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THE ROLE OF THE PUBLIC TRANSPORT SYSTEM CONFIGURATION IN THE COMPACT URBAN FORM OF THE SOCIALIST CITY IN THE 1960s

Abstract. In the 1960s the scientific progress in traffic engineering and transport development brought new possibilities, methods and demands for changes in the urban form and structure. A socialist city was oriented towards the implementation of a double objective: a city for both automobile use and for public transport. The urban structure was planned to provide the conditions for car use, while the unlimited growth of this reticular structure was expected to be controlled or ordered by the closed configurations of the public transport network. These ideas were similar in Eastern Europe, the USSR, and Great Britain. The objective of the article then is to understand the causes of applying different configurations of public transport networks and, the effects they had on the urban form. This will be approached with an analysis of urban planning methods and public transport in the cities of the Eastern Bloc. Compact urban form was strongly related to the coherence of the city structure and its flexibility for possible future development. The basic criteria for planning were the equal distribution of passenger flows, continuity of the trip and frequency of transport which changed their spatial interpretations during the period.

Keywords: Public transport, urban form, socialist city, USSR, Eastern Europe.

"During the 1960s and beyond, urban planning and, above all, the so-called urban economy made an enormous disciplinary effort to see how the form of transport networks expressed in terms of accessibility or coverage indicators affected the location of activities by means of the usefulness that gave them a certain territorial position."

Manuel Hecce, 2009

Introduction

These words allow us to understand that the 1960s was the period of time when interrelationships between traffic engineering, transport and urban planning began. It was the period when fast, motorized and suburban transport entered into competition with each other, and they needed both coordination among themselves and a change in urban structure. This issue was the problem faced by the Eastern Bloc planners along with the problem of the rationalization of their planning decisions. On the one hand, providing people with public transportation was a basic need to ensure the social and economic development of the country. While on the other hand, the development of the transport infrastructure was also related to motorized transport for the future development and the creation of a society which had an image of both progressivity and modernity. The complexity and novelty of the problem led to a variety of solutions that were aimed at finding a balance between the compactness of urban forms and economic issues.

The main ideas of the Eastern Bloc planners were based on the work of the British engineers who similarly searched for solutions in traffic planning which were oriented towards urban compactness. One of them was Alker Tripp (1947) who, during the post-war period, proposed several solutions in urban design to separate the flows of road and pedestrian transport (Khairullina, 2018). The other author was Colin Buchanan (1963) with his concern for the quality of the urban environment and growing road traffic. He proposed paying attention to land use and

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the location of activities that generated traffic in transport infrastructure. However, during the period both ideas eventually were reinterpreted in accordance with socialist politics.

Socialist five-year plans in the 1960s were designed to bring order to the many public projects that had to be carried out, an order that also required coordination between administrations. In the post-war period, the urgency of needs gave clear priority to sectoral projects and plans. The development of the country was linked to large production projects and the provision of housing, so that "separated planning" predominated and centralized planning did not ensure the integration of vertical policies. In the 1960s, there was time for another way of planning, due to political changes, academic and technical progress, and because urgency was no longer the justification for everything. Transport was a very powerful instrument for improving the economic conditions of the socialist system, but it had to be interrelated not only with the centres of production and consumption in the territories, but also with the functionality of the urban space. This was an important issue which needed urgent improvement.

The socialist economy's ideology of division of labour and the ambiguous concept of a socialist city in terms of the coherence of urban growth meant that an entity had to be planned in the form of an integrated system, where the city and transport planning had to converge. Inter-urban and urban transport should complement each other and the specialization of the functions of the transport modes and the coordination of their operation should be materialized.

Contemporary studies lack a focus related to the influence of the geometric factor of transport networks on urban planning decisions. Meanwhile, there are a variety of works that have different approaches with regards to the issue of transport such as the planning of fast tramways (Seidenglanz, Kvizda, Nigrin, Tomes, Dujka, 2015), car-oriented urban planning (Beyer, 2011, Siegelbaum, 2009), interrelations and policies in urban transport and traffic (Schmucki, 2001, Kulakov, Trofimenko, 2016), etc.

