

# MAIN DIRECTIONS OF URBAN LAND OPTIMIZATION IN KIEV AGGLOMERATION

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## Abstract

Land as a production factor occupies a special position in the economic activities of the urban population. Land resources in big cities are not only territorial basis for placing industrial and production structures, but also a space for urban life in general. However, to assess the effectiveness of urban land use, primarily the ecological and economic potential of the use of the urban land resources should be determined aimed at sustainable development of urban agglomerations (Volodchenkov, 2010). The rapid pace of development of large cities in the world and an increase of their impact on the environment and society is accompanied by the set of economic, ecological and social problems which significantly influence the development of settlements in general (Stol'berh, 2000; Onyshchuk, 2001). However, the process of urbanization as a result of rapid scientific and technological revolution requires large areas for deployment of large scale production facilities and urban settlements in the conditions of natural resource management (Kontorovich, Rivkin, 1986).

Keywords: optimization, land resources, urban land resources.

## Introduction

In general, "optimization" (from the Latin "optimus" - best) in scientific sources is understood as the process of providing anything of most favorable characteristics (Krivov V. M., 2010, p. 147). Considering the value of land resources as environmental, economic and social aspects of human life, the process of optimizing the spatial resources should also be combined with relevant areas of optimizing land use in general (Krivov V. M., 2010, p. 147). M. Maksimenko notes that (Maksimenko M. I., 2012, p. 164) "environmental component of optimization of land use is the perceived need of conservation and reasonable use of the land as the basic natural resource and the basis of environmental component, economic – in land use in those lands, where they will generate the most revenue, social – the adequacy of the nature of the land use status of social consciousness and social system's (social) needs" (Martin A. G., 2004, p. 8). So the term "optimizing the structure of land use" should be understand like the process of achieving optimal ratio and relative different types of land within a specific landscape (territory)" (Maksimenko M. I., 2012, p. 166).

Also, R. I. Bepalko, S. Yu. Hryshchuk analyzing the identity of concepts "rationalization of land use" and "optimization of land use" in their work noted (Bepalko R. I., Hryshchuk S. Yu., 2013, p. 227) that under the law of Ukraine "On the general scheme of planning the territory of Ukraine" (2002), one of the main tasks of perspective development of settlements is to optimize the structure of land use order to ensure their sustainability. According to the concept of sustainable development of settlements (1999) the term "optimization of the structure of land use" is used in the sense of measures to ensure the sustainable use of land resources".

A quite interesting analysis about the classical theories of spatial economy and agglomeration effects were made by Sh. I. Ibatullin (2007) in his scientific work. The scientist has presented his understanding about the theory of "concentric rings" by I. Tyunina. The main idea of it is the differential rent regulations and the main factor for the accommodation is transport costs. That is the land rent is equal to the saving on transport costs in the farms which are located near the centre of the city.

The problem of optimization of urban land in Kyiv is largely associated with the lack of science-based, rational land use policy. Today there is a steady trend of the lack of free land parcels in the downtown for the development of urban infrastructure, while the majority of urban land is used inefficiently. In particular, the density of buildings in some urban areas is low, but large areas are occupied by secondary objects, such as industrial warehouses, virtually non-working enterprises, farm buildings, excessive railways and transport infrastructure. All these factors motivate investors to establish new engineering objects in the new territories of (undeveloped) land that will lead to increased costs for installing the communications and their construction, repairing and modernization in the future. So the exploitation of these new buildings, from an economic point of view, is less effective than reconstruction (modernization, reindustrialization); displacement outside of settlements despite the irrational land using, which also occupy large areas of urban land (Novakovska I. O. et al., 2014, P. 118).

**The aim of research** is to identify the main ways of optimizing land in Kiev for their ecological, economic and effective use.

**Main object of research:** industrial land use in Kyiv city.

**Methodology of research and materials.** The analysis was conducted using the methods of scientific publications, statistical analysis and synthesis.

