

MODIFYING PEOPLE'S DISPLACEMENT: ZONING AND TRAMWAY NETWORK PLANNING INTERACTION IN SOCIALIST URBAN DEVELOPMENT IN THE 1960-70s.

In the 1960-1970s the urban extension both in the Eastern and Western Blocs was based primarily on zoning. The zoning tool triumphed in the capitalist world from the beginning of the 20th century, with stabilization of the land market and social-spatial segregation being the main ideas. Zoning was also a simple and easy tool, used both with the urban planning process and separately from it, and therefore perfectly suited to the functionalist paradigm of the Modern Movement.

From the mid-1950s rationalization of the economy in Eastern Bloc, zoning, without any ideological problems, was used as the main instrument of land use control. Its development schemes were intimately related to urban transport infrastructure planning decisions. While in the Western Bloc zoning was developed in relation with motorized transport infrastructure, in the Eastern Bloc, in spite of having the dominance of road infrastructure planning, zoning was developed in relation to tramway networks.

From this observation some questions arise, such as - Why did the zoning paradigm triumph in the communist world? How did zoning interact with tramway network planning? And, how did this interaction influence urban structure and the movement patterns of people?

The objective of the article is to understand the factors which facilitated the usage of zoning and identify its level of interaction with tramway lines planning. In order to do this, the interventions in tramway networks such as extension, substitution and eliminations related to zoning schemes for the new urban extensions will be analyzed.

Finally, the article concludes that tramway lines were considered both as connective and segregated elements in zoning schemes, and that zoning was a powerful political instrument with the idea being to simplify people's movement necessities to provide economic benefits and social control.

Keywords: zoning, urban planning, tramway system, people's displacement, Eastern Bloc.

INTRODUCTION

"The new culture of rationalism was accustomed to the practice of decomposition of organisms into parts, and of recomposition according to functional rules, with the strong interest in the final results - the urban plan and the possibility of designing the constitutive elements - rather than in the processes and complexity of relationships".

F. Mancuso, 1980.

Zoning emerged in Germany at the end of the 19th century as a modern urban planning tool to provide public health through the avoidance of close proximity of incompatible functional activities. The control of long-term uses of zoning was also a very powerful tool for a variety of purposes. Mancuso (1980) explained with great critical clarity to what extent zoning in the United States was a triumphant instrument of economic control (stability of real estate investment) and social control (socio-spatial segregation).

From then on, it was integrated into urban planning as the tool of modernity related to the improvement of hygiene in the city. The expansion of industries on the outskirts of the city and the need to supply a huge number of workers led to the extensive use of zoning to define residential areas or to

order the development of cities. Subsequently, zoning was used to solve problems with the road traffic circulation, avoiding disorganized movement in cities via the creation of pedestrian zones.

Zoning is closely related to the city model and to the most relevant concepts of urban planning, including those related to accessibility and mobility. Zoning has been used as an integral part of urban planning but also as a separate tool for unplanned urban interventions.

It was a functional instrument with ideological uses and this characteristic solved very diverse objectives. It has been a seemingly simple, but always straightforward and often without enough technical justification, tool of modernity that has been used in the 20th century in both capitalist and socialist cities. In summary, the simplicity of zoning contrasted greatly with its effectiveness. While in the Western Bloc it was a way to stabilize the housing market, in the Eastern Bloc it was a way to control land uses. All of this may have contributed to its wide usage, irrespective of the different socio-economic systems.

In the USSR, zoning appeared as part of the process of industrialization and urbanization from the avant-garde period in the proposals of N. Milyutin, L. Ladovsky and others. Later, in the Stalin period, this tool was not clearly identified and therefore there was not clear functional zoning, divided mainly in: zone of construction, which contained all constructed zones in the city, protective zones and agro-zones. Zoning had a direct connection with the meaning of *organization of territory* through the division in separate parts. This though was related to different land division objectives like to define land suitability for different uses, sequence and type of construction, special protective zones, etc. (Organov, 1933, p. 76-77). During the period of Khrushchev, the intensification of the importance of rationalization of the urban structure related to the industrialization objectives with the absence of rapid relations between the residence and the work spaces conditioned the return to pure and strict single-use zoning.

Meanwhile, for the countries of Eastern Europe, the inter-war period was characterized by the development of the ideas of the Modern Movement, therefore, zoning was applied extensively in the practice of urban planning. It was a period of realization of the plans and projects, which the USSR did not have, which may explain the critical attitude to zoning in the post-war period held by those of the Eastern European countries. This resulted in the idea that zoning was a tool that should be applied in relation to existing city conditions in order to avoid abstract solutions (Abrosimov, 1958, p. 10). However, in both cases we can say that the zoning tool continued to work and was very important in socialist regime in determining the urban structure in new cities and in the reconstruction of existing ones.

From the mid-1950s zoning was applied as the main tool in urban theory. The power of this tool can be seen in its influence on the change of urban structure, on the shaping of urban transport infrastructure, on the relationships between activities, etc. The most important changes occurred in the layout of the road and tramway infrastructures. Among them, if the road infrastructure was easily changeable and adaptable to the new ideas of urban planning, the tram networks presented a powerful urban transport mode that built the general urban structure. Tram network was developed with special attention as a powerful transport mode which provided separate functional areas with accessibility and connectivity.

From this observation, there are questions such as - Why was zoning adapted and successful in communist countries? How were decisions made with regards to the (re)planning of tramway networks and the location of areas interacted? Did zoning always dominate urban planning decisions? When were transport qualities important? What factors and qualities were of primary importance in the changes? And, which factors and qualities were adapted to existing situations?

The objective of this research is to propose an approach to the understanding of the factors or reasons for the success of zoning in the Eastern Block, to understand the interrelationships between urban planning and tramway lines, as well as with urban models. This will be done through the analysis of the UrbanHist Conference 2018

urban and transport planning theory of the USSR, Czechoslovakia and the GDR oriented to define spatial characteristics and influences between zoning and tramway networks.