Therefore, the aim of the article is to understand the context of the changes in the integration between urban and transport planning through the study of the proposals in the configuration of the urban transport network. This allows us to understand why the need for integrated plans appeared, and how integration and rationalization affected the urban form. The article focuses on the USSR, Eastern European countries, as well as England, which shared several similarities in the development of urban and transport planning ideas.

It will be concluded that during the 1960s there was a major shift in the integration of transport and urban planning that was related to political change and a more intensive rationalization of economic resources. This influenced the shift from utopian proposals to ones that were more differentiated and integrated in relation to the existing situation; which was the basis for the development of the urban form of the socialist city in the 1970s-1980s.

Curved enclosed network configurations in public transport

The paradigm shift in urban planning in N. Khrushchev's time in 1954 did not occur instantly because time was needed to adapt to the new principles, to carry out the first experimental projects and to evaluate the results. After these first projects and plans, the urban planning congress was organized in Moscow in 1960, where both the new directions of urban development and urgent problems were announced. Among the problems highlighted there were those of traffic rationalization and the role of urban transport in the development of the society. In East Germany, the book "Traffic in the modern city" by Wolfgang Weisel was published with the influence of this congress in 1962. The author raised the integration problem between transport and city planning which could be resolved with greater coordination between different specialists. The other problem was related to traffic rationalization with regards to the functional division of different urban transport modes. Similar ideas appeared in different publications in the USSR, for example, in "The organization of traffic on streets and highways", A. Polyakov, 1965.

Although the primary mode of public transport had not yet been defined, various questions were raised such as if it should be a surface or underground means of transport, and how it would

berelatedspatially to urban planning. Different studies were carried out on the geometric characteristics and economic profitability of a public transport network. In this first stage, the integration between transport and urban planning was understood as the search for the appropriate network configurations and location decisions for a balanced distribution of traffic. The decisions on the configuration of the rapid transport network had several objectives, such as providing compactness, limiting city growth or ordering urban space.

Among the proposals we can highlight the studies by OrestKudryavtsev in the book "The problems of the Soviet urban planning", in 1963. According to Kudryavtsev, the main objective of the research on the configurations of the rapid public transport network was to provide the minimum distance for people to travel through the creation of different location variants of both departure and arrival points (1963, p. 38-39). The importance of the balanced distribution of passenger flows, the limitation of modal interchanges, and waiting time, resulted in attention paid to geometric forms or shapes of networks. The forms, such as eight, nine, circular, line, loop, and their variations, were named as enclosed curvilinear systems.

The word "system" was then applied for the first time in studies as a result of the aspiration to turn the discipline of urbanism into a science, following Ludwig von Bertalanffy and Karl Popper's proposals. Systems theory was oriented towards establishing the applicable principles for many disciplines. The inherent complexity of its implementation sometimes required considering this scientific approach based on open and dynamic systems. In the case of Kudryavtsev's proposal the enclosed systems were not the systems because they were not a part of something, nor did they consist of the elements, and rather they were the transport schemes with the land uses associated with the geometric qualities of the configuration.

The curvilinear network configuration probably appeared as a result of disadvantages in flexibility of regular network configurations such as radial, radio concentric, rectangular. Although not sufficiently studied and applied in urban practice, this type of network may have arisen from the possibility of connecting existing land uses, adapting to the site topography and minimizing the non-rectitude coefficient.

At the same time understanding the difficulty of applying these configurations, Kudryavtsev proposed several examples of their application in the existing city, where the ends of the streets were rounded to create the looped configuration (Fig.1) or were adapted to the rectangular configuration of motorized transport (Fig. 2).

