DEVELOPMENT OF THE METRO IN SOFIA

Zdravko Zdravkov

Architecture and Urban Spatial Development Service, ul. Serdika 5, 1000 Sofia
e-mail: arch.zdravkov@gmail.com

Abstract. The 21st century is characterized by the unprecedented urbanization of human populations, making cities the epicenters of social, economic, and technological change. Sofia, as the capital of Bulgaria, is a prime example of this urbanization phenomenon. This scientific paper, authored by Arch. Zdravko Zdravkov, investigates Sofia's urban development in the context of globalization, digitalization, and the challenges posed by the COVID-19 pandemic. The study emphasizes the role of the General Master Plan (GMP) as a strategic tool for regulating urban growth, prioritizing social welfare, and fostering sustainable development. Notably, the expansion of the Sofia Metro is explored as a key infrastructure project. Its financing, socio-economic impact, and environmental benefits are thoroughly analyzed, including reduced greenhouse gas emissions and improved accessibility. Furthermore, the paper addresses the socioeconomic challenges that have emerged, such as the impact of COVID-19 and rising energy costs. It underscores the necessity of prudent financial planning and proposes several priority metro expansion projects aimed at mitigating urbanization issues and enhancing mobility. In conclusion, this scientific analysis underscores the significance of comprehensive urban policies to create a more sustainable, livable, and resilient Sofia. The extension of the Sofia Metro is presented as a pivotal component in this transformative process, ensuring the city's adaptability and vitality for future generations.

Keywords: general master plan, urbanization, metro extension

Our generation lives in the CENTURY OF CITIES, and their traditional role as drivers of scientific, technological, cultural and social change will continue to grow into the future. Great cities also have a leadership position regarding the solution of all major questions concerning the present and future of humanity, and looking back we realize that all great cultures are urban, world history is the history of cities – the history of urban man. In addition to the mechanical growth of cities observed in the last century, their impact on contact regions and territories is also increasing dramatically. All these integrated spatial interactions lead to processes of expansion and formation of new subjects of development – the agglomerations.

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Over the past three decades, urban agglomerations in our country have been in the process of fundamental spatial transformations, imposed both by the will of active civil society and by the challenges of modern life. They are also subject to a series of urban processes linked to their permanent decentralization, necessitating the planning of a new, flexible and connected network of local centers and functional sub-areas. Drivers of these changes, along with the socio-political transition in post-socialist societies, are the new environmental policies, the globalization and digitalization of society, the consumer boom accompanied by our growing energy needs, as well as the dynamic changes in economic and technological processes, the development of the economy, knowledge, accelerated urbanization and the new challenge of the last three years – the coronavirus pandemic causing COVID-19.

Life in cities, bound to a significant extent by modern technologies, is developing much faster than the existing mechanisms for urban analysis and urban management can keep up with it. At the same time, the concentration of people seeking higher wages, a higher quality of life and social infrastructure is increasingly shaping the vector of our general patterns of consumption, movement and use of natural resources.

The city as the main human habitat is formed by many factors: from our environment to socio-economic conditions. It is the city that determines the quality and length of our lives, and in the foreseeable future more and more municipal leaders will impose the two key factors related to public health – QUALITY OF LIFE and LONGEVITY as the main priorities when planning future spatial development. Modern urban culture is formed by several interrelated parameters:

– increasing dynamics of life;
– desire for sustainable development;
– a growing multicultural population.

According to UN forecasts, by 2050, about 70% of the world's population will live in urban and suburban areas, while at the beginning of the 1960s, this share was only about 30%. In the middle of the last century, every seventh country could "boast" cities with a population of over one million inhabitants, and today they are in every third country.

However, not only the share of the urban population is growing, but the cities themselves are changing in terms of population density and profile, area and spatial structure. At the same time, the environment and living conditions, which account for approximately 80% of the city's total impact on our health and well-being, are becoming a major cause of increased life expectancy.

WHERE ARE WE? With the realization of the scale of globalization in the

21st century and the depth of the challenges that face us, such as environmental protection and the purely human problems related to the permanent aging of the population in Europe, migration, inequality and injustice in society, the increasingly stressful pace of life, the unprecedented impact of technology in all spheres of our lives, the obvious unpreparedness for infectious pandemics and the growing tension of a potential emigrant wave makes us realize that Sofia will have to rethink itself in order to be ready to meet new challenges and realities.