It will be concluded that zoning was a very simple, but at the same time powerful and manageable tool to ensure control over changes in the city, especially from the perspective of the industrial city. It was also seen as a tool to simplify the diversity of the city, favoring genuine social control and the depersonalization of human relations. Both in the Western and in the Eastern Bloc, single-use zoning and automobile-oriented planning triumphed. The functional city and the concept of modernity could go hand in hand, but their practical, socio-cultural and everyday sense was quite different.

As for its relationship with transport and fundamentally with the tramway networks, there was an important influence of tramways that determined the location and direction of land use development. At the same time, these influences of tramway network were always correlated with the needs and models of zoning.

II. THE BEGINNING OF ZONING AND ITS JUSTIFICATIONS IN MODERN SOCIALIST PLANNING

The announcement of the new direction for the industrialization of the Eastern Bloc countries needed the development of the new socialist urban planning theory. From the beginning, it was understood that the problems of transport and settlement in the city are the two most important issues in urban planning. The question was how to separate and at the same time relate land use and urban transport infrastructure. To this end, at the end of the 1950s the idea of the scalar hierarchization of the two was proposed, which found an extensive dissemination in urban planning due to having a clear mechanism in the spatial relationship and the distribution of traffic. The experimental research projects, therefore, aimed to test the relationships between separate urban elements. One of the ideas for making this transition to rational planning more quickly was the exchange of ideas through visits, conferences, and translations in urban planning practice, with special attention paid to the issues of the spatial organization of transport and traffic, the location of land use, the relations between industry and residential spaces, and the distribution of passenger flows.

One of the important documents in this exchange of ideas was the report of CIAM, 1958 in Moscow where most of the questions in the interview were about solutions in urban structure, land use and urban traffic, and not so much about heritage, landscape or urban design issues. In this report it is interesting to compare the responses of the USSR, GDR and ČSSR on the principles of zoning. The similarities between them gave an abstract and not well-defined understanding of the types of zones, their proportions and spatial relationships. In spite of this, the importance was evident in the problem of the relationship between the residential areas and the work areas that had to have a close location, fast and specialized accesses. A major difference between these countries may be that in the case of ČSSR and GDR, it was expressed concern about the schematic nature of zoning and the need to overcome it through its relationship to existing city conditions (Abrosimov, 1958, p. 10). In general, the principles regarding the functions, spatial relationships and proportions of zoning were not yet explicitly explained. Possibly because the experimental work was not yet finished, and time was still needed for discussions and the consolidation of generally agreed zoning principles.

In connection with this problem, the American planner Harland Bartholomew's book "Land Use in American Cities" (published in 1953) was translated in 1959 in the USSR. The main interest of translation was mainly related to issues of proportions of different areas in cities, statistical calculations that did not exist then in Eastern European countries. H. Bartholomew¹ was an important figure in the establishment of zoning in the USA and worked on this issue from 1912 (Berton, 2017, p. 9). One of the criteria of his zoning method was scientific planning based on abstract models and rigid calculations of different zones'

¹ Harland Bartholomew was the American engineer, the planner of the city of St. Louis between 1915 and 1953. In his methods he calculated the proportions and quantities of demographics, land use, transport and street use. Their main concern was economic benefit through planned urban planning according to rigid calculations that ensured beneficial results (Berton, 2017).

proportions. From the prologue we can find that zoning was important for socialist urban planning because of the opportunity to establish balance in the development of cities, in spatial relations, in the proportions of functions, demands and offers. The two main objectives of zoning according to E. Y. Volfenzon were "*the establishment of rational planning and organic development*" (Bartholomew, 1959, p. 7). In short, the main reason for translating his book in the Eastern Bloc was the possibility of anticipating the results and the economic benefit supported by the rigidity of the land-use calculations.

On the other hand, we must admit that *single-use zoning*, with the idea of specifying internal processes, was very similar to the ideas of the Athens Charter, 1933, applying the same types of functions as residential, industrial, transport and recreational areas, the use of which was explained by the biological reasons of human beings. Similarly, in the text of D. Dorotnyak² (1969, p. 39) zoning was also explained from a bio physiological point of view with the need to *provide human life with a harmonious rhythm and avoid conflictive situations*. With all this in mind, this similarity between different political-economic systems makes it interesting to understand the reasons for applying zoning, proposing the following reasons:

I. The first reason was *the simplicity of the zoning tool*. The scale of the process of socialist urbanization was enormous; the urgency of planning and construction carried out in a short time to think conditioned the importance of zoning. This was possibly because it is an efficient tool to avoid mistakes and to have the results expected in the economic development of socialist cities. Zoning did not need to think much for the planners; it was understandable for the administration and valid for its security and flexibility in use. The pieces of the land use and their compatibility were composed and recomposed according to the criteria of accessibility with urban transport, the needs of industry, connectivity with the main center, etc.

II. Zoning was *a tool for depersonalization of people* through the separation of human relationships. This can be explained by the ideological importance of the collectivization of society and the limitation of the individuality of people. Through zoning with its implications in limiting the diversity of the city and simplifying the qualities of the urban space, the control of the variety of people's ideas was achieved. Thus, spontaneity in the face of spatial planning was seen as the threat to ideological control.

III. Zoning was a convenient *tool for overcoming social imbalance*, one of the most important postulates of the socialist city through the establishment of spatial uniformity and homogeneity in cities. While in the Western Bloc it was mainly related to the idea of social group segregation and economic control of land use, in the Eastern Bloc there was no intention to isolate and distinguish social groups, on the contrary, the intention was to balance the distribution of land use to achieve balanced access for all people. This idea of spatial equality and homogeneity was widespread, before translating and conducting some research projects in the 1970s (Chorley., Haggett, 1971., Merkulova, 1972) which presented spatial inequality as an inevitable attribute in city planning.

