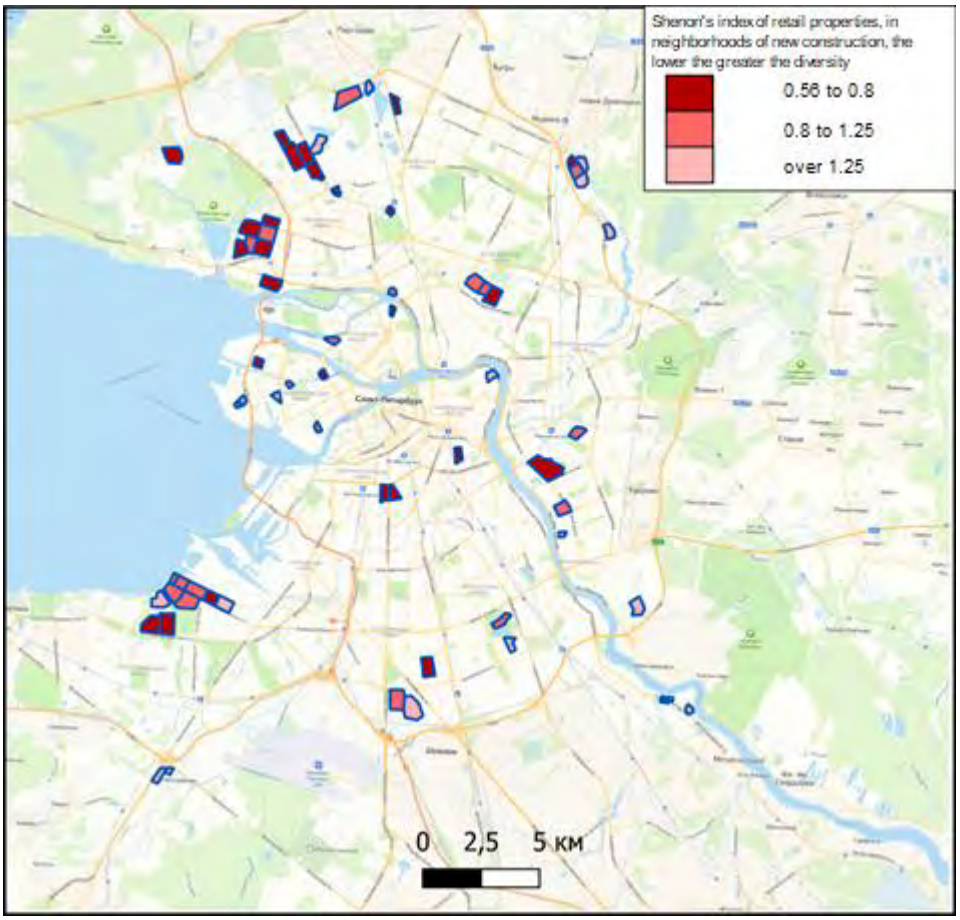

Fig. 2. Spatial structure of the Shenon index of retail facilities for 2022 by neighborhoods of new buildings, compiled by the author according to [5], [7]

The situation by neighborhoods is indeed heterogeneous: the coefficient of variation of neighborhoods according to the Shenon index is 38%, which indicates the heterogeneity of the population. The most diverse neighborhoods are those associated with the Baltiyskaya Zhemchuzhina development project, as well as micro-districts near Begovaya metro station. Neighborhoods with relatively low diversity are mostly confined to gray belt areas (e.g. Leontievsky cape on Petrogradskaya side and Sinopskaya naberezhnaya as high comfort housing, where the population is characterized by increased mobility) and small neighborhoods of peripheral development, mainly in the South-East (Zvezdnaya) and North-East (Ruchiye). There are some exceptions, such as Tsarskaya Stolitsa Residential Complex behind Moskovsky Railway Station or new housing near the former Varshavsky Railway Station. Overall, only 20 residential neighborhoods had a level of diversity higher than the St. Petersburg

average (0.73). Only Morskoy Kaskad (North-West) and Tsarskaya Stolitsa (Tsarskaya Stolitsa) had a higher diversity level than in St. Petersburg.

The following neighborhoods are the most representative examples (Fig. 3).

