Integrated development of small areas: (case study of Ulan-Ude)

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Abstract. The territories around the cities transform and develop unevenly. In the eastern part of Russia, the high intensity of transformation processes can be observed, which is conditioned by numerous specific features, such as history of settlement, geographical location, difficult natural and climatic conditions, remoteness from the economic core of European Russia, etc. [3]. In the paper a brief analysis of the territory and natural conditions of the city of Ulan-Ude and the analysis of the development of urban areas have been carried out. The most effective use of perspective free or half-ruined territories by the formation of new rural settlements and construction on agricultural and industrial lands has been revealed. Primary and secondary geographical factors of development of small territories are briefly considered on the example of Ulan-Ude and its suburban area.

1. Introduction

The city of Ulan-Ude is exposed to many difficulties, including the problems connected with its suburban area and problems in the field of ecology, transport, landscaping, etc. However, many countries and cities do not ignore such problems, on the contrary, they seek to improve the situation, to find solutions to these issues, for example, they design plans to improve the urban environment and develop projects to improve the transport situation in cities.

Today, conditions for sustainable development of urban territory are being formed in Ulan-Ude: documentation in the field of urban development, which determine the promising directions of the city development, have been developed, approved and are being implemented.

Social and economic growth plays major role in the development of small areas, and these are such indicators as indices of industrial and agricultural production growth, infrastructure availability, population growth, GRP, educational level, availability of socio-cultural and sports facilities, etc. [3].

In the development of small areas, it is necessary to form and develop regional territorial and social and economic structures with sustainable growth of economic, social and environmental qualities of regional development [3].

2. Results and Discussion

The development of small territories takes place from the economic development, i.e. level of exploration of the territory and accumulated information on the region, assessment of their natural resource potential and natural conditions. The natural resource potential is connected with the natural and climatic conditions of the region, which determines the geographical differentiation on the spatial
and temporal scale [3]. The territory of the city of Ulan-Ude and its suburban area are a single system that includes several subsystems with interrelations of different nature, in particular at the level of socio-economic phenomena. Direct connection between the city and the suburban area requires special attention. Urbanization and intensification of life determines the constant growth of human needs. Complex development of territories allows to avoid the formation of isolated residential areas, which over time without their own points of attraction and financial, economic, cultural and educational support lose their consumer appeal, turning into depressive ghettos [8].

The complex development of urban areas should be understood as the formation of complex and balanced urban planning solutions that allow to achieve high economic, social and environmental results, as well as their combination in a particular area, taking into account natural conditions. The main building development is located within the Ivolga-Uda intermountain area, surrounded by spurs of the Ulan-Burgasy (from the north) and Tsagan-Daban (from the south) ridges [7]. The climate of the studied territory is rather severe, the average annual air temperature is minus 27°C. It should be noted that climate peculiarities together with other factors (light mechanical soils, mountainous terrain, etc.) contribute to the development of wind and water erosion. The city of Ulan-Ude is located at the confluence of the Uda and Selenga rivers, where during rainfall floods (in some years during spring floods) large areas in river floodplains, agricultural lands, and urban areas are flooded. The aquifer is exploited by separate wells of industrial enterprises of the city. Due to the deep occurrence of the aquifer, it is rarely used for water supply. The city has several single wells up to 150 meters deep. The aquifer complex of modern alluvial deposits is of practical importance, however, the lack of natural protection and hydraulic connection with surface waters allows polluting the environment during operation. Development of these areas requires engineering measures.

The territory of the city is characterized by rather difficult conditions for engineering and construction, due to: high seismicity, intense tectonic disturbances, development of dangerous geological and natural processes, the presence of areas with significant surface slopes (20-30% or more), with close occurrence of groundwater levels, etc. All this causes different resistance of the geological environment to man-made impacts in different parts of the territory.

