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SUSTAINABLE LAND USE FRAMEWORK: UKRAINE CASE STUDY

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Abstract.*Under rapid urban expansion and continued use of natural land resources, it is necessary to study land use from several directions and complex data clusters. For this purpose, the data and materials provided by the scientific community, as well as from government agencies and organizations and commercial companies, had been thoroughly examined, grouped and used in research. This methodology has proven to be effective in making the right assumptions and helping build an effective development framework model for the future development of land use. Land and forest resources undoubtedly play an important role in the formation and development of cities. The quality, sheer number and their use affect the economic development and environmental situation of cities in the surrounding areas. The available forest, food and land resources are especially important for large cities. Careful planning and consideration of various factors should be aimed at restoring land and natural resources, planning the costs of introducing new energy-saving and other technologies. The focus of this research work is the case study of urban land use under sustainable development program in Ukraine, based on pre 2023 data. The sustainable land development framework is presented as research result. This framework should be considered a key part of the general urban development program. The result of using the proposed sustainable development program opens a possibility for a new land and city management policy that will result in nature resources preservation, in some case resources restoration and public quality of live improvements.*

Keywords: *urbanization, sustainable development, land use planning, sustainability*

Introduction

The modern globalized world is becoming more globalized and urbanized. The the key economic and political levers are shifting from states to a certain number of the largest cities in the world. As a rule, larger cities are characterized by a certain narrowly focused focus in their activities at the macroeconomic level. An example is such cities as: London, Paris, Tokyo, New York, Los Angeles, Singapore, Chicago, Shanghai, Guangzhou, Shenzhen and others. According to current forecasts, the total GDP of the top ten such cities in the world will reach 13.5 trillion US dollars by 2035. On the other hand, we have examples of modern problems, such as changes in climatic conditions caused

by rapid urbanization and irrational use of natural resources. In the current conditions of rapid urbanization and future climate change, it is advisable to pursue a balanced policy in the context of sustainable development of urban areas and rational use of land resources with a forecast for the next 20-25 years.

Analysis of the latest scientific research and publications

According to much prominent research works in the sustainable land use planning, the main challenge in the existing economic planning and land use is the lack of a holistic picture, and general theoretical models that could be used in practice by institutions, scientists and officials [1, 2]. Studying the process of urbanization, it is worth paying attention to the development of the real estate market, since urbanization is associated with population growth and the relocation of people from the periphery to the urban center - cities and suburbs [3]. Studying the experience of the member countries of the Organization for Economic Cooperation and Development, primarily such as Finland, Japan, Canada and Germany, the author argues that Ukraine currently does not have a comprehensive approach to the issues of rational use, conservation and restoration of forest resources [4].

Purpose. The main purpose of this study is to build a general theoretical model of development and land use options within the urban zone and adjacent territories. An important scientific task is to identify and consider the key economic and environmental factors influencing the choice of land use options, taking into account a comprehensive program of sustainable development. To address issues related to the impact of environmental factors on the economic development of cities, first of all, economic levers and regulatory framework at the national level, as well as a modern legislative framework for suburban areas and large cities, are needed. Judicial reform and amendments to the Land Code are also very important in this context. To present the concept of sustainable development of the city, it is advisable to create open registers on national and local land use in the context of natural resources and public land. Such a system should contain information about the owners of plots, communities or individuals, data on the quality of green spaces, their age, area, etc. Also important are plans for the restoration of natural resources, namely: forest plantations and distribution according to possible options for their use in the future.

Materials and methods of scientific research

The conducted studies of general economic activity and development of the largest Ukrainian cities are a continuation of the study of these issues. We have determined that the economic and environmental situation in large cities is quite uneven. The main factors influencing these indicators are - high rates of housing construction, transport infrastructure and services, as well as the concentration of enterprises in certain areas of the city. While other emerging areas require financial investment and attention from city officials to stimulate their economic development and make them attractive to citizens. In the microeconomic context, the author noted that when working on the economic model of land use in the large city and its suburbs, it is necessary to consider the costs of construction, prices for the purchase

or lease of land for commercial use [2].

It should be noted that in Ukraine today there are eight large cities with a population of more than 500 thousand people [5] (pre 2023 data). Among such cities, more than one million people live in three, these are: Kyiv (2.9 million people), Kharkiv (1.4 million people), Odesa (1 million people). At the same time, a little less than a million people live in such cities as: Dnipro (990 thousand), Donetsk (900 thousand), Zaporizhia (731 thousand), Lviv (724 thousand), Kryvyi Rih (619 thousand). In terms of total area, the city: Kyiv (847 km^2) is the whitest city in Ukraine, followed by Kryvyi Rih (430 km^2), Dnipro (409 km^2), Kharkiv (370 km^2), Donetsk (358 km^2), Zaporizhia (331 km^2), Odesa (162 km^2) and Lviv (149 km^2) [2, 5].

This discrepancy between the population and the area of cities is since Kryvyi Rih, Donetsk, Dnipro and Zaporizhia have large industrial facilities that are located within the cities and occupy a large area of the city. In the case of large cities, they are mostly developed due to the accession of adjacent settlements and changes in the use of suburban areas, namely: forests, agricultural land and public land. It should be noted that in the context of new reforms, formation and development of ATCs, the use of land territories has undergone significant changes, primarily in terms of regulations and changes in their subordination.

