Consideration of Environmental Factors in Planning and Development of Urban Areas

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Abstract. Environmental factors, in varying degrees, always have a direct influence on the urban environment formation and the provision of favorable and safe conditions for the life of the population. Their role in the planning and development of urban areas remains an integral part of the management of such areas. Management should be aimed at improving the efficiency of use of the territories and ecological environment improvement. Planning must be done with the consideration of identified ecological processes in cities on the basis of the information about their occurrence in the past and present. Currently, cities face a multitude of problems that require urgent and immediate solutions. One of the most important issues is the poor state of the urban environment, so the environmental factors remain one of the most critical problems that should be considered by the authorities while implementing the urban areas’ development plans. The article discusses the role of environmental factors in the management and planning of urban territories by the example of the city of Tobolsk.

1. Introduction

Tobolsk is one of the most scenic and beautiful cities of Siberia. The beauty of the city give the unusual terrain, the white-stone Kremlin, ancient buildings and temples. During its history it was awarded such titles as "Asia Gate", "the Father of Siberian cities", "the Blessed city Tobolsk", "Tobolsk grad cestuous Siberia", "Tobolsk - pearl of Siberia", "the City, like the angel", "the Capital city of Tobolsk". For centuries it was the capital of Siberia [1].

In the beginning of XX century, the city gradually lost its administrative importance. However, occupying a geographical position on the crossroads of South and North territories of the Tyumen region, is a crossroad of road, rail and river routes. Tobolsk actually provides the role of a social and economic bonding mechanism for the entire region. But the main uniqueness of the city is a priceless historical heritage. Cultural and spiritual-moral potential of Tobolsk puts it on one of the leading places among the historical cities of the country.

It should be noted that urban development depends very much on investment policies, where the state, local governments are trying to develop a mechanism for development. More than 200 thousand hectares of land in 66 Russian regions are subject to complex development of territories. On behalf of the Government of Russia until the end of the year, the subjects of the Russian Federation needs to prepare proposals for the formation of the unified register of areas that are subject to integrated development. This also applies to industrial zones, which are often used inefficiently. Regional and municipal authorities should undertake an inventory of underutilized built-up land located within the
boundaries of settlements and the surrounding areas. Consolidated list of territories subject to comprehensive and sustainable development as a priority, must be submitted to the Russian Government, will thus be formed a reserve of land that can be involved in integrated development. Such information is useful for investors and developers, they will be able to see the full range of land resources for integrated development [2].

It should be noted, that in Tobolsk there are areas which are subject to integrated development. Here commenced a project for the construction of the world's largest petrochemical complex "Zapsibneftekhim". "Zapsibneftekhim" will be the largest modern petrochemical complex in Russia. The project involves the construction of a pyrolysis unit with capacity of 1.5 million of ethylene, around 500 thousand tons of polypropylene and 100 thousand tons of butane-butylene fraction (BBF) per year installations for the production of various grades of polyethylene and polypropylene with total capacity of 2 million tons per year. That is, the development of industry and care about the population of the city, as the main source of air pollution in the city of Tobolsk are the enterprises of fuel, energy, petroleum industry, boiler and utilities, motor transport.

The main sources of pollution of surface waters are insufficiently treated and untreated wastewater of industrial and utility companies, untreated sewage urban stormwater, runoff agricultural enterprises. As before, almost everywhere water bodies contaminated stubborn organic substances, compounds of iron, copper, zinc, manganese, oil products. The high content of these substances, with the exception of petroleum products, caused by natural factors.

Intense sources of pollution are urban stormwater, landfills for industrial and household waste from the territory of which there is erosion and filtering pollutants [3].

2. The impact of individual industries on the environment of the city

2.1. Industrial influence

The problem of all the industrial enterprises, the formation of large quantities of waste, air emissions, wastewater and solid waste production. The reduction of areas of forests, savannas, steppes in connection with the rapid construction of cities, industrial enterprises and highways leads to the reduction of oxygen in the atmosphere.

Therefore, the subjects of such enterprises should seek to take into account and improve the greening of production in the process of financial and economic activities.

Mining and processing enterprises for industrial purposes use large quantities of water. This entails the formation of wastewater contaminated with various substances, which in contact with water bodies is detrimental to their inhabitants. In the surface water is discharged petroleum products, copper compounds, iron, zinc, phosphorus, phenol, ammonia and nitrite nitrogen. Very often these and other harmful substances are in the groundwater, where they seep from landfills production and agriculture.

