Integration of industrial territories into the urban environment

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Abstract. Industrial territories have high town-planning potential, their renovation and revitalization improve town-planning, ecological, visual and other characteristics, the cities allow creating an organic architectural and landscape environment. The question of reorganization of the urban environment by renovation of industrial territories came under the spotlight at the end of the XX century. Now this subject is actively investigated in the works by many authors of Europe and Russia. Especially it belongs to questions of a complete solution of problems of industrial territories with the objects adjoining the central part of the city and also research of the questions issues connected with influence of industrial facilities on formation of architectural and spatial composition of the city. At the same time identification of ways of harmonization and development of the urban environment by renovation of industrial territories is one of relevant tasks when forming the concept of sustainable development of the city. In the article the issue of integration of the abandoned industrial territories into the urban environment is considered. Several directions of adaptation of industrial heritage to a modern context of the city are offered.

1. Introduction

Many years in world practice the idea of “new life” of the former industrial zones is very popular. In Great Britain, the United States of America, Ireland, Germany and some other countries the old industrial enterprises of the coal industry, ferrous metallurgy and heavy mechanical engineering became a basis for creation of various museums. Various programs for change of functional purpose of industrial facilities to attract tourists [1] were developed. The large cities, actively developing, have significant deficit in the living and administrative spaces, especially in the central parts. The historical industrial heritage can play a big role in the solution of this problem.

In many cities of Russia a large number of industrial zones are practically not used though town-planning development of these territories can be favorable both to inhabitants, and to investors and builders. The big areas of both internal, and external space bear in themselves the potential for arrangement of public zones, improvements of quality of the urban area as already are within urban development with the developed transport infrastructure, in close proximity to welfare, technical objects. Such situation defines their investment attractiveness and can promote the most effective use and social and economic development. This potential can be realized thanks to reuse (renovation and rehabilitation) of industrial territories [2-5].

For an explanation of relevance of integration of industrial zones into the urban environment it is possible to allocate three major factors:
- poor quality of the existing housing and recreational zones in the cities, a high share of industrial and warehouse territories in the central parts and an adverse transport situation (the level of development of transport infrastructure does not correspond to loading and does not keep up with growth of vehicle fleet);
- the happening processes of transformation of city economic functions, development of new technologies, growth in incomes of the population and change of their requirements impose more strict requirements to quality of the urban environment;
- in the country the nature of an urbanization was replaced, it is connected with the fact that the state capital investments in development of the cities were replaced by private investments which are subordinated to market laws and are focused on obtaining fast commercial effect.

The listed processes have important consequences for town-planning development. They change social and economic characteristics of the cities, their planning and appearance, various depressive spaces appear [6]. Therefore one of the most significant conditions of sustainable development of the city is process of its continuous updating and modernization [7]. In this regard renovation of the production zones and depressive territories which lost the value is represented the most significant factor of this process.

2. Historical features of formation of industrial territories in the cities

Formation, characteristic of the 20th century, in the cities separately of the allocated large industrial zones proceeded from provisions of «The Athenian charter» (1933) – "to localize and to territorially remove the industry as a source of harmful effects on the urban environment from residential territories" that had to neutralize their negative ecological impact. Traditional methods of protection of the cities against an adverse effect of manufacturing enterprises were providing significant gaps between industrial facilities and the inhabited territory. In the presence of the harmful emissions allocated by the industrial enterprises sanitary protection zones - the planted trees and shrubs territory between border of production education (the enterprises, knot, the area) and border of the residential territory, performing protective function in relation to surrounding territories were established. However in practice it was ineffective. Creation of big gaps between industrial facilities and a residential zone does not guarantee ecologically safe conditions of accommodation of the population, and extension transport and utilities increases unproductive expenses.

Awareness of need of transition to the strategy of sustainable development is followed by change of the relation to the ecologically harmful industrial enterprises: the only security measure from harmful effects of the industrial enterprises is transition to ecologically safe technologies and effective remedies of cleaning of industrial pollution. Where there would be no industrial enterprises, they should not pollute the environment.

At the end of the 20th century the trend of formation of the integrated industrial and residential educations was outlined. The industrial enterprises «acquired» a residential zone and were completely surrounded with the housing estate which has various planning structure. This environment on architectural artly shape and improvement is not connected with industrial zones therefore these zones exist in itself [8]. In this connection, there is a natural problem: need of adaptation of industrial zones of the cities to modern conditions.