IV. And finally, we can mention the idea of *efficient and productive displacement of people* in the city. The idea of the machine city of Le Corbusier³ triumphed in the socialist regime because it responded to the needs of industrial production. As Le Corbusier noted in his project La Ville Radieuse, 1935: "The problem lies in urban planning, at a precise point: reducing 'dead' times between two fundamental functions: 'being at home' and 'going to work'". These ideas matched well with the new policy of streamlining city planning to provide effective and rapid industrialization.

² "the function" according to D. Dorotnyak meant a relative, contingent and specialized activity. According to him: "For the analysis of the function of the city it is necessary to know the functions of people. Segregation of duties makes people's work more rational, more effective, better controlled" (1969, p. 40-42).

³ about Le Corbusier's machine city, see the book by Xavier Monteys "La gran máquina. La ciudad en Le Corbusier", Barcelona, Ediciones del Serbal, 1996.

Therefore, the mobility⁴ of people in the Eastern Bloc was not only undesirable for reasons of social control, but also for economic reasons. The solution to the problem of urban traffic was related to the limitation or stabilization of the movement of people in the city.

The high mobility of people was related to the loss of time and energy. The architect M. Sukholutsky, for example, in his article "Raschety passazhiropotokov v gorodakh" (1966), explained that the mobility of people was the factor that destroyed rational relations in urban transport. The author stated that "the growth of people's mobility brings negative economic effects, because people *spend the energy that could be spent on work and social activities*" (p. 36).

In general, all these implicit reasons for the use of the zoning instrument were justified by other reasons that were very similar to those of the Western Bloc. The most important of these were hygienic issues and, the improvement of urban traffic functioning. With the urban growth and even more functional separation of the territory, zoning needed to be related to rapid urban transport, mainly to tram systems. This received special attention from socialist regime authorities, resulting in the concern for integrated planning between the zoning and the tramway networks.

III. ZONING INSTRUMENT AND ITS EFFECTS ON THE PLANNING OF TRAMWAY NETWORKS

"Traffic and its quantity are not accidental, but the consequence of the distribution of resources and objectives of passenger travel."

R. Surový, 1976, p. 346.

In the 1950s and early 1960s, zoning reached its most important development, and this was equivalent to the end of the urban structure. It then became the utility of the urban plan that preceded other factors in urban planning in defining the development of the city and tramway networks. Direct connections and short time accessibility between traffic generating and traffic absorbing zones determined spatial solutions for the whole urban planning. Thus, early ideas of zoning in the socialist urban structure in the 1950s were related to a parallel and concentrated location of industrial and residential areas with direct accesses, something similar to the ideas of N. Milyutin³, 1930. In larger cities, urban sprawl was organized through satellite cities concept as the mode of regulation of urban growth where industry and population were developed in a self-contained community (Hall, 1979, p. 170), that was also related to the previous ideas of the avant-garde period of the 1920s. Both concepts presented the basis for understanding the rationalization of urban structure in the 1950s - early 1960s. The difference was that these models developed questions about the relationships between functional areas through the planning of the socio-cultural infrastructure, green spaces networks located in relation with urban transport infrastructure network.

From the mid-1960s, the process of a scientific revolution began, resulting in the development of light industry. Because of its character, light industry did not need the large, concentrated areas as was the case for heavy industry, which resulted in the fragmented and dispersed nature of its spatial location. All

⁴ mobility of persons was divided into two types: general mobility and mobility with urban transport (Goltz, 1981). *Mobility meant quantitative indicator of movements intensity* (Efremov, Kobozev, Yudin, 1980, p. 170), which not included different motives in

the movement of people. Instead, travel objectives were planned according to established functional zones. Therefore, the mobility of people here can be explained as the planned organization and distribution of quantity and direction of people's movements. This in general could be named as "*planned displacement of people*".

⁵ according to G. Goltz the stability of people's overall mobility was related to the stability of time expenditure for travel. In the USSR, with low car use, this was between the 1930s and 1970s within 780-1200 times of one-year movements for a person (1981, p. 160-161).

this needed to reconsider the existing urban structure in terms of relations with other functional areas in order to provide the best accessibility between them. The dispersion of industrial zones and urban growth resulted in a new urban model, which was called settlement groups. As the main solution it is considered the possibility to make the relations work and home closer and to eliminate the needs in fast urban transport (Smykovskaya, 1972, p. 37).

Within this process, preference was given to urban extension, rather than to urban reconstruction, which was seen as a costly process. Urban extension was related to important issues such as the organization of new passenger flows and the connectivity of new areas with the existing city. The concept of the satellite city no longer met the needs of the socialist city. The change from the satellite city to the city model in groups of settlements was explained by E. Hrushka in his book "The City Theory", 1972: "Satellite cities did not perform their function of alleviating the growth of major cities" (p. 241). The problem was the need to ensure the productivity of cities in this urban growth through the maintenance of important spatial relationships between functional areas. Within this intention to create the combined zones, the idea of homogeneity of the zones was still valued, understanding the complexity of the urban structure as the dispersion of the industrial zones with a smaller size within the city (Fig.1).

Zoning with urban characteristics such as relative location, number and direction of passenger flows, the importance of pedestrian traffic, and, direct accessibility between industrial and residential areas was an important tool in determining the development of tramway networks. In this connection, the following influences can be distinguished:

1. The size and form of the areas influenced the configuration of the tramway networks.

The shape and size of the grid zones related to motorized traffic needs and economic issues required an '*optimal*' density of the transport networks with larger dimensions (1x1, 1.5x1.5 km). The grid form with its advantages of segregation and specialization of the different types of traffic, resulted in the elimination and adjustment of the configuration of the tramway networks to the central part, as well as the planning of the new lines according to these criteria in the periphery. This was accompanied by the importance of creating pedestrian and traffic-free urban transport functional zones which affected the elimination of tramway lines and their displacement to the periphery of zones.