In the Ulan-Ude urban environment, when assessing the stability of the geological environment, the determining factor is the tectonic factor - increased seismicity and intensive disturbances of the territory by various faults. During the placement of separate buildings and constructions it is necessary to pay special attention to tectonic faults and connected with them radon and geopathogenic zones, considering that faults are often conductors of radon to a surface.

Taking into account that according to the "Map of seismic zoning" seismic activity of the construction area of the city of Ulan-Ude is evaluated by magnitude 8, construction should be carried out taking into account the requirements of Building code II-7-81* [6].

Taking into consideration the above, it can be noted that there are no territories absolutely favorable for construction due to the increased seismic activity in the area of construction, so within the considered territory of Ulan-Ude the following land categories can be singled out: most favorable, partially favorable, unfavorable, not subject to construction, with regulated construction (with special conditions of use).

The most favorable for construction are the areas characterized by flat relief with surface slopes of up to 10% - high terraces above floodplain of the Uda river (with prevailing surface slopes of 0.5-3.0%) and gentle slopes of the Ulan-Burgasy and Tsagan-Daban ridges (with surface slopes of 7.5-10%), with seismic activity of magnitudes 7-8 and with groundwater occurrence at a depth of more than 5.0 m (there also can be occurrences of perched groundwater). Quaternary gravels, sands, sand clays and loams will be located in the area where foundations will be laid on river terraces. Their conditional design resistances according to Building code 2.02.01-83 will be 0.2-0.5 mPa, in the foothills - both bedrock (sandstones, conglomerates, clay shale) and quaternary ones (crushed stone and woody soils) with conditional design resistances will be 0.3-0.6 mPa.
In the north-eastern part of the city of Ulan-Ude, red-colored loams, classified as collapsible soils of the 1st type, are widely spread. Their thickness is 1-5 m. Construction on this loams should be carried out taking into account the requirements of SNiP 2.02.01-83 [1].

The restrictedly favorable territories for urban development include:

- Territories with elevated surface slopes of 10-20% and 20-30%; these are the foothills of the Ulan-Burgasy and Tsagan-Daban ridges. Both bedrock (sandstones, conglomerates, clay shale) and quaternary formations (crushed stone and woody soils) with conditional design resistance of 0.3-0.6 mPa will serve as the base for the foundations;
- Territories with close occurrence of groundwater levels (at a depth of less than 2.0 m and 2.0-5.0 m from the surface); these are the areas of the Ivolga-Uda intermountain area characterized by plain, often flat relief with absolute surface level of 500-510 m. The geological structure of the territory is characterized by a thick mass (20-50 m and more) of pebbles covered with sand and loam from the surface. Conditional design resistances will be 0.15-0.3 mPa for sands and 0.3-0.6 mPa for pebbles;
- Bogs with turf thickness of up to 2 m, occupying small areas of flooded floodplains;
- Territories with developing aeolian forms of relief – 5-8 m high hillocks and barchans, where the main factor complicating the construction is broken relief;

The unfavorable for the development territories are: with surface slopes of over 30%, flooded 1% of the Selenga and Uda rivers exceedance probability, disturbed by man-made activities (quarries, rock dumps), floodplains of small watercourses.

The following territories are not subject to construction: areas of mineral deposits, sanitary protection zones of the 1st belt of domestic and drinking water supply sources, territory of the coastal protection zone.

The territories with special conditions of use (with regulated construction) include [5]:

- Sanitary protection zones; within their limits it is not allowed to locate residential buildings, hospitals, recreation facilities, food industry enterprises, but it is allowed to locate enterprises with production of a lower class of harmfulness than the main production, car parks, gas stations, as well as organizations related to the maintenance of the main enterprise;
- Water protection zones (more than 100 m wide);
- Noise zone;
- Zone of air approach to the airport;
- Power transmission corridors.

1. Despite the expected moderate growth of the population of Ulan-Ude, the number of labor force will be constantly decreasing in the next 15-20 years as a result of the reduction of the working age population in accordance with the population forecast. In order to maintain the future labor force at its current level in favor of its own demographic potential, it will be necessary to involve up to 40-60% of the population of Ulan-Ude older than the able-bodied population in the work force, which is unrealistic (at present, it is up to 11%).

