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HIGHRISE BUILDINGS IN HOUSING CONSTRUCTION: ECONOMIC EFFICIENCY VS SPATIAL BALANCE

Abstract

Nowadays, many growing cities around the world face very intensive construction in the housing sector. The pressure of the construction sector is reflected in the insistence on increasing the number of floors of residential buildings due to economic profitability, while the principles of spatial balance and sustainability are questionable. Therefore, this research seeks to discover which minimum number of floors of residential buildings ensures the economic profitability of the investment in housing construction. The methodological approach, based on the relevant principles of urban economy, ensures the development of a model for empirical testing of spatial and economic relations. The research polygon is the residential module from the regulatory plan of the residential settlement located in the area of a fairground in Banja Luka - Bosnia and Herzegovina.

Keywords: highrise building, housing construction, profit margin, optimal building height

ВИСОКЕ ЗГРАДЕ У СТАНОГРАДЊИ: ЕКОНОМСКА ЕФИКАСНОСТ ВС. ПРОСТОРНА РАВНОТЕЖА

Сажетак

Данас се многи растући градови широм свијета суочавају са врло интензивном изградњом у стамбеном сектору. Притисак грађевинског сектора огледа се у инсистирању за повећањем спратности стамбених објеката ради постизања економске исплативости и оправданости, при чему је поштовање начела друштвене правичности и просторне одрживости упитно. Стога се у раду настоји открити која минимална спратност стамбених објеката обезбјеђује економску исплативост инвестиције у изградању стамбеног објекта. Методолошки приступ, темељен на релевантним начелима урбане економије, осигурава развој модела за емпиријску провјеру просторних и економских односа. Истраживачки полигон је стамбени модул из регулационог плана стамбеног насеља смјештеног на простору сајмишта у Бањој Луци - Босни и Херцеговини.

Кључне ријечи: вишеспратнице, станоградња, профитна маржа, оптимална висина зграде

1. INTRODUCTION

Urbanization leads to the spatial and physical growth of cities both in terms of expanding their territory and in terms of their vertical growth and building density. The greatest pressure on the city in the process of urbanization is exerted in the domain of housing construction through the expansion of residential areas and the increase in housing densities. If privately owned urban land intended for housing constitutes 4/5 of the city's territory [1], it can be said that the construction control in the housing sector represents a key regulatory instrument on the path to achieving a sustainable city. The intensification of high-rise housing construction is often the result of economic pressures and the developer's demand for profit maximization. The question of urban sustainability requires a careful analysis to ensure that economic efficiency does not dominate over other aspects of urban space, as well as needs of the city and its citizens. Given the impact that multi-story residential structures make on urban infrastructure, socio-economic dynamics, and citizens' quality of life, the analysis of the economic efficiency of housing construction becomes crucial in terms of achieving spatial balance and viability. While the market often focuses on profit maximization, it is important to reconsider whether this strategy supports the balanced development of the city and its settlements.

The sustainability of growing cities as complex urban systems is an issue directly addressed by urban plans and planners. As an instrument of social production of space, urban planning represents an objective-rational and socio-communicative process of establishing new spatial relations [2]. Since planning unfolds within a communicative arena, involving actors with diverse (professional) viewpoints, it is necessary to adapt planning practices and methods to enhance dialogue in the collaboration process, simultaneously bringing the best planning solutions. This entails openness to new knowledge and continuous learning by all involved actors [3]. Misunderstandings and tensions evident in the relationship between investors, decision-maker (local administration) and planners are the key inhibitors of productive dialogue and obstacles to achieving consensus.

The prerequisite for breaking down communicative barriers in these relationships is the development of mechanisms for better understanding. Therefore, based on the application of principles of urban economy [1, 4, 5], urban planning parameters and other aspects of urban-morphological analysis, this research develops a model enabling the analysis of spatial and economic planning indicators in multi-family housing. It is expected that this spatial-economic model for analyzing alternative plan solutions, in its further development, will serve as a valuable tool for planners and decision-makers during negotiation processes with investors, aiming to achieve sustainable planning solutions that entail an optimal balance between private and public interests in urban spaces. In other words, its application would ensure better-informed decision-making and improved urban planning. The testing ground for the developed model is a residential plot in Banja Luka, the capital city of Republic of Srpska as one of the entities of Bosnia and Herzegovina. The plot is treated with a new regulatory plan within an area currently used for fair purposes.

