Ecological Aspects in Urban Planning and Territorial Planning on the Example of Tyumen

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Abstract. Analysis of the current situation and perspective solutions of the spatial development of the city until 2040 allows us to conclude that the main problems of Tyumen are: high density of building the territory of the historic city center; fragmented and mosaic residential and industrial zones of the city. Functional problems include the inefficiencies of the transport infrastructure: the main transport routes of the city are needed to be created some substitutes in both latitudinal and longitudinal directions. The development's stimulation of housing construction in the city in free territories and dotted buildings, provided with transport infrastructure, strengthens transport links between the city's districts, which leads to the capacity's restriction of urban highways. In addition, the size of the public areas of the city, which do not meet urban planning standards, contribute to the gravitation of human flows in the historical and business centers of the city. Traditional methods of the level's research (mapping and comparative-descriptive) of main highways' loading in the presented master plan and published literature data showed excess of regulatory requirements, and transport is a source of substantial chemical pollution of the city's air environment. This circumstance is important in the engineering of public and residential buildings, as in the current practice, regulatory requirements and standards in the planning and development of settlements do not take into account the current environmental conditions formed by transport flows.

1. Introduction
One of the priority tasks for the Russian cities' development is the transport systems' improvement, since the massive presence and the constantly increasing pace of the motorization process lead to a mismatch between existing categories of roads and streets, as a result the city begins to experience an increased transport load due to the inability to expand them.

The city's spatial organization and planning structure is highly influenced by the transport system of the city. In addition, existing systems are imperfect in terms of organization and usability and are not able to effectively fulfill their primary function of ensuring timely and high-quality satisfaction of the city's needs for freight and passenger transportation [1-3].

In the RF Code of 29.12.2004 № 1907FZ «Urban Planning Code of the Russian Federation» the main principles of legislation on urban development are:
ensuring sustainable development of the territories on the basis of territorial planning and urban zoning;
ensuring a balanced consideration of environmental, economic, social and other factors in the implementation of urban development activities;
implementation of town-planning activities in compliance with the requirements of environmental protection and environmental safety.

Compliance with these principles will stop the degradation of the urban environment in the urban transport system's formation.

Thus, the main directions of the development of the city are established by the master plan, which is developed for all the territories of urban and rural settlements, where residential, industrial and recreational areas are treated with the same degree of study. As a rule, in the general plan, the conditions for the formation of the environment for the vital activity of the population, the directions and boundaries of development of the territories of urban districts and settlements, the functional zoning of the territories of settlements, the development of engineering, transport and social infrastructures have been determined [4-6]. Therefore, the master plan is the basis for the birth of ideas and the adoption of managerial decisions with specific, exact boundaries of planning elements: the street-road network, districts, neighborhoods, quarters. A clear, fixed by the coordinates street-road network and all the necessary public areas are established by planning projects [7, 8].

2. Materials and Methods
In the analysis of level of loading of the main highways in the submitted master plan of the city of Tyumen and the published literary data traditional methods of researches were applied (mapping and comparative-descriptive).
For understanding of characteristics of structure and intensity of traffic flows, were visual examination of sites and knots of a street road network of the city of Tyumen is conducted by forces of students and graduate students of the Tyumen industrial university and long-term research programs for the city of Tyumen are analysed.

3. Results
The problems of Tyumen's planning and building don't have any special dimensions and differ little from the general problems which are typical for the cities of the Russian Federation [9]. There is a complex of some socio-economic tasks for Tyumen, the solution of which in the long term will create a comfortable for the population city. The main directions of the spatial development of the city include the reconstruction of the administrative and territorial organization, the space's intensification of the historical center of the city, the system's development of public centers and the reorganization of the urban transport system's structure. The balance of these indicators will characterize the quality of decisions and the feasibility of the master plan.

The general plan of the city district of the city of Tyumen is approved for the period until 2040 (official site of the administration of the city of Tyumen (www.tyumen-city.ru)). Consequently, the competent use of planning and building methods plays an important role in providing comfortable living conditions in the urban environment. The planning structure and organization of transport should ensure minimum time spent on labor and cultural and everyday movements, compactness of construction, autonomy in servicing settlements and the complexity of the network of cultural and domestic institutions [10-15]. One of the main obstacles on the way to the ideal city is a shortage of normative and legislative town-planning documentation and incompetence of some mayors.