In order not to be among the losers in the competition for finance, technology and talent, after the 1990s, Sofia had to initiate energetic changes in order to survive the new wave in urban planning, and it was these changes that determined its current viability. The current Amendment to the General Master Plan (GMP) of the Capital Municipality, adopted by Decision No. 960 of December 16, 2009 of the Council of Ministers, is undoubtedly the most significant and positive phenomenon in the processes of planning and management of the territories in the capital. To a high degree, it was able to regulate construction activities, prevent the pursuit of maximum financial benefit, optimize the framework of investment initiatives, prioritize certain social needs and interests.

In the conditions of a transition unique in our history from a centralized economy and autocratic government to a market economy and managerial pluralism, parallel but also unprecedented processes of restoration of private property took place in Bulgaria, as well as the creation of a series of restitution laws tied to this policy. had an absolutely negative impact on urban development in the conditions of a market economy.

It is an irrefutable fact that the OUP provided the municipal management structures with considerable regulatory levers in the processes of territorial organization of the capital and mastered a chaotic process in the development of the city.

Now, after applying the regulations and tools that provided us with the General Master Plan (GMP) in force from 28.01.2007 and the GMP-2009 on development zones for more than 15 years, the management involved in the spatial and economic development of the Metropolitan Municipality, is aware of the local and general problems leading to divergence in the goals for sustainable development of the city, laid down in the Law on the Organization and Development of the Sofia Municipality (LODSM). There is a clear vector of changing goals in urban planning, leading to the creation of ONE RICHER, HEALTHIER AND ECOLOGICAL CITY [1], whose goals include building a quality urban environment, stimulating multi-functionality combined with

multiple use of the territory, low energy consumption, reduction of environmental pollution, characterized by prioritization of pedestrian movement, development of public and bicycle transport. The creation and development of METRO has a structure-determining importance for achieving a large part of the general long-term development goals of the Sofia Municipality (Fig. 1).

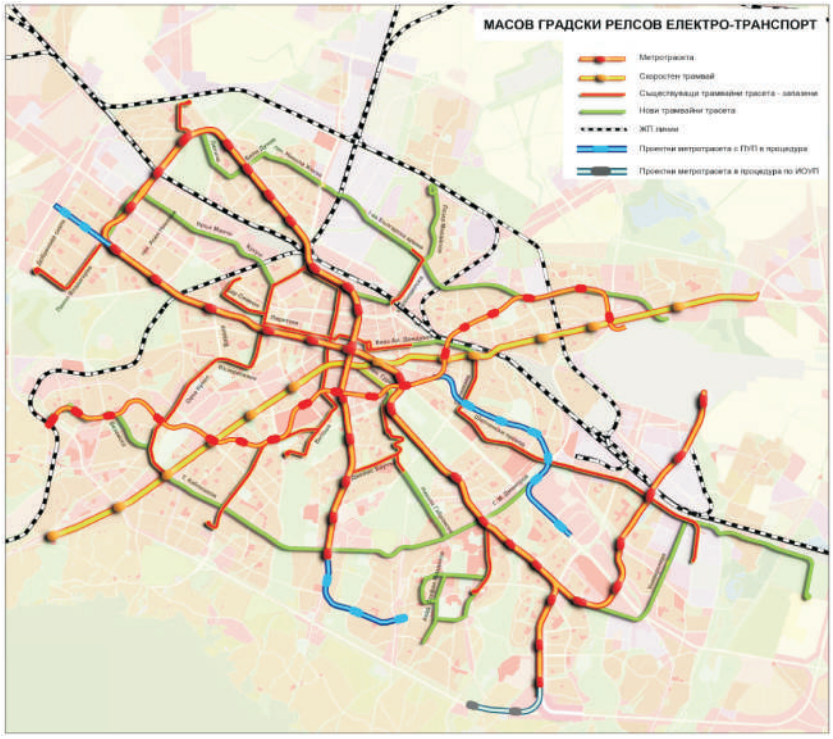

Fig. 1. General scheme of Mass urban rail electric transport (concepts for development), Source: Department "Architecture and urban planning"