2.2. Transport influence

Transport is one of the most important elements of the material-technical base of social production and a necessary condition for the functioning of modern industrial society, as it is used for the movement of goods and passengers.

Transport is a major source of acoustic pollution of the environment. In large cities, the noise level of 70-75 acoustic decibels, which is several times exceeds admissible norms.

The combustion of fuel in engine cylinders are formed non-toxic (water vapor, carbon dioxide) and toxic substances. The latter are the products of combustion or side-reactions occurring at high temperatures. The main toxic component of exhaust gases released during the operation of gasoline engines is carbon monoxide. It is formed by incomplete oxidation of carbon fuels due to lack of oxygen in the whole volume of the engine cylinder or in its separate parts.

The priority areas of reduction of environmental pollution by motor transport are the use of new types of vehicles, minimally polluting (e.g., electric vehicle), rational organization and management of traffic flows and the use of better and more environmentally friendly fuels (e.g. gas).
2.3. Sewage and waste water
At present, domestic sewage is a huge problem both from the point of view of ecology and the environment, and economic side. Of the household domestic waste water to the hydrosphere do organic substances which are decomposed by oxygen-consuming colonies of bacteria. With the necessary access of air to the aerobic bacteria convert the wastewater into environmentally harmless substances. Given the restricted access of oxygen to the sewage decreases the activity of aerobic bacteria, thereby developing the anaerobic bacteria, implying the process of decay.

With sewage from domestic wastewaters into the water includes pesticides, phenols, surfactants (e.g., detergents). Their decomposition process is slow, some substances do not decompose at all. Via food chains from the organisms of aquatic animals and fish, these substances enter the human organism, negatively affect human health, which can further lead to various acute and chronic infectious diseases.

2.4. Municipal solid waste
Environmental pollution household waste affects the person through air, water, foods of plant origin grown on the poisoned soil debris.

Entering the soil chemical compounds accumulate and lead to a gradual change of chemical and physical properties, reduce the number of living organisms, impair fertility. Along with pollutants, often in soil bacteria, helminth eggs and other harmful organisms. Currently the recycling of trash is becoming the phenomenon only in a few countries, but there is an important need for more active use. Such methods of disposal of waste placement on landfills and incineration is not innocuous. Landfills emit methane gas, which creates a menacing our planet, the greenhouse effect, trapping heat in the earth's atmosphere [4].

3. Consideration of environmental factors in the planning system in areas of the city
In order to ensure safety and adequate conditions of life of the population, to limit the negative impact of economic and other activities on the environment and to ensure the protection and rational use of natural resources for the benefit of present and future generations, local governments in the implementation of spatial planning should take environmental factors into account. Therefore, speaking about environmental factors, we should pay attention to those functional areas that are most dependent planning in relation to environmental factors or themselves have an impact on the environment.

These are production zones, zones of engineering and transport infrastructures, residential and recreational areas. Production zone designed to accommodate industrial, municipal and warehouse facilities. The production area recommended to be placed on territories with a calm relief, providing convenient transport links to places of settlement employed in the enterprise workers and external facilities and urban transport. Planning should take into account the fact that in the production area included the territory of sanitary protection zones of the objects themselves and in these sanitary protection zones are not allowed in residential houses, preschool and educational institutions, and healthcare institutions, leisure, recreational and sports facilities, horticultural, suburban and gardening cooperatives and agricultural production.

In addition to production areas should pay attention to the zones of engineering and transport infrastructure, which is designed to accommodate activities and facilities and communications of railway, road, river, Maritime, air and pipeline transport, communications and engineering equipment, and also have in one way or another impact on the environment. When planning must take into account compliance with the required distances from such facilities to areas of residential, social, business and recreational areas and other requirements to prevent harmful effects on the environment. It should be understood that the objects of engineering and transport infrastructure, possessing the feature of a direct harmful impact on the security of the population, must be located outside urban and rural settlements.
Also in planning land use should pay attention to the location of the city's recreational areas. As these areas are intended for the organization of places of rest of the population you need to consider that their territories are not permitted the construction and expansion of existing industrial, communal and storage objects, which can have a negative impact on human health and the environment. The exception may be only industrial, municipal and warehouse facilities, which is directly related to the operation of facilities health and recreational purposes.