2. The importance of the relative location of zones and its influence on the configuration of tramway networks.

The search for a *compact composition of zones* related to transport infrastructure which was accompanied by numerous alternatives became the main task of urban planners. The main criterion in the location of land uses was the balanced distribution of traffic and the reduction of travel time. This led to the need to change existing patterns of people's settlement and thereby change the patterns of their movement. Thus, the problem of transport and traffic was closely related to the problems of human settlement (Vsesoyuznoe soveshanie po gradostroitel'stvu, 1960, p. 119). To this end, a matrix of short and rapid relations was established between the important areas such as between the residence and industry, the central areas, the train station, the airport, the large parts of the city such as sports facilities, recreation areas, etc. (Fig. 2 and 3). In the new cities, the composition of the zones was mainly created according to these principles, while in existing cities the main idea was to locate the new zones around the points of attraction, whereas new directions in urban development were created with great attention and

supported by their own working zones. Finally, this zoning logic affected the planning of the tramway lines, determining their direction of development and the geometry of the networks.

³ The ideas of N. Milutin (1930) were among the first to rationalize the urban structure in the USSR, which remained as a concept, important for a defined development of spatial relations between residence and industry, a formula for accelerating industrial production (See the article by K. Frampton, "Notes on Soviet Urbanism, 1917-1932", in the book "Urban Structure", D. Lewis, 1968). Interestingly, the question of urban transport planning, both in Milyutin's ideas and in the work of other avant-garde artists, was not defined taking an abstract and sometimes utopian form.

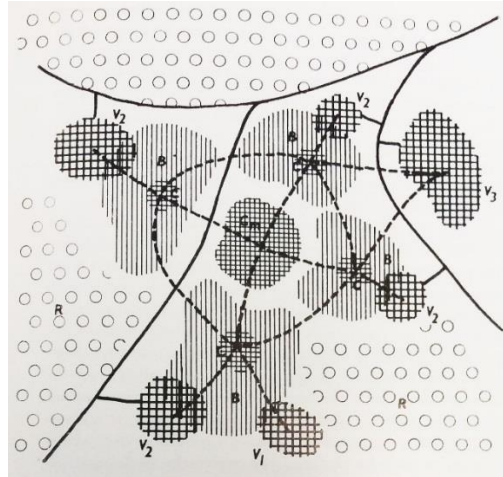


Fig. 1. Diagram of the distribution of the basic functions of the city. B - housing, Cm - city center (central area), C - district perimeter center, V1 - peripheral production center (primary sector), V2 perimeter production center (hygienically harmless secondary sector), V3 - production (hygienically defective), R - recreational areas. Source: Tibor Zalčík, Príspevok k formovaniu struktury mesta, *Architektura a Urbanizmus*, №, 1973, p. 31. The complexity of zoning understood as a dispersion of industrial zones.

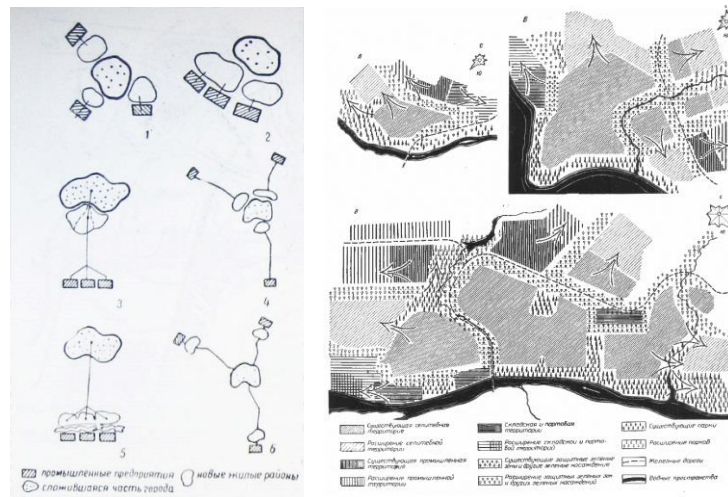


Fig. 2. Diagrams of the possible location of working and residential zones. Source: N. K. Polyakov. *Osnovy proektirovaniya planirovki i zastroyki gorodov*, 1964, p. 178. The intention to cover the all possible geographical situations of cities in order to create pre-established relations schemes between the existing city, new residential and industrial zones.

Fig. 3. Schemes of the extension of city areas in relation to their size. Source: N. K. Polyakov. *Osnovy proektirovaniya planirovki i zastroyki gorodov*, 1964, p. 176. The parallel extension of residential and industrial zones.

The most important spatial relationship was between residential and working areas. As mentioned at the Union-wide Conference on Urban Development in USSR in 1960: "The main conditions for the successful solution of urban traffic require the creation of comfortable relations between residence and industry" (p. 122). The planning of these two areas has a two way relationship: the location of residential areas with their effect on the location of industrial areas, and, vice-versa. In linear models these relationships were transversal, tramway lines used to have a ring or linear configuration to collect workers' flows. In the radio

centric models, the residential areas were located close to the industrial areas by connecting with a tram line. Sometimes, they were combined with the passenger flows of the main centre (periphery-centre-periphery), which complicated urban traffic and resulted in the need for the construction of additional tram lines on the periphery of the main center. In the case of Bratislava, for example, this impossibility of creating the industrial zone next to the new districts in the western part of the city, as well as the coincidence of labor and socio-cultural flows, generated the concern and discussions of the planners, resulting in the temporary solution with a new tram line built in 1979 on the periphery of the historic center.

Among other important relationships it could be highlighted the criterion of the compact settlement of people in relation to the main centre. The monocentric urban model and the ideological importance of centres in socialist cities needed to provide connectivity of all functional areas with the main centre as was considered to be the core of the city. This influenced the planning of the new tram lines that gave access to the residential areas to the distributive ring or tangential line around the centre.