### Discussion and results

An important step to intensify the economic activity, business development, attraction of foreign investment in the city is the rational use of urban land considering international experience (deindustrialization of large settlements) and trends in modern developed cities. The main reasons for optimizing industrial areas of Kyiv are:

- Economic factors:
  - low tax revenues to the local budget from the land tax of the industrial lands compared to other functional land using;
  - costs of salaries for employees in industrial enterprises in Kiev are higher than in the suburbs;
  - the market value of the surrounding city land is low compared to similar areas without industrial facilities "in the neighborhood";
  - the logistics network of Kyiv city is inefficient for industrial needs.
- Environmental factors:
  - air pollution;
  - pollution of water sources of the city;
  - soil pollution.
- Social factors:
  - the trend of a decrease in the number of the employed in industry in Kiev; in particular, 122.1 thousand people were employed in the industrial sector in January of 2016, which is by 2.4 thousand people less than in 2015.

However, environmental and economic potential of Kyiv is associated with industrial development within urban land and expediency of transforming as an inefficient industrial facilities outside the city. The total number of active companies in Kiev account for 1,044 industrial and other enterprises, in total they occupy 3.8 thousand hectares of land (Table 1).

**Table 1**

Area of land under industrial and other enterprises in the city of Kyiv

Industrial and other enterprises	Quantity	The total land area, thousand hectares
		1,044
Enterprises of mining industry	25	0.1
Metallurgical enterprises and enterprises of metal processing	58	0.3
Enterprises of production and distribution of electricity	10	0.1
Enterprises of building materials production	139	1.0
Food industry and agricultural products processing enterprises	62	0,5
Enterprises of other industries	750	1.8

The largest area is occupied by companies producing building materials (1.0 thousand hectares); enterprises of other industries occupy 1.8 thousand hectares; the least amount of area is occupied by the companies of producing and distributing electricity (0.1 thousand hectares) and mining enterprises (0.1 thousand hectares).

Chemically dangerous industry objects have a particularly negative impact on the ecological state of Kyiv. There is environmental pollution by hazardous chemicals, including: ammonia, hydrochloric acid, caustic soda, chlorine, mercury and other dangerous chemicals.

However, according to our calculations, the further development of technologically-hazardous industrial facilities in Kiev should be limited. The zone of possible effect from an emergency situation covers 93.4% of the total area of the capital city with the 96.9% of the population.

It is obvious that, regarding ecological and economic aspects, the decline of industrial production has led to negative results, in particular, large industrial areas in Kyiv are in the state of deep stagnation or

spontaneously and unsystematically used in legal and semi-legal ways, usually without taking into account the real needs of the city and the interests of urban residents. So at the current stage, one of the most pressing issues for Kyiv city is the optimization of non-functioning industrial areas into a territory reserve for future development of the city through an integrated approach to its solution (Mazur T. N. et.al., 2006) (Fig. 1).

In our opinion, the basic principles of optimizing industrial areas should be focused on the sustainable development the big city in the way that future purpose of the land use is considered from the standpoint of the need to make a functional element in the urban area, which is located on land. The main factor is meeting the needs of territorial-planning zone of the city: the centre, median, peripheral (Abakumov A. V., 2014).



**Fig. 1.** An example of not functioning industrial facilities in Kyiv city (Kyiv plant "Budshlyahmash")  
*Sources: made by the authors according to the data of the website: URBAN3P Project.*

Three main approaches of optimization of industrial objects and their areas should be identified in order to effectively use urban land (Votinov M. A., 2014):

- complete safety of the production function through reorganization, reconstruction, restoration, adaptation and modernization of industrial areas (Table 2);
- partial preservation production function – this approach is advisable in social and cultural terms, because it allows to keep production function and also improve the aesthetic characteristics of the environment by combining production function of the object and functions of the city. In this case, partial re-functionalization allows to expand social infrastructure of the city and transform the industrial area according to the current requirements;
- the elimination of production function; it is realized by the conservation, revitalization, renovation, environmental rehabilitation, full re-functionalization of industrial areas (Table 3).