2. As a result, the absolute number of both the economically active and the economically inactive population is projected to decrease. At the same time, the ratio of these groups remains almost at the current level - 3:1.

3. Despite the decline in the total number of employed in the structure of employed population, employment in the main branches of material production and services ("formal economy") is increasing due to the expected significant reduction in employment (by 1.5-2 times) in the unregulated economy (individual, household, private subsidiary plot, shadow economy).

4. The balance between the material production and services sectors will change in the future in favour of the latter. If the number of employed people in the material production remains at the current level, the number of people employed in the non-production sphere is expected to increase by 1/3. Employment in the service sector is expected to grow somewhat faster than in the production of goods.
5. In the branches of material production, a slight reduction in employment in industry is expected, as well as an increase in employment in transport, construction, and trade.

6. In the non-production sphere, an increase in employment is expected in education, health care, housing and utilities. They account for 2/3 of all those employed in the non-production sphere. A significant increase in employment in science, culture and art is expected.

7. Tourism as one of the leading sectors of the city's economy in the future is distinguished as a separate aggregative industry. It involves the smooth functioning of various sectors of the economy in the same complex, they are hotel industry, trade, restaurants, cafes, transport, utilities, cultural and entertainment institutions, financial sector, etc.

8. According to the forecast of demographic development in the city's economy, it is assumed that labor migrants (guest workers) will be used as unskilled and low-skilled labor force. Their work can be used in industry, construction, trade, housing and communal services, non-productive types of household services and other auxiliary works. The composition of the municipal entity - the urban district "City of Ulan-Ude" includes: the city of Ulan-Ude, which is divided into three administrative and territorial units - Zheleznodorozhny, Oktyabrsky and Soviet districts and settlements - municipal settlements Sokol and Zarechny and rural settlements Istok, Tulunzha, Stepnoy, Zabaikalsky, Soldatsky. This composition gives characteristics of the housing stock.

The dynamics of the housing stock of the city in recent years is characterized by the following data [4]:

| Year of construction | 2000-2009 | 2010-2019 |
|----------------------|-----------|-----------|
| Total area - thousand sq. m. | 303,917.12 m² | 954,386.86 m² |
| Residential space-thousand sq. m. | 179,303.01 m² | 627,470.99 m² |
| Non-residential space -thousand sq. m. | 47,554.94 m² | 133,364.61 m² |
| Number of apartments - thousand | 2,717 | 11,696 |
| Non-residential premises | 141 | 1,029 |
| Number of buildings | 52 | 192 |

From 1900 to 2018, the number of apartments increased by 89,561, the number of houses by 1,800, and the number of non-residential premises by 3,979.

The share of the housing stock of Ulan-Ude settlements in the total housing stock of the municipal entity is insignificant-6%. The majority of the city's housing stock is private - 67%, state property (institutional) - 15%, and municipal - 17%.

3-storey and above stone buildings account for 72% of the city's housing stock. Characteristically, in the structure of 2-storey residential buildings, where wooden buildings prevail (59%), stone buildings prevail in the structure of private ownership of citizens (78%) [4]. The structure of a single-storey building is dominated by wooden structures (60-67%). In the same group of housing stock there are more houses of other materials than stone ones, especially those belonging to citizens. The condition of the housing stock in Ulan-Ude in terms of wear and tear, according to the Property Inventory and Registration Authority data, can be characterized as satisfactory:

However, more than 160 thousand square meters of housing in Ulan-Ude (2.4%) is classified as dilapidated housing. It is estimated that 11 thousand citizens (up to 3%) live in dilapidated housing. Approximately 20-30 thousand square meters of the city's housing stock annually turns into dilapidated [5].