The impact of the development of public infrastructure of a similar scale is measured over time in decades, and in this sense the expected positive effect significantly exceeds the horizon of the GMP from 2030. It is an indisputable fact that the investments of the Sofia Municipality in the development of the Metro and in the construction of technical infrastructure become catalyst of processes of investment activity at the local level, and this can be traced through the analysis of the real estate market in the period determining the last growth of construction in Sofia 2012–2021 [2] (by residential areas):

– Suha Reka 2012 Q4 – 577 €/sq.m 2021 Q3 – 1140 €/sq.m;
– Ovcha Kupel 2012 Q4 – 640 €/sq.m 2021 Q3 – 1067 €/sq.m;
– Levski D 2012 Q4 – 550 €/sq.m 2021 Q3 – 1585 €/sq.m.

Adopted by Decision No. 672/15.09.22 of the Council of Ministers Expanding the scope of service of the Metro (Fig. 2). is a prerequisite for an improved quality of life in the Metropolitan Municipality, for increasing its rating and its vital attractiveness in a competitive global reality, where the businesses of the future are looking for their headquarters in locations not only with a developed labor market, but also with a good living environment – clean, safe, dynamic, offering modern amenities and services.

Fig. 2. Amendment of the GMP of the SM for expanding the scope of Line 3 of the Sofia Metro - Decision No. 672/15.09.22 of the Council of Ministers, Source: Department "Architecture and Urban Planning"

The latest amendment in the General Master Plan of the Sofia Municipality will allow the scope of the third line of the Sofia Metro to be extended. The amendment in the "Communication-transport system – mass public rail transport" part of the plan was adopted by Decision 672/15.09.22 of the Council of Ministers. The metro extension project will be financed by the Sofia Municipality with an investment loan, own funds and with co-financing from the state budget, and the total investment for the construction is expected to be BGN 548 million, of which: BGN 360 million with a loan from EIB; BGN 45 million from own funds and BGN 143 million from the state budget. It is

planned that the branch of Line 3 of the metro will be from Evlogi Georgiev Blvd. at the Military Academy G. S. Rakovski to the junction of Tsarigradsko shose Blvd. with Prof. Petar Mutafchiev. The route will pass along Geo Milev Street, Asen Yordanov Blvd., in front of the Arena Armeets Sofia Hall and along Tsarigradsko Shose Blvd. Reducing the time needed to move around the capital is a condition for a uniform and more efficient functioning of the labor market, and hence for better economic results for the city, the municipality and the capital agglomeration.

Expanding the individual territorial scope of accessibility while reducing or keeping travel time within acceptable limits also has valuable social dimensions of inclusion – by facilitating and improving access for all citizens to services, healthcare, education and culture. And last but not least, it contributes to increasing the feeling of a good individual quality of life, enabling the time saved from travel to be used for recreation and personal development. These social dimensions are difficult to prove directly metrically, isolated from influences, but they are visible and appreciated by the residents, businesses and guests of the Capital [3].

With the latest amendment in the GMP, the Metro network will increase by another 6 km and 6 new metro stations. Thus, the total length of the lines will become 61 km, and the metro stations will reach 56. It is planned to carry 16 million more passengers annually, and the share of metro trips in urban transport will reach nearly 50%.

Among the expected effects are a drop in the number of cars in operation by 8,801 per day and a reduction in traffic by about 25%. The higher speed of movement with the metro compared to the rest of the transport will save the city residents an additional 8,553 man-hours per day. The implementation of the project to extend the third line of the Sofia metro will also have a positive effect in terms of reducing harmful greenhouse gases, fine dust particles, lead aerosols, etc. by several thousand tons per year, as well as will contribute to the implementation of measures related to the strategy for low-carbon development of urban areas and mitigation of climate change impacts. With the construction of successive sections, the metro continues to establish itself as the backbone of the transport system in the city, linked to the other transport elements of the trans-European corridors, as well as the transport network of the region, uniting it into a single functioning transport infrastructure.

Over the past 7 years, dozens of large-scale projects to improve urban mobility and the operation of transport systems have been implemented in the Metropolitan Municipality. In my work as Chief Architect, I faced a series of new challenges, including those related to the environment, pedestrian and

cyclist safety, and development of undervalued modes of transportation. The state of emergency declared in 2020 due to COVID-19 led to a huge drop in the revenues of the Sofia Municipality, as well as numerous accompanying unforeseen expenses related to ensuring the implementation of anti-epidemic measures, as well as a significant drop in public transport travel.