**Table 2**

The directions to optimize industrial areas with complete preservation of production function of enterprises

<b>Name</b>	<b>Explanation</b>
Reorganization	The transformation of organizational and management structures while preserving fixed assets and production potential of the company. A variety of complex radical innovations, which suggests a restructuring of the organizational structure (systems, goals, relationships, norms) of any object. Reorganization of industrial buildings and structures gives an opportunity to effectively control under the development of the spatial environment of the city.
Reconstruction	From (lat.) – fundamental alteration, improvement ordering anything. Reconstruction in architecture - restructuring the city, an architectural complex of buildings, caused by new living conditions. Reconstruction first of all involves reconstruction of current cost-effective enterprises, which are form the budget of the city and provides a large number of workplaces. In order to improve the ecological and economic industrial environment for these enterprises should be provided the reconstruction of industrial areas with creation of ergonomic spaces for recreation (short rest) and improve the ecological and aesthetic environment indicators.
Restoration	It is used for improving the aesthetic features of the industrial environment. Basically involves restoration of facades, if the architecture of industrial buildings have the historical value or this is a architectural monument.
Adaptation	Restructuring industrial object for its partial using with functional changes. Concerning industrial buildings or complexes envisaged measures for placing the technological process, which related to other industrial sectors, typically, with less environmental impact on the environment of the city.
Modernization	Reconstruction of buildings, technical re-equipment, landscaping, more efficient using the available area with implementation of new technologies. Through these measures, the city does not lose taxpayer in the face of the company and the workplaces for urban residents.

Sources: developed by the authors according to the data of Votinov M. A., 2014; Sysoeva O. I. et.al., 2005.

**Table 3**

The directions to optimize industrial areas with liquidation of the production function of enterprises

<b>Name</b>	<b>Explanation</b>
Conservation	The type of activity which includes cultural and historical aspects, directed to research and preserving industrial facilities which are the part of world cultural heritage.
Revitalization	Revitalization allows to find the new more efficient and cost-effective ways to transform former industrial objects. Unlike the renovation (redevelopment), revitalization requires considerably less investment. It allows to significantly reduce the period from the beginning of works on revitalization to the commissioning of the object with a new internal and external.
Renovation (redevelopment)	The set of measures aimed on the changing the functional purpose of industrial objects. The main measures during the renovation process are: removal production function; preserving the industrial character of the building; forming a new functional use of the urban territory. Inactive or inefficient industrial objects and areas which prevent proper development of urban infrastructure, become to the subject to renovation.
Environmental rehabilitation	Involves using the territory under the industrial objects in recreational purposes (creation of parks, systems of recreational rides etc.)
Full re-functionalization of industrial areas	Implemented within dilapidated industrial facilities. Total demolition of old industrial objects. The territory used for building a new effective buildings.

Sources: developed by the authors according to the data of Votinov M. A., 2014; Sysoeva O. I. et.al., 2005.

However, the development of plans to optimize land use in Kyiv is regulated by modern development strategy of the city on the basis of the adopted (current) General Plan of Kyiv for the period until 2020. Within this document, a phased implementation optimization measures for reproduction of natural resources (lands) of Kyiv and rehabilitation of disturbed (under the industrial objects) areas for environmental protection within the big city are provided. The main ones concerning the renovation of industrial areas are (General Plan of Kyiv for the period until 2020):

- re-functionalization of production with reducing the class of ecological hazard;
- displacement of industrial enterprises and some manufacturing plants which are located in residential areas and on the lands of water fund;
- in total, it is envisaged relocate 32 companies and production plants, therefore 118.45 hectares of urban areas will be exempted.

### Conclusions and proposals

General Plan of Kyiv defines not only an economic but also ecological model of the city development. From the ecological point of view, preservation and expansion of the environmental "corridor" for normal life of population is envisaged. However, sanitary-protection zone of enterprises which amount to 500 metres, does not allow to actively explore the area around them. That is why the General Plan of Kyiv envisages rehabilitation of residential environment by transferring some of the industrial enterprises, which, according to environmental, urban planning and other requirements, should not be present in current locations.

We should also mention that the process of transfer of enterprises or building new objects elsewhere requires significant investments, which companies generally do not have. It is therefore necessary to activate all managerial, organizational, administrative measures to find investors who will continue the development of exempt urban areas, and to help companies with their investments. Then the mechanism of attracting investors might be different: auction for lease rights of this land or direct discussions with the signing of relevant documents etc.

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