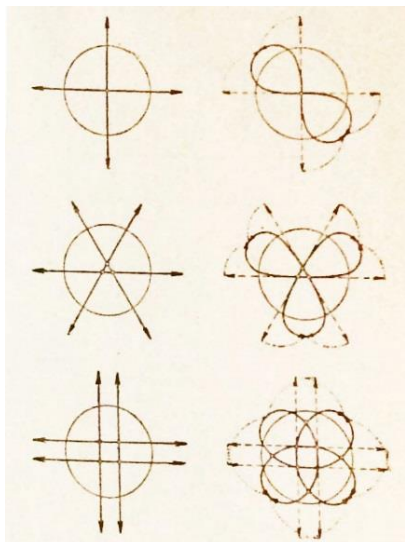


Figure 1. The transformation schemes of rectangular, radial systems in enclosed curvilinear systems. Kudryavtsev, 1963. The possibility of converting existing cities into a compact urban model

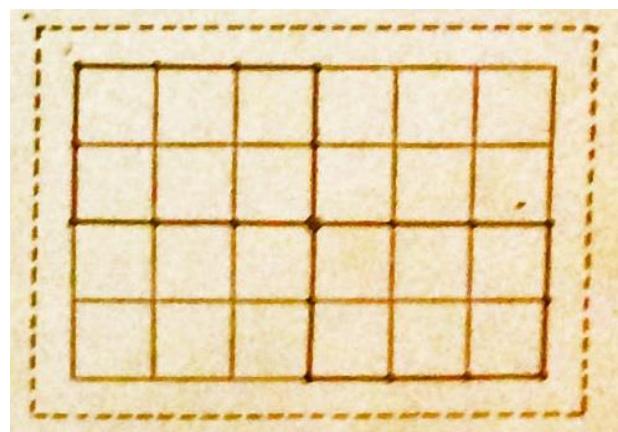


Figure 2. The overlay scheme "eight" form network configuration into the existing rectangular system. Kudryavtsev, 1963. Adaptation of the public rapid transit network to the motorized transport network to limit changes in urban structure

However, as these ideas were difficult to apply to existing cities, they were mainly applied in the planning of new cities. Among the applications of those ideas in the USSR, the new city of Tselinograd (for 350,000 inhabitants) planned in 1963 by the Central Research and Project Institute of Urban Planning with the participation of Kudryavtsev can be highlighted. The idea was to apply a closed configuration of the express bus network that was connected to the city centre in the middle of the route. This created the possibility of organising an "eight" form public transport route. The express bus route located on the reserved platform was combined with the motorised transport network (Fig. 3).

Another example can be found in England, a small city of Runcorn planned for 202,000 inhabitants in 1965, with the intention to limit the use of private transport. The Runcorn project was one of the first new cities in England to achieve the planned balance between private and public transport by dividing the flows of both with a 50/50 ratio with the application of express bus network independent from motorized transport (Runcorn New Town, 1967, p.70). It can be also highlighted by variations in enclosed configurations and functional specialisation of different express bus itineraries.

In Eastern European countries, ideas about enclosed configurations of the public rapid transit network were not so developed in the new cities because of their small size. However, we can notice the similar tendency to create a closed configuration in urban extensions, such as, for example, in East Germany, in Halle and its new part Halle West, planned in 1961. The main idea in this project was balanced redistribution of traffic between the two parts of the city creating a compact urban model through the annular configuration of an urban transport network (Fig.4).