The integration of economic factors into urban planning enables a more comprehensive approach to city development, taking into account both economic and spatial aspects. Through an interdisciplinary approach, this study aims to provide insights into the complex dynamics that shape urban morphology and the economy of residential construction, while simultaneously exploring ways to balance economic interests with the demands of spatial sustainability and social justice.

2. METHODOLOGY

The methodological approach of this research is based on the analysis of spatial and economic indicators using a specific plot as an example, where the regulatory plan envisages the construction of three residential row multi-story buildings in an area currently utilized for fairground purposes. The area covered in the plan undergoes a transformation in both, its purpose and building density during the planning process (Figure 2) [6]. Given that the aim is to examine the investment profitability of residential construction in correlation with the increase in the number of storeys, a case study has been conducted on a plot without changes in the number of buildings during the planning process. Instead, there was only an increase in the built density on the lot, manifested through the addition of underground and aboveground floors.

The analysis is divided into five key steps: a) calculation of planned building areas, b) calculation of urban parameters, c) cost estimation, d) revenue estimation, and e) calculation of return on investment. The steps of the methodological approach are illustrated in Figure 1, while an overview of the relevant parameters necessary for conducting the analysis is provided in Table 1.

The first step involves analyzing the achieved built density in terms of gross, net, net usable area of the building, and areas intended for sale. The areas' analysis is divided into the calculation of underground floors, ground floors, and aboveground floors, cumulatively summed up and expressed collectively for all buildings on the plot (Figure 1 – part 1a). The reason for introducing this differentiation lies in the variable dimensions of these three groups of floors. In case some of the underground or aboveground floors differ, i.e. are not typical, separate calculations are necessary for them.

Secondly, as a result of this analysis, urban planning parameters are defined at the plot level as site coverage ratios and floor area ratios, with distinctions between gross and net values of these coefficients (Figure 1 – part 1b). According to the Law on Spatial Planning and Construction [7], these parameters are defined as the share of aboveground floors in the total built area of the plot, or as net ones. However, this study introduces gross values of parameters that consider buildings integrally, encompassing both underground and aboveground floors in the analysis, all with the aim of understanding the actual state of overall construction.

The third part concerns cost analysis, specifically outlining the extent of direct investments in the realization of the building construction project (Figure – part 2a). Indirect costs, such as overhead costs, salaries of sales staff, taxes, etc., were not considered in this analysis. Given that land acquisition represents one of the major expenses, the unit price of construction land in this research was determined based on market prices in the vicinity of the location, using data obtained from the public Sales Price Register Data [8], for the year in which the regulatory plan was developed. The average unit price of construction for residential buildings was obtained from the decision of the city administration regarding the determination of the basis for calculating rent [9]. Specifically, key input for establishing this basis is the average final construction price per square meter of usable area for residential and commercial spaces in the Banja Luka. This data is derived from the main design documentations, submitted to obtain building permits, i.e., from the section related to the cost estimation of overall construction works. The costs of various types of fees that the investor is obligated to pay to the city during the process of investment realization were taken from the official decisions of the city administration for the year in which the regulatory plan was being developed [10].

The fourth part of the revenue analysis (Figure – part 2b) is based on the application of unit prices per square meter of residential space expressed in €. This unit price represents the market value per square meter and is obtained through the analysis of sales prices of residential space in the vicinity of the location for the year in which the regulatory plan was being developed [8], thus ensuring consistency in prices across both temporal and spatial dimensions. Differentiation between underground and aboveground floors was carried out during price calculation to achieve greater accuracy in the calculation.

In the final part of the analysis, an assessment of return on investment (ROI) was conducted through the definition of profit margin (Figure 1 – part 2c). ROI measures the profitability of the project relative to the amount invested. It indicates the percentage of return on the investment and is calculated by dividing the profit earned by the amount of direct costs [4]. As such, it represents the net profit margin, excluding costs such as sales agents' salaries, marketing expenses, sales tax, overhead costs, etc. Although the standard profit margin for a property development project, according to the literature [4, 5], should be 15–25% or more of the project’s total cost, the research adopts a target and minimum profit margin of 20% of the total project costs. The results of the conducted analysis enable comparisons of planning solutions in terms of urban and economic indicators in phases before and after public consultation. Additionally, two hypothetical alternatives of minimum and maximum built density are introduced through the analysis to assess the impact of increase in the number of storeys on the economic efficiency of the investment.