3. The density of the zones as a determinant of the planning of the tramway networks.

The importance of accessibility radio in functional zoning decisions is sometimes mentioned as one of the intentions to relate existing urban features, morphology and densities to the planning of urban transport networks. As noticed by Z. Merkulova: "This helps to describe the functional relationship between land use character and traffic quantity" (1972, p. 91), (Fig. 4 and 5). In short, this division by zones gave the idea of what kind of solutions have to be applied in tramway networks planning. In the dense central areas tramways were resolved in tunnels, overpasses or with exceptional tramway traffic streets; in the medium zone with less density tramways had more space for their location in separated platform and were adapted to the grid form of the new residential districts; in the peripheral area tramways were planned in independent platforms from motorized traffic infrastructure, had separated intersections and more distance between stops.

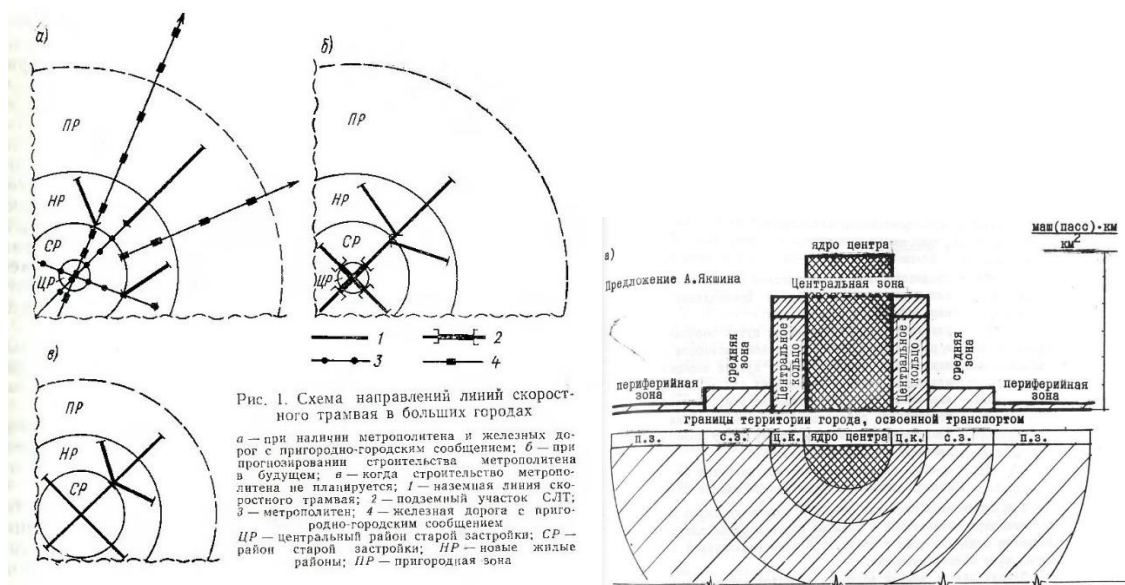


Fig. 4. Fast tramway development scheme in relation to the densities of urban areas. Source: V. Khitzenko, 'Skorostnoi tramvaj', Leningrad, Sroyzdat, 1976, p. 25. The length and type of tramway solutions depend on the densities of the areas.

Fig. 5. One of the models used in the analysis of spatial inequality of urban traffic. A. Yakshin's proposal. Source: Z. Merkulova (1972) The inequality of zones' density determined the inequality in tramway networks planning solutions.

4. Fragmented urban structure and connections to suburban areas (up to 25-30km)

A considerable amount of passenger traffic resulted in the planning of special tramway lines. The spatial fragmentation of working zones was understood as the complexity of the urban structure that required

rapid urban transport. There was not always the possibility of locating the areas close to each other, sometimes large residential areas with complex services needed land for their construction, in this case new tram lines were the only fast and economical answer. For example, different solutions were considered to establish connections between working and residential zones outside the city: 1. change the settlement of people to the near city location, 2. build a working area near residential areas, 3. improve connections with public rapid transit (Goltz, 1981, p. 50). In most cases this was solved by planning new tram line.

There were also cases where large industrial areas influenced the planning of tramway networks. In relation to this V. Shabarova noticed that (1986, p. 144): "The fragmentation and lack of compactness, in most cases in cities with the mining industry. This specificity has its mark on the configuration of transport networks". In relation to this, we can highlight some cities with mining industry such as Ostrava or Karaganda with fragmented urban structures and with a disproportionate location of areas which resulted in the need to create an irregular tramway network. Also, cities with steel industry located outside the city as in Košice with a specialized tram line for workers. All these aspects were affecting the modification of tramway network geometry.

IV. THE GROWTH OF THE POTENTIAL OF TRAMWAY NETWORKS, THEIR INFLUENCE ON ZONING AND THE URBAN MODEL

"The role of transport is not to completely change the location of people and industries, but to transform the functions and hierarchies of settlements and industries, their territorial growth and their level of coherence"

G. Goltz (1981, p. 31)

Since the mid-1960s, the role of tramway network planning has been growing. The technical characteristics, the spatial separation, the management of tramway operation and the idea of creating a consolidated transport system affected both zoning solutions and urban planning. This importance of tramway systems in urban planning did not suddenly appear and has evolved since the electrification of trams in the late 19th century. The electrification of tramway systems was an important technological innovation that brought about the growth of people's mobility and the growth of cities in the years 1920-1930⁵. The electrification of trams not only meant the growth of speed, the extension of the service area, cheap transport prices, but also the possibility of implementing this service and its acceptance by society. All this led to an urban transport revolution in Europe (McKay, 1976, p. 240). These processes also took place in the USSR, although the electrification of the tramway was not so widespread due to the delay in the process of industrialization and the problems in the production of tramway transport. However, these developments were not integrated with urban planning and was rather developed in the form of radial lines to establish connections between the urban centre and the new residential and industrial areas.