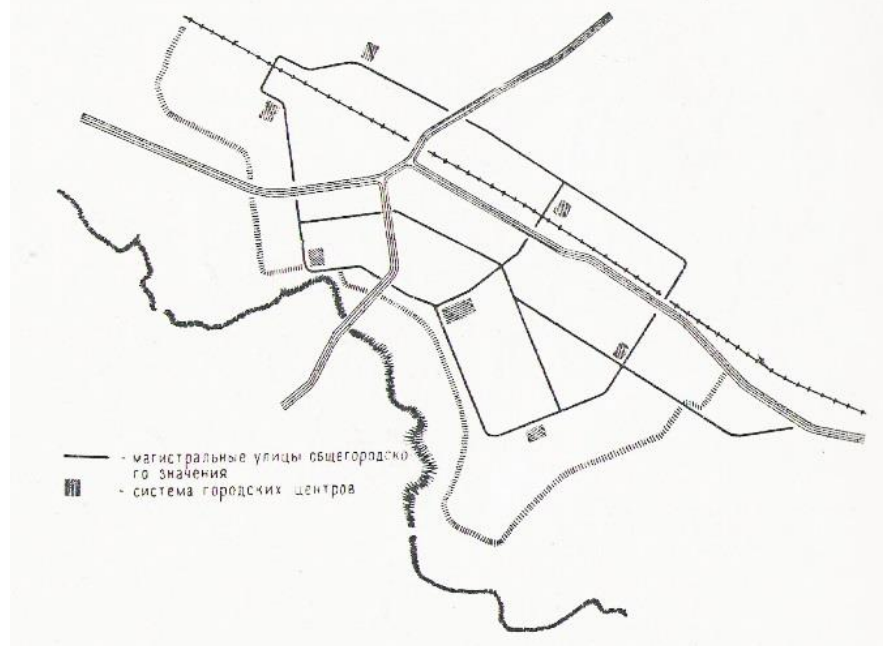


Figure 3. The model for the new city in the USSR. The Source Central Research and Project Institute of Urban Planning. 1964. One of the interpretations of circular and eight form configurations in the new city. The planning of the public transport network in relation to the motorised transport network

Kudryavtsev's proposals received continuity in the book "Principles of the Soviet Urban Planning" in 1966, written by the Central Institute of Urban Planning. The qualities of enclosed configurations with the possibility of two-way service (mainly from the industrial zone) were underlined, as well as the balanced distribution of traffic for cities with the size over 100,000 people (1966, p. 366). At the same time, in the case of urban development in enclosed

configurations, the possibility of extending transport lines was considered. Thus, we see that the importance of fluid urban traffic organization led to transport network solutions with enclosed configurations that received extensive application in both the East and West Blocs during the 1960s.



Figure 4. The traffic study for the city of Halle, 1961. Source: Gebietsplanung Bezirke Halle, 1961, Bundesarchiv, DH 2/21466. Prolonging semi-circular street into annular configuration

Motorized transport and the advantages of the rectangular grid network

Together with the concern for traffic rationalization in rapid public transport, the configurations of the motorized transport network were developed. Economic geometric parameter studies were carried out to find the balance between network density, the number of intersections and, accessibility. Apart from the operation of buses and trolleybuses, private transport played a significant role in the socialist regime and all the necessary infrastructure was planned for future use. This possibly could be explained by several reasons:

- The large and complex road infrastructures created the imaginary part of the communist party as a symbol of progressivity and modernity. The competition with the Western Bloc for dominance in the world required the representation of technological advances and their spatial implementation in large and complex road infrastructure constructions.
- Another reason could be the importance of traffic planners in urban planning. Traffic planners were treated as people who could address the complexity of traffic planning with mathematical calculations and models. They therefore had a decisive voice in urban planning. The planning logic based on engineering arguments such as a concern to plan maximum road infrastructure capacity with a possibility of future expansion became the main principle of the planning of the motorized transport infrastructure in that period.
- On the other hand, it may also be the Socialist regime's concern for circulation and accessibility to ensure the efficiency of cities and the economy in general. In the post-war period most cities did not have a classified and functionally specialized street structure, therefore, the construction of roads and rationalization of the existing street structure became the main problem for the Eastern Bloc. Slow access and loss of time meant loss of economic benefit.