Table 1. Spatial-economic parameters relevant for the calculation of revenue and expenses of building development

Unit prices		**Source**	**€/m2**
A	Average unit market price of construction land in the vicinity of the polygon for 2023	[8]	104
B	Average unit market price of the net usable area of residential space in new construction, with VAT in the vicinity of the polygon for 2023	[8]	1255
C	Average unit price of construction of residential buildings	[9]	515
D	Unit city rent price for the II urban zone of Banja Luka, expressed in €/m2 of the net usable area - valid from March 1, 2023	[10]	26
E	Unit price of the fee for the development of urban construction land for the II urban zone of Banja Luka, expressed in €/m2 of the net usable area - valid from April 11, 2023.	[10]	70
F	Unit price of technical documentation for multi-family residential building, expressed in €/m2 of the gross building area	[11]	15
Percentage parameters related to the calculation of revenues/costs			**%**
G	Share of the price of the accompanying services of the construction in the total price of the construction (%)	/	2
H	Contribution for the cadastre - % of the estimated value of construction works	[12]	0.03
I	Reduction percentage of unit prices (construction and sales) for utility rooms and basement space – underground areas	/	50
Correction coefficients for the calculation of areas			**%**
J	Share of the net floor area in the gross floor area of the aboveground floors	/	85
K	Share of the net floor area in the gross floor area of the underground floors	/	95
L	Reduction of the net area of the above-ground floors based on the installation of wall coverings	/	3
M	Share of the sales area in the net usable area of the above-ground floors (15% of losses on communications)	/	85
N	Share of the sales area of underground floors (parking spaces, storage rooms, utility rooms, etc.) in the net usable area of underground floors (50% of losses on communications)	/	50