Situation on social housing is better than private housing. According to Property Inventory and Registration Authority, the dilapidated housing stock makes up less than 1% of the total housing stock of the city. Nevertheless, the wooden private housing stock of the citizens, which is very close to the dilapidated and emergency condition, makes up 42% of the private housing stock of the citizens or up to 6% of the total housing stock of the city, and together with the similar social housing stock - up to 12%. The distribution of the city's housing stock by storeys shows its rather distinct polarization into low-rise (1-2 storeys) and high-rise (5-6 and more storeys) buildings with a small layer of medium-rise
(3-4 storeys) buildings. The issue of the distribution of the city's housing stock by storeys is closely related to the density of residential buildings and the efficiency of its residential development [5].

Efficient use of city’s territory is one of the main requirements of urban planning policy, which determines the relevance of the issues of efficiency of both the existing building and the prospective development of building in accordance with the general layout [5].

Thus, according to the data of the Municipal Entity "City of Ulan-Ude" with the coefficient of use of land plots (development coefficient) currently amounts to 0.31, in the areas of social housing stock it is 30% higher than in the areas of buildings owned by citizens (0.35 and 0.27 respectively). In Ulan-Ude (without subordinate settlements), this excess is 60%.

The situation is the opposite for the subordinate settlements - the land-to-building ratio of the social housing stock territories is twice as low as that of the territories of building plots owned by citizens.

There is a significant contrast in the intensity of land use in some settlements. The ratio of land use ratios for collectivized housing stock to citizens in settlements is higher than the average in settlements Zarechny (2.15), Istok (1.06), Stepnoy (1.39), and lower than the average in settlements Sokol (0.46), Soldatsky (0.27), Zabaikalsky (0.93), and Tulunzha (0.25). Fluctuations in land-to-building ratio are significant - from 0.2-0.3 to 0.7-0.8.

3. Conclusion

The city of Ulan-Ude itself accounts for 84% of the total land area of the Municipal entity of Ulan-Ude, which is 94% of the total housing stock of the municipal entity. At the same time, the territories under the jurisdiction of the Municipal Entity of Ulan-Ude account for 16% and 6% respectively. Thus, the intensity of land use for housing in Ulan-Ude is three times higher than in the territories under its jurisdiction. And this is despite the fact that in Ulan-Ude there is 7-8 times more low-rise (1-2 floors) housing than in the territories of subordinate settlements.

Another important aspect is the non-profit dacha holders’ partnerships and gardener’s partnerships (in Russian DNT, SNT) located in the border areas of the city. Medical organizations located in the city of Ulan-Ude, are not able to fully provide timely emergency medical care and primary health care due to the absence of addresses and overcrowding of houses, which lead to impossibility of passage of ambulances on narrow roads in the territories of DNT and SNT. As a result, the population permanently residing on the land plots of DNT and SNT is not provided with walking distance access to any medical care. In this connection, it is necessary to build ambulatory centers in these areas, which is provided in the list of activities of the Program.

The planning pattern of urban settlements should be formed taking into account the interrelated placement of public centers, residential buildings, street and road network, green areas of common use, as well as together with the planning pattern of the settlement as a whole, depending on its size and natural features of the territory.

Accommodation of individual construction in cities should be provided:

- Within the city, mainly in free territories, including territories previously considered unsuitable for construction, and in the territories of the building under reconstruction (in the areas of the existing individual dacha construction, in the areas without manor construction in order to preserve the character of the existing urban environment);
- In the suburban areas, in the protected areas included in the city limits; in the new and developing settlements located within the limits of transport accessibility of the city for 30-40 minutes.

Individual development areas in cities should not be located on the main directions of development of multi-storey construction for the future.

Individual development areas should include landscaping and engineering equipment, siting of institutions and enterprises of everyday use. At reconstruction of areas with prevalence of the developed inhabited building it is necessary to provide alignment of a planning pattern and a street network, improvement of the state services, gardening and land improvements, maximum preservation of originality of architectural shape of inhabited and public buildings, their modernization and major repairs, restoration and adaptation of monuments of history and culture to modern use.
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