3. Value of the industry as factor of ensuring stability of the urbanized territory

3.1. Industrial zones in planning structure of the cities: types and regulatory requirements to placement

In town-planning practice there was a certain typology of territorial and production educations and it consists of the following types of objects of an industrial profile: industrial quarter, industrial panel, industrial hub, industrial region.
Primary structural and planning unit of town-planning production educations is industrial quarter. Represents the territory limited from all parties to thoroughfares, streets or drives. In it one or several production objects can be located.

Several industrial quarters form the industrial panel located, as a rule, along one communication axis.

The industrial hub is a group technologically and organizationally the cooperated enterprises placed on one platform and united by a uniform system: general communications, engineering constructions and auxiliary production, service of workers, architectural and planning plan.

Natural resources belong to the major factors influencing placement of industrial complexes of the area. At placement of the concrete enterprises and complexes the relief of territories, engineering-geological conditions, seismicity, the other engineering-geological phenomena has significant effect (landslides, etc.).

The main town-planning requirements at placement of industrial territories in structure of the city are:

- the organization of communications with places of resettlement of workers, with a source of raw materials, sources power - and water supply of city value, external and intracity thoroughfares;
- ensuring planning and composite communication with adjacent districts of the city, their inclusion in composite structure of the city;
- cooperation of service of the industrial region with the city and regional systems of cultural and community service;
- an exception (or, in extreme cases, minimizing) influences of production hazards on residential territories of the city.

The order of formation of production zones and the nature of their combination to other spatial zones standardly defines the joint venture 42.13330.2016 where special attention is paid to a regulation of issues of spatial dispersal of production and residential zones.

The functional and planning organization of industrial zones needs to be provided in the form of quarters, within which the main and auxiliary productions of the enterprises, taking into account sanitary and hygienic and fire-prevention requirements to their placement, goods turnover and means of transport and also sequence of construction are placed. And, the territory occupied by platforms of the industrial enterprises and other production objects, institutions and the enterprises of service has to make not less than 60% of all territory of the industrial zone.

3.2. Influence of the industrial enterprises on a condition of the urban environment

Today the main sources of pollution of the urban environment are the industry and transport. Despite the considerable expenses and efforts of experts directed to reduction of harmful emissions in the environment, their catching and neutralization, in the large cities industrial pollution make up to 50% of total amount of the substances polluting the urban environment [9].

The harm done to the person by consequences of industrial production - toxic chemical compounds, industrial dust, noise, radiation and many other types of harmful effects, is shown in growth of number cardiovascular, pulmonary, oncological, etc. diseases, the child mortality, decrease in average age of men up to 58, women - till 71 year [10].

Complex studying of negative impacts of industrial production on the surrounding urban environment shows that the developed adverse situation is defined in many respects by the architectural and construction decisions, both certain buildings and constructions, and the enterprises and the whole industrial regions which are not considering in a due measure of modern ecological requirements.
The analysis of master plans of a number of the cities, in particular their industrial territories, says that they do not meet ecological requirements for the developed scales of development of industrial regions, neither for their placement, nor for planning and volume and spatial solutions, and are not effective in terms of economy of the territory, resources and energy.

Essential shortcomings are noted in questions of interrelation of production objects and constructions with a city and natural landscape [11]. Building of industrial territories quite often destroys fine natural landscapes by chaotic arrangement and poor architectural and art quality of the built buildings and constructions. In small, average and even large cities it is possible to see sad landscapes of the solid concrete fences stretched on many kilometers, the cluttered-up platforms of warehouses, dumps and dumps of production waste, the destroyed surface of the territory and the ruined green plantings [12].

In development of the city the part of industrial territories is brought out of constant use, keeping, generally engineering infrastructure and many production buildings. Transformation of such fragments of city structure into a source of ecological tension is considerably connected with the fact that in them, as a rule, there are no elements of gardening and improvement, the soil cover is broken or destroyed.

At the same time on the territorial placement many of industrial sites have convenient communications with water spaces and are located near historic districts of the city.

4. Current trends of introduction of industrial territories to the urban environment

One of methods of integration of industrial territories into the urban environment is renovation. Renovation means adaptive use of the land plot, buildings, constructions and complexes at change of their functional purpose and further use [13].

Main objective of renovation is improvement of quality of city space, and, therefore, increase in the standard of living of citizens. The essence of this action consists in the most effective use of opportunities of the territory; ensuring their sustainable development; increase in competitive capacity and development of social and economic potential.