The motorized transport rectangular grid configuration was considered important for the quality of the growing flexibility independent of the urban structure with the segregation of the

flows in the transverse and longitudinal road directions. The longitudinal roads were planned to connect the centralities, while the transversal ones received the traffic load between the residences and industries. This preference for the linear form and rectangular grid configuration was especially maintained in new cities, e.g. in the planning of cities such as Toliatti (Fig. 5), Novolipetsk, Nizhnekamsk, etc.

Similar ideas also appeared in the studies of transmission rectangular grid configurations in England. Rectangular configurations in a linear form received attention as the most appropriate solutions for both car and public transport use (Fig. 6). Primarily for giving possibility to uniformity of urban development (Favaz, Newell, 1975) In short, priority was given to the operation of motorized transport and the possibilities of the meshed network to provide multiple means of access. This was not comfortable for rapid public transport, which needed a different spatial organization logic.

Thus, we see that in the 1960s, transport planners made a significant effort to determine alternative configurations of transport networks to traditional radioconcentric models. Both linear and enclosed curvilinear configurations were considered capable of providing stable and balanced spatial relationships in terms of activity and traffic distribution. As a result, cities with radioconcentric plans had a tendency to expand in a linear form. Examples include cities such as Ivanovo in the USSR, Kosice in Czechoslovakia, Erfurt in East Germany. On the other hand, in larger cities, the urban form approached the circle form, levelling existing radial lines with the new directions of urban development to provide a compact form.

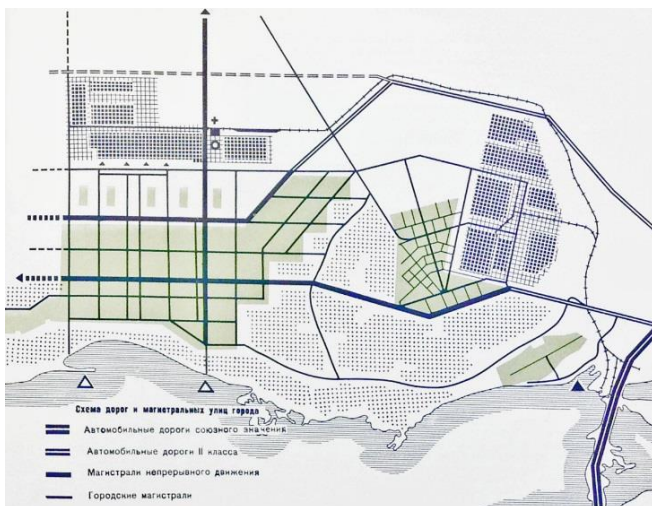


Figure 5. Toliatti's plan, 1967. Diagram of the main and secondary streets. Source: The city of Toliatti, The general plan for the new part of the city, the first phase of construction. 1968-1971.

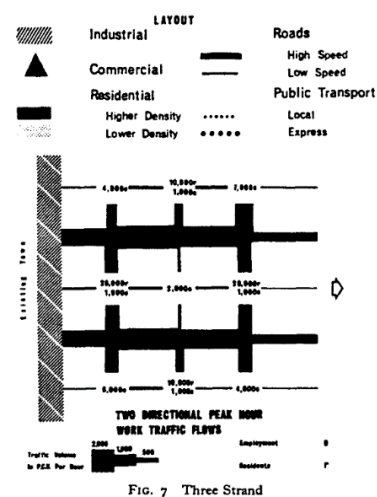


FIG. 7 Three Strand

Figure 6. Studies in transportation and land use structures in England, 1967, Source: Jamieson.G.B., Mackay W., Latchford J.C.R. Urban studies. Vol. 4. № 3

In general, in these works we see that the itineraries of the different modes of transport were not planned, but rather the transport was adapted to the infrastructure already planned and built in the cities. The location of suburban transport lines and their stops were also not integrated with urban transport. The problem then was the disintegrated planning between the different transport services, leading to economically unsatisfactory results in urban planning. In 1966, the political change in the USSR led to a series of decisions that marked the beginning of a new stage in the integration between transport, traffic and the city.