This continued with the 2nd technological modernization of trams in the 1950s, with the improvement of dynamic features such as speed (from 15km/h to 25-35km/h), acceleration and deceleration time, increased wagon capacity (growth to 220-260 people), (Skalov., Mijeev, 1972), noise limitation, etc. The technological improvement together with the ideas of the separation of tram traffic through the spatial solutions such as the possibility of using the reserved platform, the separation of levels through their location in tunnels and overpasses gave a certain attractiveness to tram transport. These characteristics converted the tramway system to the *rapid transit system*. It should be noted that these ideas existed from the 1920s to the 1930s but were not widely applied in practice. Probably, because there was no urgent need to implement it, there was not so much urban growth, industrialization had not yet reached its maximum development and finally, problems with road traffic had not yet appeared, etc. As Hilton

⁵ On the electrification of trams, see works such as "A History of tramways: from horse to rapid transit", Buckey, R. J., David & Charles, 1975, "Tramway and Trolleys The rise of Urban mass transport in Europe", McKay, J. P. New Jersey, Princeton, 1976, "Suburbanizing the masses Public Transport and Urban Development in Historical Perspective", Divall, C., and Bond, W., Ashgate, 2003.

(1969, p. 127) mentioned: "Rapid transit was the adaptation of basic tramway technology to the conditions of intensive demand".

With this improvement, especially related to the growth of speeds, trams were no longer only for urban but also suburban use. Remote residential areas, industrial areas, nearby cities, recreation areas or other points with large passenger loads could be connected to a tramway system. It also became an accessible mode of transport that facilitated the solution of urgent economic problems with urban transport. Initially, tramways helped to execute the satellite cities model, and later the idea of the agglomerations and urban development in groups of settlements. In comparison, the metro was used to create the developed image of socialist cities, but only a few cities had it, while most of the cities with the size from 150,000 to 800,000 inhabitants, or even 1 million, continued to rely on the tramway system. Thus, it could be seen the strategic importance of trams as the main mean of providing for the urbanization and industrialization of socialist countries.

All this required thinking of it as the integrated transport system with a relevant relationship with the urban model. This consolidation of separate lines and spontaneous development into a system of tramways related to the land use system created the *basis of the socialist urban model*. In other words, the rational solution of these two issues defined the development of the whole urban structure. This process sometimes went hand in hand with the process of urban extension, but mainly the planning of tram networks came after urban planning.

The integration of the urban planning process and the tramway system can be explained by the concern for the accessibility of large passenger flows to the attraction areas. For example, in the case of Dresden, the tramway in both the urban planning and construction process went hand in hand with the urban planning, from the very beginning solving the accessibility of people with the main centre and working zones (Fig. 6).

On the other hand, there were cases where the planning of tram networks came later from urban planning. These cases are mainly found in the new cities where, due to their small size, they were based on buses. Sometimes the development of cities was also foreseen with the reservation of space in the middle of the street for rapid urban transport being traced in the important directions and areas. This can possibly be explained by the fact that trams were not popular with planners, which coincided with the period of high deployment of buses and trolleybuses (in the late 1950s and early 1960s) as the more flexible and faster modes of transport. However, as cities began to grow rapidly, public motorized transport could not meet the time and economic criteria resulting in the introduction of modernized tramway systems. This scenario of further tramway development can be seen in some cities of the USSR such as Volzhsky, Naberezhnie Chelny, Angarsk, Tselinograd, etc. The tram lines were introduced in the middle of the streets, adapted to the grid network and the existing urban structure (Fig. 7).

Thus, the problems of inadequate access time became the main threat of malfunctioning of cities. The impossibility of the zoning instrument together with the idea of balanced distribution of traffic flows to control the accessibility criterion of 30-40 min resulted in the importance of rapid urban transport planning, mainly the tramway system. Among some of the most important influences of the tramway networks to the zoning it could be highlighted:

1. Consolidated tram network with the powerful passenger traffic defined the direction of the location of the zones.

The tram networks were difficult to change because of their established connections with important land uses. In most cases, only a few changes were made in relation to the idea of minimizing the density of their networks, especially in the central part of the cities. V. Cherepanov in his work "Transport in the City", 1964, stated that in the planning of the general scheme of mass surface transport, the possibility of *maximum maintenance of the existing tramway networks must first be defined* (p. 31). Tramway networks previously served to provide connectivity of important areas such as city center and industrial areas, presented a consolidated network of spatial relationships between these important areas. Therefore, the preservation of tram lines was a quick and economical response where other functional zones were adapted to the spatial characteristics of existing tram network.

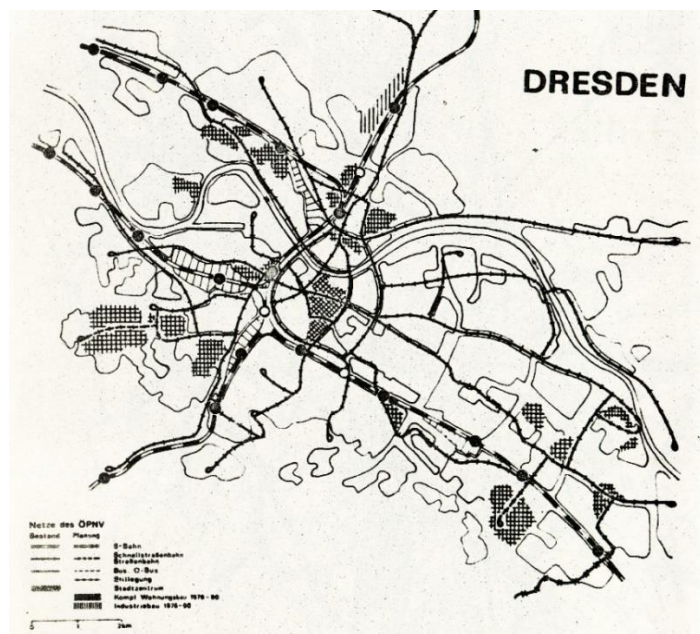


Fig. 6. The proposed urban transport network in Dresden. Source: Erkenntnisse und Erfahrungen aus der Begutachtung von Generalbebauungsplänen ausgewählter Städte, Verlagsort, Berlin, 1977, p. 42, The location of new residential areas in Dresden in relation to existing and new tramway lines.