The analysis of international experience of renovation of industrial territories shows that architectural town-planning transformations are conducted at various levels (town-planning, architectural and planning, constructive and technological) and are divided into 3 views depending on that, industrial function of the enterprise remains, partially remains or does not remain [14].

If to consider transformation of production zones from the functional point of view, then today there are three essentially different directions [15]:

1. Preservation of industrial function:
   - a memorial way – full restoration of the building, maintaining its initial shape (it is relevant for monuments of industrial architecture);
   - improvement – introduction of new production technologies in the existing building volume.

2. Partial refunksionalization:
   - reconstruction of planning structure which basic principle is exarticulation and maintaining the steadiest planning characteristics;
   - transformation of an object into the museum;
   - inclusion of new objects of city value in historical and industrial territories.

3. Full refunksionalization:
   - conversion of industrial facilities under residential buildings, administrative and office centers, educational institutions, cultural entertainment centers, hotels, trade enterprises, sports constructions;
• ecological rehabilitation of the territory due to land reclamation, creation of new green massifs;

• full demolition of an industrial facility and use of the freed square in other purposes.

The accurate sequence of works at various levels is necessary for identification of a method of renovation which needs to be used in the concrete territory. Treats them [16]:

1. Extensive planning of the territory at which the existing city problems which arose around industrial territories come to light.

2. Coordination with the Master plan and Strategy of perspective development. The list of the necessary measures chosen for transformation of this territory, answering the purpose and problems of development of all city [17] is defined. At this stage polls of citizens, public hearings are carried out, public organizations which will promote transformation of the territory are created.

3. Choice of a method of renovation. At this stage the analysis of the tasks defined for transformation the territory is carried out. Further it is necessary to make changes to rules of land use and building. They are necessary for change of functional zoning of the territory and creation of the project of renovation [18].

It follows from this that for effective renovation of industrial territories, it is necessary to carry out complex analysis of this zone, the available objects and nearby territories. It will allow to choose the most optimum method of renovation of each concrete territory.

Today, the leading direction of renovation is full refunktsionalization of the territory. At full withdrawal of production function from the territory the new site for building corresponding to modern problems and the principles of city development is provided to the city. This approach demands direct participation of government institutions in the project of renovation and extensive planning of the territory as new city area.

After renovation the former industrial zones can perform different functions: in particular, inhabited, social and recreational [19].

Reorganization of the invalid industrial enterprises, adaptation, renovation of production objects will help to organize use of the former industrial territories, effective from the economic point of view, which are especially located in the central planning region of the city. At the same time the fact that industrial buildings can be rather easily converted into functions which are in the greatest demand today also is positive: business, trade, sport, entertainments [20].

5. Conclusion
Having carried out the analysis of industrial territories in the cities, the following regularities which can be used at their renovation were marked out:

1. Comprehensive planning of the territory. As a rule, the former plants occupy the big spaces – their territory is estimated in tens and hundreds of hectares. It allows to plan functionally a building spot, to competently think over zoning, it is rational to use all territory with the maximum convenience to people.

2. Optimum location of territories. Many industrial facilities are located in the central part of the modern cities as they were under construction in those days when the square of the cities was many times less.

3. Transport availability. Today the majority of industrial zones have good access roads from the main thoroughfares, various on orientation and load of the highway, territorially available bus, trolleybus and tram stops.

4. High recreational capacity of territories. Historically so it developed that many industrial zones were located on coast of the rivers or near reservoirs. In the majority of the cities located on the rivers there is a situation when well-planned pedestrian embankments are absent or their quantity is very limited. Therefore renovation of the industrial zones located along the rivers allows to create the vacation spot of citizens which it often to them does not get.
5. Creation of additional jobs. Complex building of territories of industrial zones allows to create business centers, science and technology parks, innovative clusters, contemporary art centers and other objects of architecture within the project.

6. Solution of environmental problem. Follows from the previous prerequisites of reorganization of the territory that the industrial past, the proximity to large city highways and other features of the concrete cities create adverse ecological situation around object. By means of competent approach to building of industrial territories it is possible to increase quantity of green zones in the cities, thereby having created occasional seats of recreation and having improved quality of the environment.

Thus, it is possible to claim that the organization of modern architectural complexes in the territory of the former industrial enterprises will allow to resolve at the same time several problematic issues in the course of activity of the city. These questions, eventually, come down to harmonization of three components: economies, ecology and esthetics.

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