Territorial planning of the municipal district is accompanied by the preparation of necessary documentation for territorial planning:
- documents of territorial planning;
- documents zoning;
- documentation on planning the territory.

In accordance with article 18 of the town planning Code of the Russian Federation territorial planning documents of municipalities are:
- territorial planning schemes of municipal districts;
- master plans of settlements;
- master plans of urban districts

The General plan of the municipal formation is main planning document that determines the prospects of development of the city for a long time. It must be presented not only transport, architectural planning, engineering, social and industrial aspects of city development and the ecological living conditions of the population and prospects of preservation of the environment. With the development of project planning documentation should consider the regulations and restrictions on natural resources, the sanitary-hygienic norms and rules, and other regulations governing environmental safety of living of population, natural features areas, the demographic features of the territory, its historical and cultural value and other environmental factors, or otherwise influencing the adoption of planning decisions.

Such a collection of information about the area required for the implementation of investment projects for the integrated development of the city. Detailed preliminary analysis of the relevant documents allows to predict the possible risks at the initial stage of implementation of the investment. These documents are very important for the investor because on the basis of the relevant documents, management decisions that may affect the interests of holders of land plots and capital construction objects (for example, decisions on seizure of land plots) [5,6].

3.1. Environmental factors

Ecological factors are processes or individual elements of the environment, natural or anthropogenic, are considered when planning land use in order to ensure favorable living conditions of the population and protection of sustainable functioning of natural ecological systems from pollution and other negative impacts of economic and other activities.

For effective management of urban areas and improve the planning should include the parameters of the natural environment as good or bad as air, drinking water quality, the presence or absence of green areas, noise, the presence or absence of unattractive objects. Very often three of the above factors — air quality, the presence of landscaping and the absence of industrial facilities that form people's opinions about the good or bad quality of the environment and create prerequisites for increase of prestige of urban areas and, consequently, increase in property prices of the cities.

Thus, in the urban planning law defines the concept of sustainable development of territories. In accordance with paragraph 3 of article 1 of GRK of the Russian Federation sustainable development of territories is a provision in the implementation of urban development of safe and favorable conditions of human life, the limitation of negative impact of economic and other activities on the environment and the protection and rational use of natural resources for the benefit of present and future generations [7].
The concept of sustainable development has a similar wording in the international law document - the Rio Declaration on the environment. On the basis of recommendations and principles published documents in Rio de Janeiro in 1992 at the UN Conference on environment and development.

As noted by A. S. Bogolyubov, cities and towns are the main places of residence of citizens of the Russian Federation. Such places are designed to create every favourable environment and other conditions necessary to improve the quality of life of the population. Means for the free development of man in the urban environment, to provide institutions and norms of town planning and environmental legislation [8].

3.2. Consideration of environmental factors when planning the use of areas of the city of Tobolsk.

Currently cities face a multitude of problems that require urgent and immediate solutions. One of them, the most relevant is the poor state of the environment of the city. It should be noted that the state of the environmental situation depends not only on climatic and anthropogenic impacts on the environment and the responsibility of authorities and activity of the population.

For solving problems of spatial development of the city of Tobolsk is necessary to create favorable living environment and human activities and environment for sustainable development for the future by achieving balance economic and environmental interests. This task involves a number of areas, osnovnym of which include: preservation of unique natural potentials of the territory, the increase of investment attractiveness of the city, improvement of living standards of the population, as well as creating an attractive and environmentally favorable conditions to attract tourists.

Therefore, territorial planning necessarily takes into account ecological factors of the urban district and involves the planning and development of territories in the long term, as well as preparation of documentation necessary for implementation planning, which must contain ecological justification of planned actions.

The analysis of the documentation on territorial planning and materials for the assessment of the ecological status of the city of Tobolsk, helped to identify the main problem areas of the municipality. Such today are:

- environmental pollution by industrial enterprises and motor transport;
- the poor state of hydrographic system of the Piedmont historical part of the city;
- flooding and flooding of territories;
- pollution of surface waters;
- solid waste management.

Tobolsk today is a unique city in our country, which combines not only attractive for tourists is the historical site, but is also a city of active industrial enterprises and transport hub, which intersect roads, providing a connecting mechanism of the entire region. For this reason, in Tobolsk road transport and industrial predpriyatiya one of the largest sources of emissions of hazardous substances into the atmosphere.