Political change and new ideas for the integration-rationalization of urban transport

The political change with L. Brezhnev in 1966 brought about significant changes in urban planning in both the USSR and Eastern European countries. The new policy implied a more

complex and strong rationalization consolidated through multiple conferences. In the urban planning sector, the problem was compounded by a lack of complex and coordinated planning of all modes of urban transport. The idea of rationalization was related to the need for coordinating passengers' volume, the form of the network and the distribution of routes (Niewand, 1969, p. 72). The concepts of integration and rationalization in the transport system meant the same thing, although they did not always have the same results.

The first work on this issue was carried out between 1964 and 1967. In East Germany, as a result, a book was published in the form of the general guidelines "The development of transport in East Germany between the 6th and 7th SED days" drawn up by the special research group on transport, the Ministry of Transport, county and city councils' offices, etc. In the USSR, the ideas of transport rationalization were announced in the collective work "Methodological in public transport and street network planning", in 1968, and in connection with the improvement of research into transport rationalization, institutes of socialist economic management in transport were set up. The other issue was to choose the main mode of urban transport, which, if previously related to monorail, metro, etc., in the mid-1960s was decided in favor of what was then called "fast tram". The pre-existence of the infrastructure for this type of transport in the cities, and the technological ease of its introduction were important criteria for socialist rationalization. First, a rationalization of the tramway network was needed through the elimination of branching of lines, and the rectification of transport routes based on axis principle (Büro für Stadtverkehr des Rates der Stadt Dresden, 1969). On the other hand, rationalization meant management in the location of transport networks, identifying where the use of rapid tram transport should be intensified, and where it should be eliminated and replaced by public motorized transport.

All these changes needed to reconsider previous ideas in transport network configurations and create a more rational vision. In this connection, the article by V. Sheshtokas "The perspective definition of the urban transport network parameter" in 1968, the USSR Architecture, was important. The author's main idea was that passengers' journeys should define the configuration of the urban transport network that depended on the location of activities, and not just on the balanced distribution of traffic and network configuration. The criteria of the demand (actual and potential) were thus balanced with the criteria of an urban strategy and equally distributed transport network.

The enclosed configurations were recognized as simple in their interpretations, and they also led to the increase in the length of the transport infrastructure and the separate displacements with distinct reasons (1968, p. 47). Attention should then have been paid to the influence of urban structure on the volume and load of urban traffic. Therefore, the ideas of regular public transport network configurations such as grid and radial were returned. The traffic load balance tried to be reached through variations in type and displacement of land uses related to accessibility of the transport network, characteristics of transport modes, population density, etc.

From these schemes we can observe the intention to redistribute activities, and their location in a balanced way along the network of rapid public transport (such as the redistribution of productive spaces). As an example, the Kaunas plan was studied, where through comparison the priority was given back to the radial configurations, and not to concentric or enclosed ones. These intentions were explained by the motivation to rationalize resources and not build infrastructure where it would not be profitable. It is probable that a strong aspiration to such rationalization gave way to the understanding that transport and traffic requirements should be related closely to urban structure. With this notion, in 1971 a new stage in the interrelationships between transport planning and the city began. This was based not only on integration through coordination among organizations, services, practices and ministries, but also on extensive theoretical studies between different institutions and countries. For an approach related to both the reality and predicted changes, the work of central transport research institutes and transport economics institutes needed to be initiated, as well as include different disciplines such as urban planning, transport technology, sociology, economics, etc.