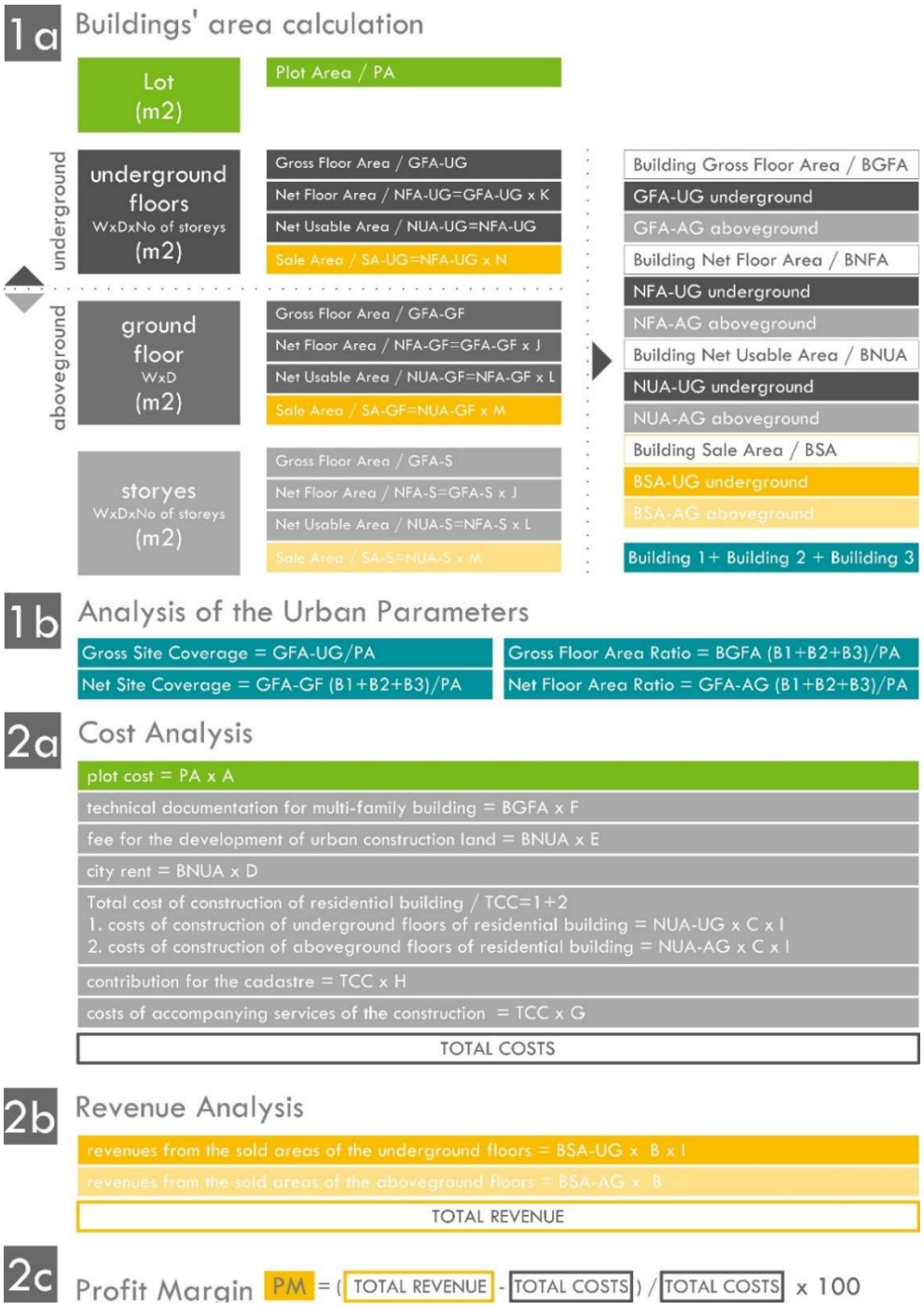

Figure 1. Methodological approach

3. RESULTS

The research results are examined on several levels in terms alternatives of: a) regulatory plan, b) spatial indicators, and c) economic indicators. The area covered by the new regulatory plan is currently undergoing a change in land use. From its former status as a fairground complex, this area is being transformed into a mix of various, often incompatible, uses (such as shops, wedding halls, indoor sports courts, recycling center, etc.). Some buildings are not in use, and most structures are neglected and in poor condition. The current regulatory plan envisages retaining the fairground function in this area, with improvements to spatial organization and infrastructure [13]. According to this regulatory plan, the concept of the spatial organization of the fairground is based on a pavilion system and low-rise exhibition halls (ground floor and gallery). The Banja Luka City Administration made a decision in 2022 to amend the regulatory plan for this area. The draft of the regulatory plan

completely changed the land use of the area, converting the fairground complex into a mixed residential and commercial zone characterized by high-rise buildings. Following the public consultation process, as a tool for citizen and stakeholder engagement in the planning process, there has been a noticeable increase in construction density, both in terms of the number of buildings on parcels and in terms of increase in the number of storeys. Comparing the new planning solutions with the existing regulatory plan for the fairground complex [13], it is evident that there has been a significant increase in site coverage and floor area ratio in the new planning document [6]. Furthermore, within the iterations of the new regulatory plan, there is a visible trend of increasing overall built density, as a result of pressure from investors and landowners, which is presented in detail in Figure 2.

Figure 2. Spatial analysis of the regulatory plan at the lot level (Source: Authors according to [6])

The spatial-economic analysis was conducted using the example of a plot within a residential zone, considering not only plan alternatives (before and after public consultation), but also hypothetical simulations of the low-rise and high-rise buildings. The main research question is: what minimum number of storeys of residential buildings ensures the economic profitability of the investment in residential construction? The findings of this analysis show that the increase in the number of storeys, resulting from public consultations, leads to a drastic drop in profit margin, simultaneously raising questions about the profitability of such an investment (Figure 3 – line chart – columns 1 and 2). The main reason for the decline in profit margin in alternative 2 is the increase in the number of underground floors, which arose as a result of the need to meet the minimum number of parking spaces [14]. Second, the standard profit margin of 25% is achieved even with the significantly lower number of storeys - B+G+3, as shown in Figure 3 – line chart – column 0. Third, the profit margin achieved in variant 1 is difficult to attain with buildings having two underground floors, despite the significant increase in the number of aboveground storeys (Figure 3 – line chart – columns 1 and 3).