The situation is similar at the moment with rising energy prices and rising inflation. Therefore, the implementation with own funds of a large-scale construction program for the construction of public infrastructure will in the future represent a huge and almost insurmountable financial challenge for the budget of the Sofia Municipality. Therefore, we will need long-term planning, focused on a huge number of goals and tasks, which is not already compromised in its analytical part due to ambiguity, lack of commitment and incompleteness in the information base. Forecasting for the future in the process of amending the PMO is important to assess the dynamics in the statistical data, trying to compare the change in information from all urban planning units, when for example the levels of motorization, the functional distribution or the provision of the city with social, technical, social and "green" infrastructure. In this regard, several priority projects for the development of the metro (Fig. 3) are in an advanced phase, also included in the program of the Mayor, Ms. Yordanka Fandakova, which are in different phases of research, communication and approval.

First of all, this is the development of the first metro line in the western direction from MS "Lyulin" to the Sofia Ring Road. This development is in the process of approval of the Detailed Master Plan, which will significantly ease the public transport movements of the residents of Lyulin 1, 2, 3 and 4 micro areas of the district. It is expected that in 2023 the procedures for approving the plan will be finalized, which will allow subsequent investments of the SM in the expropriation of the contact private properties and construction of the section.

The main advantage of this section is also related to the possibility of building a buffer parking lot at the road intersection of Tsaritsa Joana Blvd. and Ring Road, which would enable the limitation of work trips in the direction of Highway "Struma" and enable development of the area in contact with the residential area. As part of the program to improve mobility in the city and the quality of the environment, several more priority projects can be highlighted. The project for the development of the 2nd metro line in the direction of Studentski Grad is also in an advanced phase. There, after a series of public consultations, the development of a detailed development plan was started to secure the route from Cherni Vrah Blvd. to Studentski Grad (Fig. 4).

Fig. 3. Proposal to extend the Line 1 of the Sofia Metro – from MS Lyulin towards Ring Road, Source: Department "Architecture and Urban Planning"

The plan will be approved in 2023, which will enable a series of public investments in the adjacent districts "Krastova Vada" and "Vitosha VEC Simeonovo". The fact is that traffic jams on the main transport roads in the southern part of the city have increased significantly recently. This is due to the increasing levels of motorization in the city, which reached its peak in 2021, the poor condition of the car fleet, as well as the fact that most jobs are located in the territory of the central part of the city and compactly separated business centers. To this end, special attention should be paid to changing mobility and urban travel in order to permanently change public attitudes and adopt the notion that public transport can function as an extension of public spaces from home to work and vice versa. In this regard, the latest large-scale study was launched to connect the city to Vitosha and create a new intermodal hub located north of the Ring Road, which would connect the city to the mountain and create an opportunity to build a buffer parking lot and a bus station.