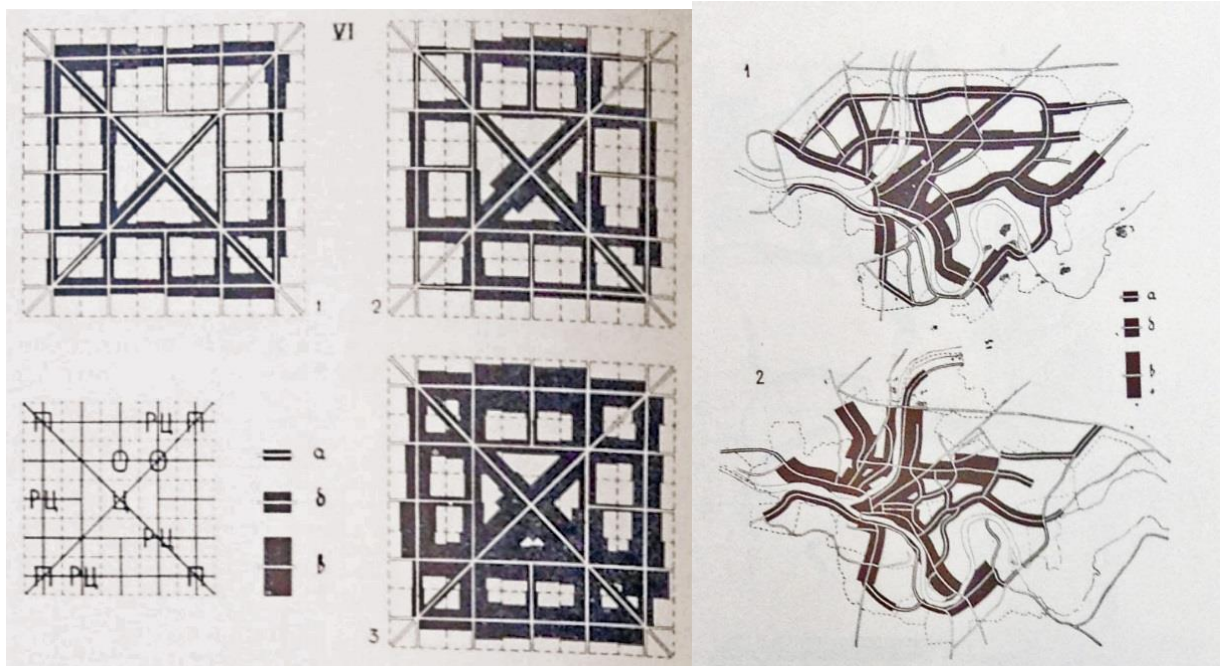


Figure 7. V. Sheshtokas' proposal for the city model and for the city of Kaunas, Source: the USSR Architecture, 1968, p. 46-47. The return to regular transport network configurations and attempts to control network load through land-use change

Conclusions

Following this study, we can observe a major change in urban transport network configurations in the 1960s. At the beginning of the period, the configuration of the transport network was planned on large-scale projects aimed at creating a new model of the socialist city. The indeterminacy in technological development of rapid public transport resulted in the importance in motorized transport infrastructure planning. The development of both systems is explained by the fact that the hierarchization of space required the hierarchization of urban transport, rapid public transport with the function of carrying mass passenger flows with enclosed network configurations for compactness of the urban plan. While motorized transport was used for secondary flows with a rectangular grid configuration to distribute the flows and provide a proportionate urban extension.

These ideas were developed both in the Eastern Bloc cities and in some cities in England, which allow us to understand that the balanced distribution of traffic was a common concern based on the geometric qualities of the transport network. However, the policy of rationalization made it possible to broaden this vision with the qualities of the urban environment, the characteristics of different modes of transport and the coordination between different departments in the Eastern Bloc countries.

In the new solutions we see the rejection of great transformations, and the intention of reaching the principles of the socialist city as compactness, coherence, integrity of space with solutions different from those announced at the beginning of the 1960s. If in the first stage we see that urban compactness was understood as a physical and formal representation of urban space, then under the rationalization paradigm urban compactness acquired the qualities of differentiation and redistribution of land uses. This intention to save resources and receive the maximum possible benefit through coordination and management of the sectoral disciplines urban planning, transport and traffic, gave the first impetus for integration between them.

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