Currently, the existing functional condition of the territory in the city of Tyumen is rather chaotic and not balanced, for example, the territories occupied by residential buildings are quite extensive, and the territories of green common areas are much lower than the normative ones. In the present-day city center, two time-space formations are fairly clearly identified: the historical core, whose volume-spatial composition is focused mainly on the Tura river, and the modern part, the main compositional
axis of which is the Republic Street. The most actively reconstructed this part of the city: the construction of high-rise buildings and multifunctional complexes, the sealing of residential areas. The city is being large-sided modernized by some landscaping and improvement systems (figure). The organization of the territory of the city of Tyumen has a number of architectural and spatial features:

- the Trans-Siberian railway Moscow-Vladivostok passes through the center of Tyumen;
- the river Tura with high banks and a vast floodplain is an important element of the natural framework of the city, affecting the spatial organization;
- the river Tura and the Trans-Siberian Railway divide the city of Tyumen into three planning zones: Zarechnaya, Central and Southern;
- the main places of employment are concentrated in the central part of the city district, which creates an imbalance of transport and passenger flows, aggravated by the location of the Central Planning Zone between the Tura River and the Trans-Siberian Railway;
- in close proximity to the city of Tyumen are settlements that are not part of the urban district, but are united with the city by a common labor market, a common real estate market, a common consumer market and the production interconnection of organizations.

![Figure 1. Scheme of use and condition of the territory (www.tyumen-city.ru).](image)

The existing structure of the central part of the city is compact with a dense regular grid of streets, and the planning structure within the boundaries of the city district is disjointed due to existing transport and natural objects. The size of the public areas of the city of Tyumen lags behind urban planning standards. This is manifested in the existing shortage of specialized public areas, office-business, recreational and sports complexes that meet the requirements of the modern city. This specificity of the spatial organization of the city leads to the emergence of intensive movements from the residential area of the built-up areas to the central part of the city and back, which leads to an additional load of the capacity of urban highways. This discrepancy leads to an additional movement of traffic flows. Since the traffic flows of the city of Tyumen are concentrated mainly in the central part of the city, the air of which not only is depleted by oxygen, but also polluted by harmful components of the exhaust gases [16].
According to the statistical observations presented in the master plan, a high level of air pollution is due to the concentrations of formaldehyde and benz (a) pyrene.

The maximum content of dust and nitrogen dioxide was recorded at the intersection of the streets of the Republic and Maurice Thorez. Environmental assessment of the atmospheric air in the master plan is presented according to the data of the Territorial Body of the Federal State Statistics Service for the Tyumen Region (Tyumen): the volume of emissions of pollutants from stationary sources is 12,722 thousand tons; information on emissions from mobile sources is not available.

In the ecological section of the master plan for the main roads of the regulated traffic of the first and second class, the distance from the edge of the roadway of these roads to the building is recommended to be at least: up to the residential development of 100 m, to horticultural partnerships of 50 m in accordance with the requirements of § 8.2.6 of the regional standards of town-planning design of the Tyumen region «Urban planning. Planning and development of settlements».

According to the resolution of the administration of the city of Tyumen the length of public roads of local importance (to which a considerable part of the streets is attributed) is 861.4 km, of which hard surface - 732.2 km. A study of the street network of the city of Tyumen shows that it basically has capital execution (asphalt concrete), in the areas of individual development, the lowest and transitional type of coverage prevails [17]. A visual inspection of a number of sections of the street-road network was carried out by the departments of the Tyumen State Architectural University [18].

Analysis of the intensity and composition of traffic flows shows that the most unfavorable situation has developed on the streets, where the intensity of the traffic flow reaches 1.6 to 8.1 thousand units per hour. At such intensity of transport streams the condition of atmospheric air on adjoining territories to проездной parts is characterized by a dangerous level of pollution.

Literary data of M.V. Volkodaeva [19] and S.V. Vasilenko [20] shows the presence of air pollution of a separate motorway with high levels of concentrations in the territory adjacent to the carriageway in the 10-50 meter zone, with gradually decreasing concentrations at a distance from it. According to the data of [19], for an intensity of 2500 U / h, the concentration of nitrogen dioxide is 10 MPCm.r., and for the most strained highways - more than 20 MPCm.r (maximum single maximum permissible concentration). The conducted studies [20] confirm the level of atmospheric air pollution for motorways, the traffic intensity of 3000 units/h - according to nitrogen dioxide 20 MPCm.r.

4. Discussion

Thus, the perspective solutions of the spatial development of the city will allow to complete the process of uniting the city districts with each other and with the city center, ensure the interconnection of the inner city highways with an external transport frame and help to save the center and residential areas from the transit traffic of road transport. And the results of the above studies prove the importance of taking into account the local nature of air pollution by vehicle emissions. Therefore, it is necessary to develop regulatory requirements and standards that allow to ensure environmental safety in the planning and development of settlements.

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