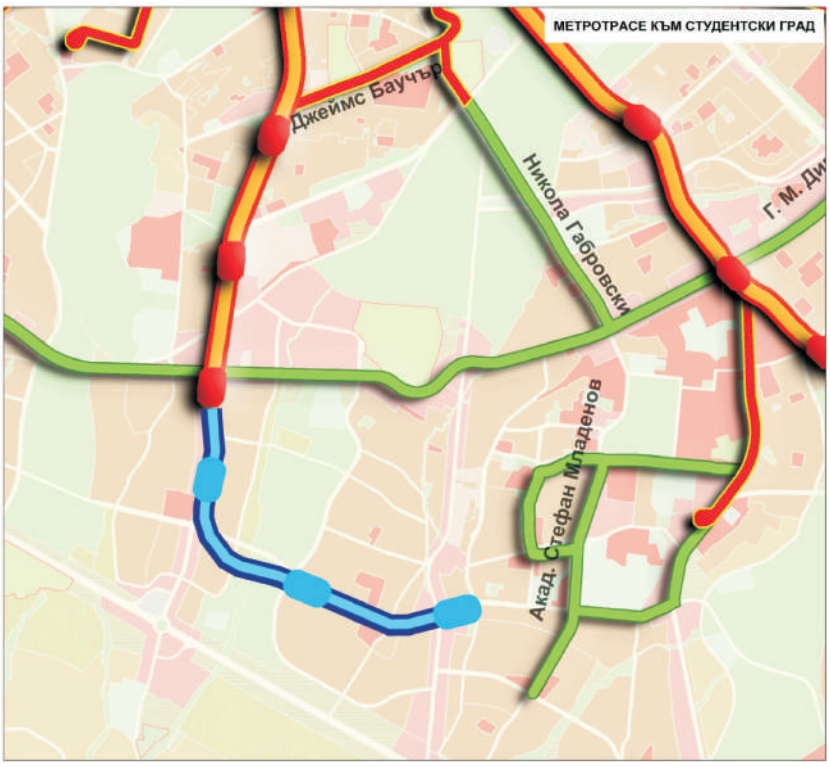

Fig. 4. Proposal to extend the Line 2 of the Sofia Metro – from MC Vitosha to Studentski Grad, Source: Department "Architecture and Urban Planning"

The Department "Architecture and Urban Planning" department assigned an analysis to the municipal company "Sofiaplan" to prove the expediency of connecting the Metro with the Simeonovo lift or connecting the hub with another alternative type of rail transport

It is currently evident that there is no shortage of ideas, theories, concepts for the construction of compact, modern and ecological cities, but before us as administrators of the urban planning process there are a series of specific urban challenges: increasing urbanization and labor migration to the capital, climate change, mobility, fuel scarcity and high energy consumption, social inclusion and many others.

The safety of today, when epidemics become a real problem and when people still perceive mass urban transport and public spaces as dangerous, make us rethink our urban policies to convince the public that our car is not a refuge, but rather the life of an increasing percentage of the inhabitants of the

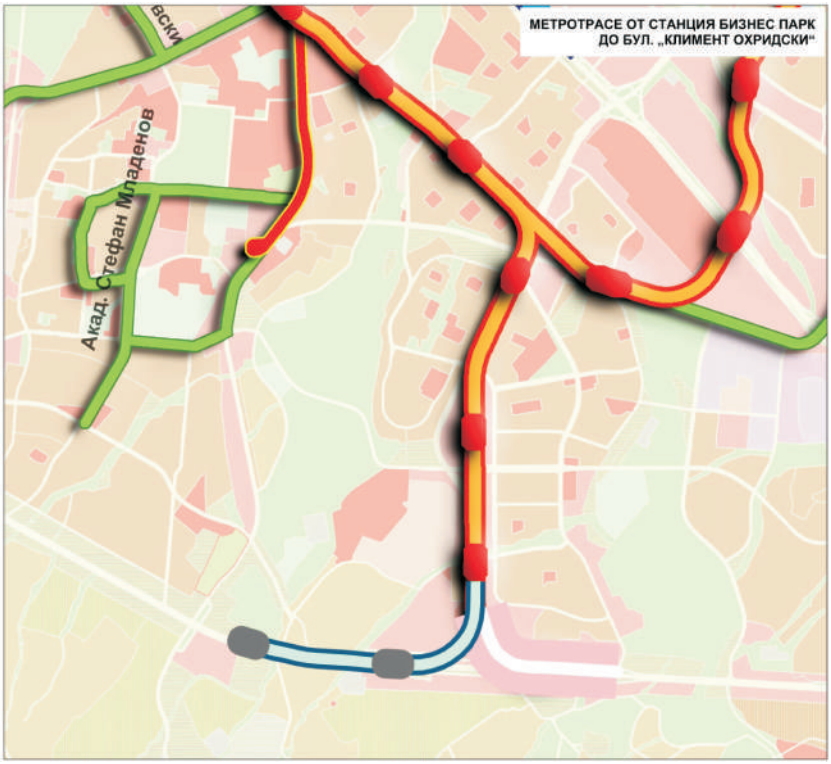

Fig.5. Concept for extending the Line 1 of the Sofia Metro – MS "Business Park" to "Kliment Ohridski" Blvd., Source: Department "Architecture and Urban Planning"

capital city for the last three decades has become permanently dependent on the private car. What we seem to need is a series of actions related to taking coordinated action to translate our visionary ideas into concrete management steps to make our city MORE WALKABLE, MORE LIVABLE AND MORE SUSTAINABLE, for to pass it on to future generations.

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