High emissions due to the presence in the city highways of regional importance: Tobolsk-Ishim, Tobolsk-Injure, Tobolsk-Upper Aremzyany, Tobolsk-Setovo and passing through the city territory of a Federal highway "Tyumen-Khanty-Mansiysk". In connection with these factors to ensure the protection of atmospheric air should carry out reconstruction of the Central streets with the aim of increasing throughput of motor vehicles that will ensure the safety of road users and reduce the pollution of air on the loaded road transport stations. Takingapcalis plan of the city of Tobolsk is proposed for additional landscaping providing screening of roads and ensuring the assimilation and filtration of air pollutants.

In addition to road transport, affect the composition of atmospheric air, in the town of Tobolsk is about 7 percent of the industrial potential of the South of the Tyumen region, where the greatest contribution to emissions of stationary sources contribute the following enterprises: JSC "Tobolsk-Neftekhim", Tobolsk CHP, Tobolsk operating company TTS "GTLIC" Station of Tobolsk of the Tyumen branch of the Sverdlovsk railway", JSC "Tyumen'dorstroy" SU-931, Tobolsk branch of GUP "SG-TRANS", JSC "Tobolsk city water".
According to the Tyumen regional Department of statistics in the city of Tobolsk from stationary sources into the atmosphere each year on average emitted more than 10 tons of pollutants, including about 300 tons of solid substances, from 50 to 100 tons of sulfur dioxide, 3,000 tons of carbon monoxide, 5000 tons of nitrogen oxides, approximately 100 tons of hydrocarbons (without volatile organic compounds) and an average of 2,000 tons of volatile organic compounds.

In this regard, to improve the quality of atmospheric air on the territory of the Tobolsk city district there shall be established sanitary protection zones for all sources of air pollution, to ensure the landscaping of settlements and to transfer municipal boilers to gas. But in addition to the above activities, it is also necessary to constantly control the sources of pollution.

Control over sources of pollutant emissions in the city of Tobolsk is carried out by three independent methods. One of them is calculation method, which is done by the staff of the Main Department of natural resources and environmental protection in Tyumen region. The method of instrumental measurements carried out by employees of FGI "SIAC of UR" during on-site inspections on polluters, and control is carried out by the laboratory of the Tobolsk industrial site SIBUR group. This laboratory carries out monitoring of atmospheric air on the border of sanitary-protective zone of the enterprises in the city limits.

Part of the Tobolsk industrial site consists of the enterprise OOO "Tobolsk-Polymer", LLC "Tobolsk-Neftekhim", LLC "Zapsibneftekhim" - the leading enterprises of SIBUR, which occupies the first place in Russia by volumes of associated petroleum gas processing and is the leading company in the Russian petrochemicals industry.

Today, in residential neighborhoods is two posts of observation of atmospheric air pollution. Inside pavilions, equipped with modern equipment for sampling and work of the laboratory, allowing control of the ambient air 3 times during the day. Third post located on the border of sanitary-protective zones of enterprises of the Tobolsk production site with consideration of the wind rose: on the South side of the site, as prevailing on the territory of industrial zones are the Northern and North-Western wind. Unlike urban posts where the sampling of air and analysis produce technicians, third post is equipped with automatic analyzers of Russian production "OPTEK". The equipment is capable of continuously obtain data on the composition of air and define the contents in the ambient air of major pollutants such as hydrocarbons, nitrogen dioxide, phenol, formaldehyde, carbon monoxide, nitrogen oxides and dust.

In the framework of the environmental project acquired a mobile laboratory, which today can produce a sample of atmospheric air in any part of the city and the industrial site. The observation stations of atmospheric air is included in the accounting registry of the fixed positions of the Ob-Irtysh Department of the Federal service for Hydrometeorology and environmental monitoring. The frequency of sampling is governed by the environmental controls agreed with the Territorial Department of Rospotrebnadzor.

It should be noted that industrial activities has a negative impact not only on air quality but also on water sources, therefore, for the protection of water environment and prevention of negative impact of industrial enterprises on its facilities in the Tobolsk city district master plan is provided to develop projects for the organization water protection zones and coastal shelterbelts on water bodies. To clean the territories of water protection zones from industrial waste, to identify businesses that unauthorized use of water objects and to apply penalties, in accordance with environmental legislation.