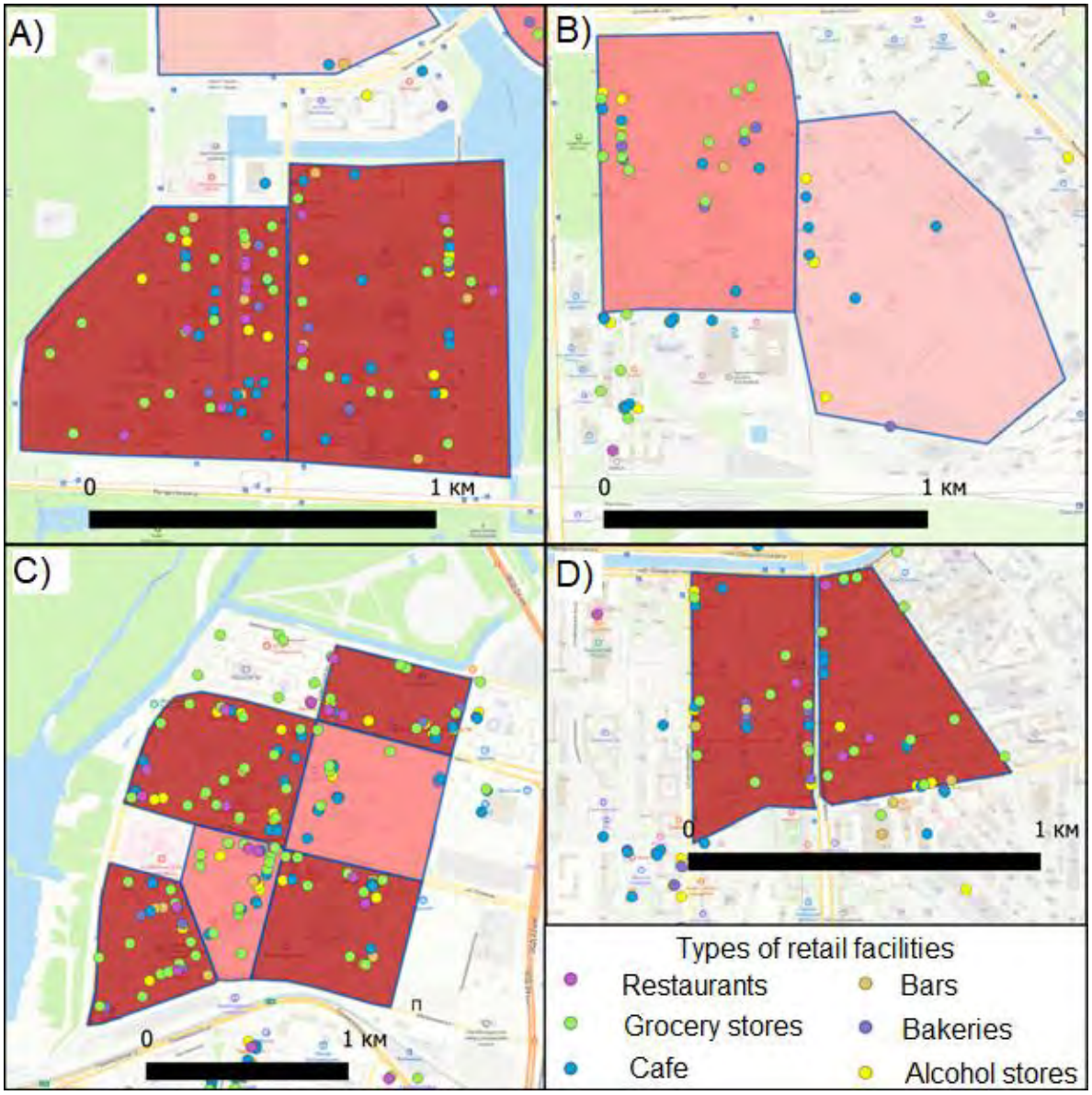

Fig. 3. Examples of typical neighborhoods of new residential development, blocks of Baltiyskaya Zhemchuzhina (A), near Zvyozdnaya metro station (B), behind Primorsky Shosse (C) and near Varshavsky Railway Station (D), compiled by the author according to [5], [7].

High diversity indicators in Baltiyskaya Zhemchuzhina are associated with the complexity of the development of the area: the presence of shopping centers of different levels of hierarchy, a variety of commercial real estate [3], as well as a relatively developed morphological structure, expressed in different storeys

and a relatively developed street and road network. The antonym is the development of the area near the metro station Zvezdnaya south of Dunayskiy Avenue (B). With a comparable area (about 250 ha), on the territory the variety of retail facilities is limited to grocery stores, cafes and alkomarkets. At the same time, the density of facilities is lower. The area generally lacks a comprehensive approach as redevelopment of vacated land plots has taken place at different times. There is no large, neighborhood-forming retail facility in the designated area. Similar to Baltiyskaya Zhemchuzhina is the development of the territories behind Primorsky Highway (C). The territory was systematically developed by developers, which resulted in the formation of a developed urban morphology. An interesting variant of the Grey Belt redevelopment is the territory near Varshavsky Railway Station (D). It is important to note that the Grey Belt in terms of new housing is generally characterized by the fact that it is designed for at least middle class+ and high class, i.e. a population with relatively high purchasing power. This zone also includes a metro station, which further enhances the commercial attractiveness of the area.

Based on the analysis of the cases, we can conclude that residential construction in general leads only to an increase in the number of retail facilities, but not their quality, expressed by diversity. However, there are a number of territory development projects characterized by complexity and, accordingly, leading to the transformation of the urban environment of the city as a whole.

The importance of integrated territory development is obvious. The construction of new housing to accommodate the growing population is an important aspect of urban development. Integrated development of territories allows not only to meet the demand for housing, but also to improve the well-being of citizens due to the developed urban environment. The diversity of urban environment increases the agglomeration effect of cities [1], and also corresponds to social approaches to urban planning [2]. Given these effects, the city authorities and developers should make the integrated development of territories in new housing construction a priority to ensure the sustainable development of St. Petersburg, in particular, having the opportunity to replicate the most successful practices, such as Baltic Pearl or the neighborhoods behind Primorsky Highway.

References

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