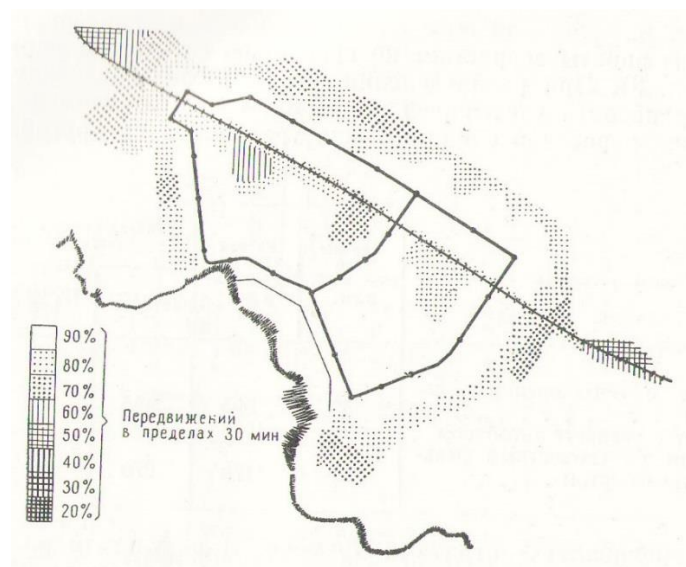


Fig. 7. The new city Tselinograd, USSR, 1963, The main road network and the degree of accessibility to the main zones. Source: Shkvarikov, V. Tselinograd. Opyt Proektirovaniya, Moskva, Stroyizdat, 1964, p. 122. Reserved platform of 10m (required for two lines of any type of rapid public transport) in the middle of the main road network, in relation to the main areas of the city.

The existing tramlines had the capacity to accommodate urban traffic within the time limit, resulting mainly in their extension to the fast tram system in peripheral areas (Fig. 8). In most cases, these directions also had the possibilities to create a continuous tramway flow of traffic with sufficient street width, infrequent intersections, the possibility for the isolation of pedestrian traffic, etc.

2. Accessibility⁷ and connectivity⁸ of tram lines as an opportunity for the location of new functional areas. Tram lines with regular accessibility conditions (along the line with 1-2 connections) both within the city and on its periphery were used for the location of residential and industrial areas. While better connectivity and accessibility created conditions for locating certain important areas. Similarly, the growth of industrial areas required the planning of new tramway line directions to improve their connectivity and accessibility with the whole city.

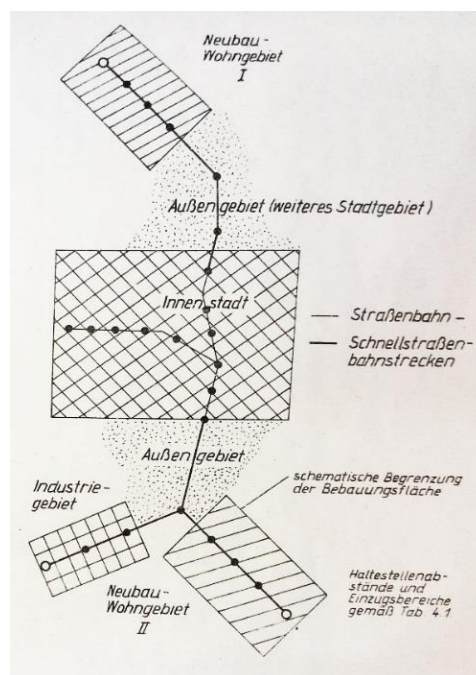


Fig. 8. The planning of fast tram lines as an extension of existing itineraries. Source: Richtlinie für die Planung und Gestaltung der verbesserten Strassenbahn - Schnellstrassenbahn, Mimisterium für Verkehrswesen, Berlin, 1976, p. 6.

The importance of the connectivity of urban zones could also be highlighted and this was accomplished by connecting them with tram line routes. Although there was a need to create the straight configuration of the lines (with the importance of the non-rectitude coefficient for the urban economy) for fast and economical access, the criteria of connecting more points to each other was more important which defined the form of tramway line layout. Therefore, there was an intention to create a continuous system of tram lines and stops in order to collect passenger flows and direct them to attraction points such as the airport, industrial areas, main hub, recreation areas, etc.

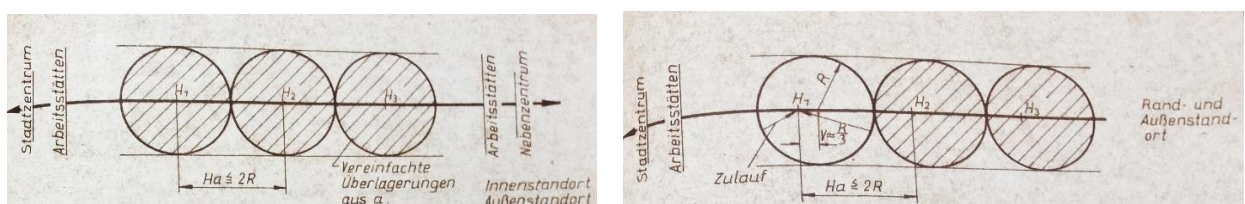


Fig. 9. The location of the residential areas between the working and the central zones. The location of residential areas with unidirectional access with work areas and centrality. Source: "Verkehrliche Anbindung von Wohngebieten", Zentrales Forschungsinstitut des Verkehrswesen der DDR, Berlin, 1973, p. 161.

At the same time, however, the sequence of the zones on the tramway route was not a spontaneous issue and was conditioned only by the tramway lines, in most cases meeting the criterion of the relative location of the zones. Thus, the residential areas were located on the tramway line which had as its intermediate or final point the industrial areas and the central areas to avoid the mixing of passenger traffic (Fig. 9).