It should be noted that industrial enterprises have a negative impact not only on atmospheric air and water objects, but also on the soil condition of the city district. To recover and also to prevent contamination and destruction of the soil cover of the city of Tobolsk, the General plan proposes to develop a series of measures on protection of water objects, pesticides, industrial and other technological waste. For this reason provided for activities such as reclamation and rehabilitation of the territories of the liquidated farms, agricultural enterprises and other polluting objects. You should also organize agrotechnical service for continuous monitoring for quality changes of soil and taking appropriate measures for its protection, ensuring quality control and timeliness of performance of works on recultivation of disturbed lands.
Speaking about the industrial impact on the environment, not to mention the fact that a relatively new, largest enterprise Topolskogo urban district, LLC "Tobolsk-Polymer", the project which was supervised by leading international environmental organizations use such processes, which are by far the safest in the production of polymers. OOO "Tobolsk-polymer"corresponds to the Russian environmental legislation and international norms on the protection of the environment.

Contamination of surface water and elevated groundwater levels is also an important environmental factor in the planning and development of the territory.

Intense sources of surface water contamination of the city of Tobolsk is a city storm sewer. The organization of surface runoff in the city is of great importance, as it is not only the factor of urban areas, but also contributes to the reduction of infiltration of precipitation into the soil, which leads to lowering of the groundwater level and helps to prevent the growth of ravines.

In connection with these factors to improve the environmental situation in the city, to avoid the periodic flooding of urban areas and partial waterlogging, increasing the service life of pavement, as well as to reduce pollution of surface water the General plan provides for the comprehensive development of the Sewerage system of storm (rain) wastewater and protection from flooding of the city, as well as works on Bank protection of the river Irtysh in the area of the cemetery and the construction of the dam embankment. In 2014 at the expense of means of the Federal budget made the establishment of special information signs on the border of the water protection zone of the Irtysh river.

On the basis of this program was amended in the General plan of the city district of the city of Tobolsk, which provides for the construction, repair and inventory of storm water drain network and the purchase of specialized equipment for maintenance of the storm water drain network in the municipal property of the city of Tobolsk and design the development of a network of stormwater is presented in figure 1 [9].

In the mountainous part of the city master plan proposes the construction of modular systems for cleaning the surface runoff of the closed type. The advantage of these systems is that as investment it is possible to increase the number of candy bars (blocking) and to increase surface water treatment to the required performance. There are currently a large number of scientific-production companies – OOO "Everest-M", Tyumen, ZAO "SEVZAPMONTAZHAUTOMATIKA", "ekoprom", the firm OyLabkoAb (Finland), etc. specializing on development of technologies for the treatment of storm water, production plants and stations of full factory readiness of different capacity and degree of purification. Modern installations and treatment plants have many advantages: no minimum size, compactness, simplicity and reliability in operation, high automation.
In the estuaries of single releases of water collectors and in some areas, cleaning of surface runoff is provided in the treatment plants of surface runoff with subsequent disinfection.

For a long time on the territory of the city of Tobolsk, there is the problem of disposal of solid waste. The greatest amount of generated waste is placed for storage and disposal on the municipal solid waste (MSW) and landfills.

On the territory of the municipality of solid waste represents a source of environmental pollution, contributing to the spread of hazardous substances. However, they contain in their composition components (ferrous and non-ferrous metals, plastics), which can be used as secondary resources. Production debris, similar in composition to MSW could be used as valuable secondary raw material after special processing. Food waste (catering, vegetable bases, etc.), if they do not require sorting, are also of great value. In any case, the separation of food and non-food solid waste allows us to offer an adequate technology of their processing.

Currently in the city of Tobolsk waste is not sorted, and stored in the landfill (in the area of ZKSM, site 1). If you sort and recycle waste, it will significantly reduce the load on the natural environment will make more efficient use of space of the landfill, reduce costs to the city for the removal and disposal, the return of secondary material resources in the sphere of production and consumption. For the solution of environmental problems in the city of Tobolsk, the construction waste recycling plant with pre-sorting of MSW [10].

4. Conclusion

In this article, a study was conducted of the existing dynamics of development of territories of the city Tobolsk. When doing research, much attention was paid to the complex approach to the assessment of the urban situation, identified the main environmental problems of the urban district, identified the major sources of environmental pollution and carried out the synthesis, solution-oriented priorities in the field of environmental planning land use city of Tobolsk. The article describes the options for more efficient use of the urban area to reduce negative impacts of natural and anthropogenic character.

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