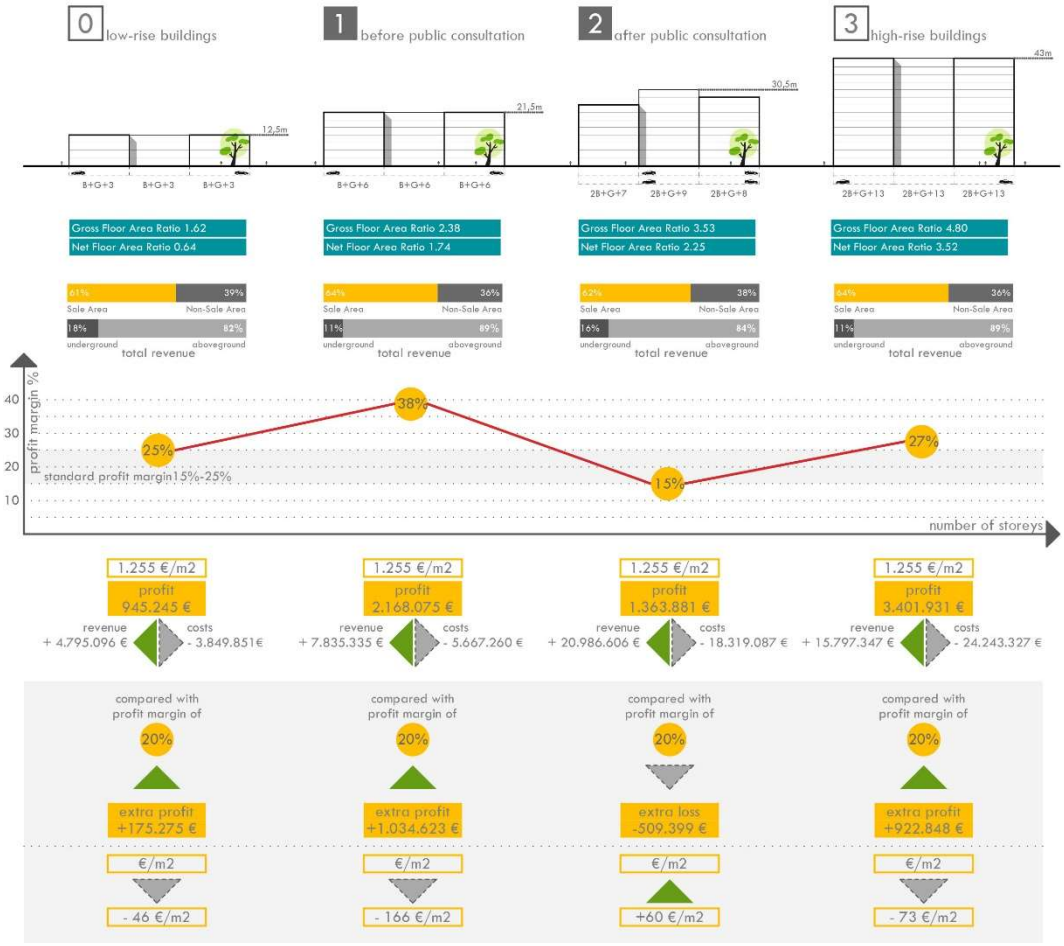

Figure 3. Analysis of economic indicators for the regulatory plan at the lot level

4. DISCUSSION

It is evident that urban spaces are undergoing a change in land use, with an increasing trend in building height and density, not only worldwide but also in the city of Banja Luka, especially in its central urban zone. Even if the changes are taken as an inevitable circumstance, the carrying capacity of plots and the extent of actions are questionable in the context of sustainability. This research has revealed weaknesses in urban planning concerning the application of urban planning parameters (site coverage and floor area ratio), as defined by the legislative framework [7, 14]. By considering only aboveground floors when calculating these parameters, a comprehensive image of construction is missing. According to the rulebook on general rules of urban regulation and subdivision [14], the maximum permissible (net) site coverage ratio for residential zones with higher densities is 0.7, and the maximum permissible (net) floor area ratio for the same zone is 2.5 [11], both of which are

satisfied by the planning solutions. However, if we consider the gross floor area ratio, it exceeds the threshold values, reaching 3.53 for variant 2 (Figure 2). As the number of storeys increases, the requirement for parking spaces increases too, leading to the larger size and number of underground levels. The expansion of underground works increases total investment outlay, which yields a low return on investment due to the lower prices of underground areas and the significant share of non-saleable areas. Furthermore, enlarging the dimensions of underground levels diminishes the available open space for implementing greenery and other outdoor amenities essential for residential zones. On the other hand, increasing building height dehumanizes the space, enhances the flow of people, and reinforces activities, reducing safety and privacy within the neighborhood.

The standard of living is changing, transitioning from the concept of medium and low-density housing typical for Banja Luka to the concept of high-density housing. This approach aligns with the idea of a compact city, aiming to mitigate urban sprawl and preserve the natural environment. However, (re)assessment of the scope and typology of residential construction by urban zones, in correlation with the local identity of Banja Luka, is an imperative that the urban housing policy and city master plan must address. In the absence of a city master plan, as the key planning document regulating spatial production and ensuring spatial balance, it is certain that the trend of investor pressure for the increase of building density (number of storeys) will continue. The consequences of this tendency on urban morphology and the cityscape are irreversible, raising questions about the quality of living in these newly developed areas.