3. The change of tramway lines in order to establish desirable urban models.

This causal relationship is not always certain and defined by having intimate and complex relationships. It is possible to highlight the development control actions of certain tramway lines to maintain the urban model, or vice versa, to extend the tramway lines in some directions to create certain urban models (linear or radial-circular, with proportions of 1:1, 1:2, etc). A strong relationship between tramway line planning and urban planning led to the use of tramway networks to control its development. The different examples of these actions can be found in the extension of cities such as Yaroslavl, Tula (USSR), Erfurt, Cottbus, Magdeburg (GDR), Brno, Bratislava, Košice (ČSSR) where the geometry of the tramway network created the conditions to create certain zoning and urban models.

Thus, some residential areas did not develop, although they had favorable conditions for it. The planning of the tramway networks responded to the economic criteria, first, it was preferred to develop two or three tramline directions arriving at the linear configuration and then in other directions taking the form of a circle or directional grid models. Through the planning of the tramway lines, the land use system was changed, which led to the control of the development of the city model. As stated by architect G. Smykovskaya (1972): "The transport network is used as a tool to change the way it is used and the functional differentiation of the territory".

In general, the relationships between zoning and tramway network planning can be summed up in a diagram (Fig. 10). The scheme presents the main characteristics of the interaction between zoning, tramway network planning and urban model, which was affected by the political and economic contexts changing their degree of interaction.

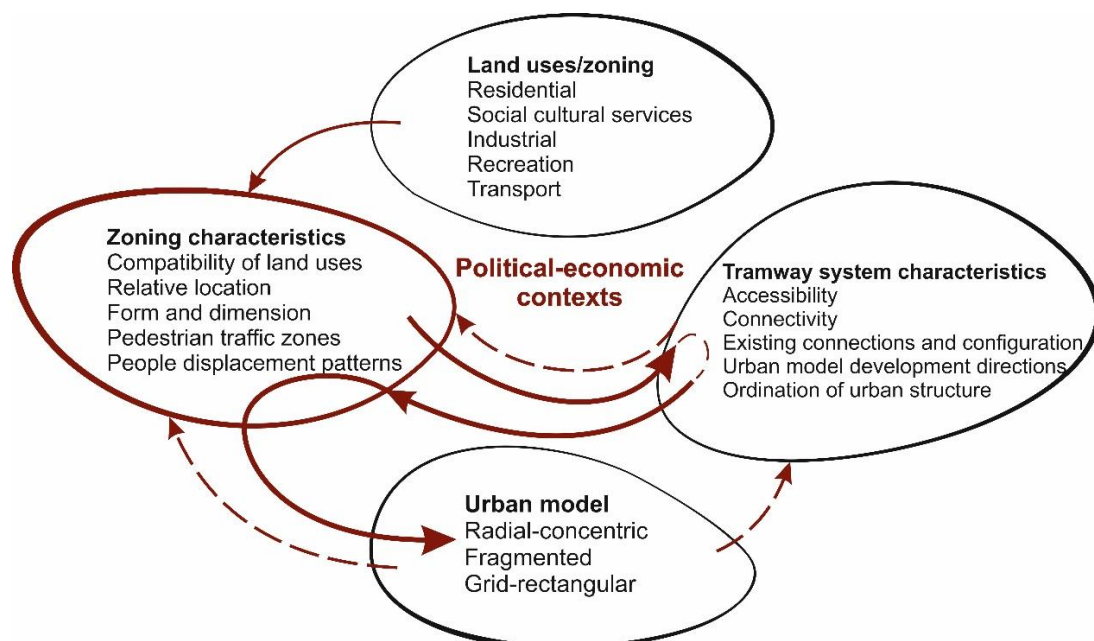


Fig. 10. Characteristics and interaction between zoning and tramway networks. Elaborated by the authors.

⁷ Accessibility is the relative value of a place, defined by its location in relation to the transport system, in the operational sense it is a changing parameter that characterizes centrality or proximity to other functions and places (Smykovskaya, 1972, p. 35).

⁸ about connectivity O. K. Kudryavcev and Y. P. Bocharov in their book "Planirovochnaya structura goroda", 1972, p. 113: Connectivity is one of the main characteristics of the transport structure. The growth in connectivity is good for direction selectivity, and therefore reduces travel time. At the same time, however, this leads to an increase in the length of the networks and the number of intersections, i.e. to an increase in the price of the transport system. Hence, a differentiated approach to districts with different functions is important. The main center must have the maximum connections, while for other areas it is sufficient to have two or three connections".

VI. CONCLUSIONS

Functional zoning was an important tool in the Eastern Bloc that did not fit in with the socialist ideology of collectivization and the improvement of social relations. In spite of this, it became the main tool of the new theory and practice of socialist urbanism in the mid-1950s, because it responded to various political and economic motives of the communist state at the same time. This, in turn, clearly demonstrates the prevalence of these aspects over the social aspects of the socialist city phenomenon. The main reason for this was the importance of the accessibility of the working areas carried out through the zoning instrument, which basically defined the model of the tramway networks, the patterns of people's movement and all urban planning process.

Within this idea, it could be noted that there was no specific model of interaction between zoning and tramway networks, as it was adapted to political - economic needs and changes. As G. Werner (1967, p. 48) noted, the socialist economy was an "*improvised economy*" which explains a constant change in the methods of urban planning. Among the most important criteria for zoning and tramway network solutions are: minimum costs and greater economic benefit, ideological control, assurance of controlled and planned future development.

As for the interaction between the tramway system and the zoning, even though it seems that the tramway was important for preserving its layout, orienting urban development, defining accessibility and connectivity of areas, zoning continued to be the determining factor in urban planning. Changing the areas was easier economically than changing the tramway infrastructure that needed time for reconstruction and later urban structure changes. This was not possible within a socialist economy policy oriented towards rapid economic results. In this socialist urban development model, in most cases, zoning was adapted to the existing tramway system only if it matched the pre-established land-use models, otherwise, the tramway networks were changed or modified in relation to the ideas of zoning.

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