Regarding the housing market dynamics, it is evident that there has been a disbalance in the territory of Banja Luka over the past five years. Increased demand for apartments has led to a growth in investments in the housing construction sector. It is presumed that the reasons for this surge in demand stem from the needs of the population that has mostly moved abroad or lives in smaller neighboring cities, for real estate investments in Banja Luka - the main administrative and university center of the Republic of Srpska. Identifying this trend, landowners and developers strive to produce as many square meters of sales area as possible and ensure profit maximization by increasing the plot's built-up area. However, during this process, investors often do not adequately consider spatial aspects as influential factors in the profitability and feasibility of the investment. Ultimately, this oversight can lead not only to poor decisions, losses, and insufficient return on investment but also potentially leading to overbuilt-up space.

The research indicates that an increase in the number of storeys does not necessarily mean an increase in profit. On the contrary, the analyzed alternatives point to a decline in both profit and profit margin (Figure 3 – variant 1 and 2). In order to reach the profit margin attained at a lower number of storeys (variant 1 - B+G+6), the investor/developer must significantly raise the price per square meter (approximately €100 in variant 2 - 2B+G+8/9/10), which makes them non-competitive. Further increase in the number of storeys, aimed at boosting profits, does not yield a proportional increase in the profit margin. Even with a double increase in the number of storeys (Figure 3 - variant 3 compared to variant 1), the initial margin level cannot be achieved. This leads to the conclusion that the optimal number of storeys, which provides the highest profit margin, was achieved with buildings of B+G+6 storeys. Such a planning solution reaches the maximum level of permitted construction but also the maximum profit margin. Any exceeding of these thresholds has negative consequences in all aspects - spatial, economic, social, and environmental. Variant 1 also indicates the possibility of reducing the sales price per square meter of residential space. This would produce a drop in the profit margin but would ensure more affordable housing for social groups and individuals who acquire their first property, especially for young people and couples with moderate and lower incomes. Finally, under current market conditions, the hypothetical variant "0" with B+G+3 storeys provides the most balanced planning solution and the most equitable distribution of well-being. In this variant, the ratio of the sale price and achieved housing/living standards is most optimal, and the spatial environment is most humane.

5. CONCLUSION

The presented model of spatial-economic analysis at the parcel level serves as the initial basis for further development of the analytical tool for assessing spatial-economic indicators applicable on a larger scale, at the level of the regulatory plan - settlements. This research focuses on the profit of investors - construction entrepreneurs - who directly associate their profit with the sale area of residential buildings, often without considering the negative consequences for urban space and the quality of life of the population in these neighborhoods. This research demonstrates that such a standpoint is not grounded in relevant indicators of actual investor benefits. Indeed, the variant of

the regulatory plan adopted after public consultations (Figure 3 - variant 2), during which the investor requested an increasing number of storeys for the planned residential buildings besides the negative consequences for the urban standard of living on a broader scale (reduction of green space per capita, increased infrastructural burden, worse bioclimatic conditions, etc.), simultaneously results in a drastic drop in profit for the investor. It is evident that such an analysis of planning solutions would be a strong argument in the hands of urban planners and city planning departments in negotiations with investors, aiming to achieve consensus on planning solutions that offer an optimal balance between private and public interests. This process implies further development of the spatial-economic analysis model of regulatory plans, wherein it is possible to monitor additional economic parameters, such as the city's revenue from private investment construction, the relationship between realized revenue and the percentage of investment in public infrastructure, and facilities of public interest, environmental considerations, and other aspects of urban space, aiming for more comprehensive support of sustainable urban development. At smaller scales, further research can be directed towards assessing the achieved housing standards in new construction in correlation with housing prices and the issue of housing affordability for domestic populations. Additionally, it is essential to investigate the impact of the increasingly pronounced trend of reducing the floor area of apartments and increasing the number of apartments per building on the profitability of residential construction projects, as well as the influence of this trend on a larger scale on urban blocks or neighborhood space. The development and application of specific spatial-economic analysis models in urban planning imply additional education for planners and public services dealing with the spatial development of the city, as well as work on raising the capacity of investors and residents in collaborative and participatory planning.

In circumstances where the pressure from the construction sector in residential development is increasingly manifested in urban space, and where tensions between citizens and stakeholders are growing, understanding spatial-economic relationships can significantly improve negotiation processes in urban planning, facilitate dialogue among all involved parties, and facilitate the presentation of plans itself. In the negotiating arena dominated by: a) representatives of local administration as decision-makers, b) investors as agents of change, and c) urban planners as experts and mediators, better-informed decision-making is key to achieving spatially sustainable planning solutions, economically viable investments, and a more equitable distribution of well-being.

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