An important component to develop sustainable land use program and framework is the analysis of current and previous models of land use, outlining the existing problems and economic inefficiency in these patterns in a large city. For research, we had referred to the official statistical data provided by the State Statistics Service of Ukraine, the Kyiv City Council, the Municipal Enterprise "Kyivgenplan", private real estate companies, economists and the State Cadastre of Ukraine (pre 2023 data) [6]. Suburban areas are particularly important objects for such a system. As mentioned above, cities develop at the expense of surrounding areas, which often include agricultural land or forest areas. The impact on suburban areas and forest plantations may not be direct (not due to development or change of their use), but indirect. Such factors include environmental impacts (landfills, polluted water flows or harmful emissions, noise and radiation) and illegal use of territories.

The results

Without a doubt there is a negative impact of urban growth and development on the natural environment, the quality of land and natural resources, and public health problems. In this regard, various measures have been taken by international NGOs, trade unions and inter-municipal summits, such as the Kyoto Protocol, the Paris Agreement, etc. Urban agglomerations (cities) and industrial sites are the main contributors to environmental pollution and waste generation, resource consumption and land degradation.

The author offers an example of a sustainable development program in the broader context of land use and land management (Table 1). This planning program will serve as the basis for the city's future sustainable land management plan. There are six stages of the program, starting with the initial analysis of the system and planning, leading to the action plan and its monitoring (observation). There are many factors that influence each phase, while phases 1 to

1. Key phases of sustainable land urban development planning*

	Phase	Influencing factors	Urban development components
1	System Analysis	Social Ecological Economic Political	Quality of life and state of resources Infrastructure condition and coverage Economic profile and health care State of the Environment and Natural Resources
2	Planning	Statement of the problem Study & Research Inspection & EvaluationUsage Patterns & Cost	Land Use Planning and Allocation Zoning & Special Zones Construction plan Resource Allocation
3	Policy & Prioritization	Public opinion Costs Environment, Land Resources and Ecology	Land market Spatial Location and Distribution Climatic aspects Quality and use of natural resources
4	Resource Planning and Allocation	Public opinion Costs Environment Land Resources and Ecology	Spatial development Energy Supply & Infrastructure Distribution Investment & Financial Planning
5	Policy program (framework)	Implementation Policy Timeline Land Cost and Use Lands and the transformation of natural resources	Layouts of houses and dwellings Construction & Location of Industry City management Economic Activities and Resource Planning
6	Surveillance and policy updates	Policy & Monitoring System Public Monitoring	Transport & Traffic Control Land use and use of natural resources, restoration costs

* prepared based on the research data [7-10]

3 focus on a broader dataset, resource planning, and sequence of actions that rely on aspects of land management in relation to urban development. For the study, the following indicators were included in one column, among which both urban and suburban aspects of development are presented. However, each of them has unique properties and a set of data that will be covered in further research work. The sustainable land development program emphasizes effective resource planning, extensive preliminary research and public opinion research, and relies on climate agreements and general recommendations of government agencies to consider the environmental aspects of urban planning in the future.

The potential of the sustainable urban areas' development program is that it provides a set of benefits to both communities, city residents, and private organizations. Figure 1 showcase a set of key components of the sustainable land management program (framework). One of the main reasons for the benefits of a sustainable land management program is long-term planning, which considers the complex area of management and development of the city, its social, economic and environmental aspects, as well as management, policy development, food supply, water supply, waste management, electricity supply and construction. Land management policies, resource allocation, and market regulation are the main factors that contribute to sustainable urban development.

Figure 2 highlights components for sustainable urban development plan-

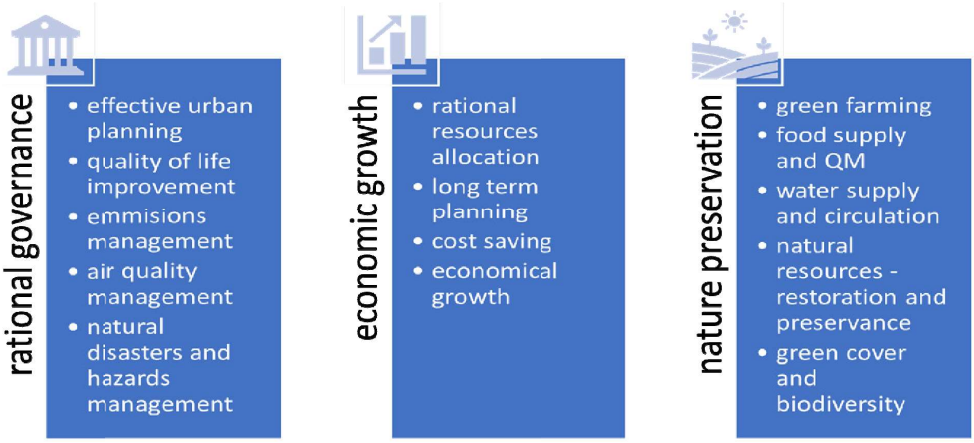

Figure 1. Sustainable land development framework

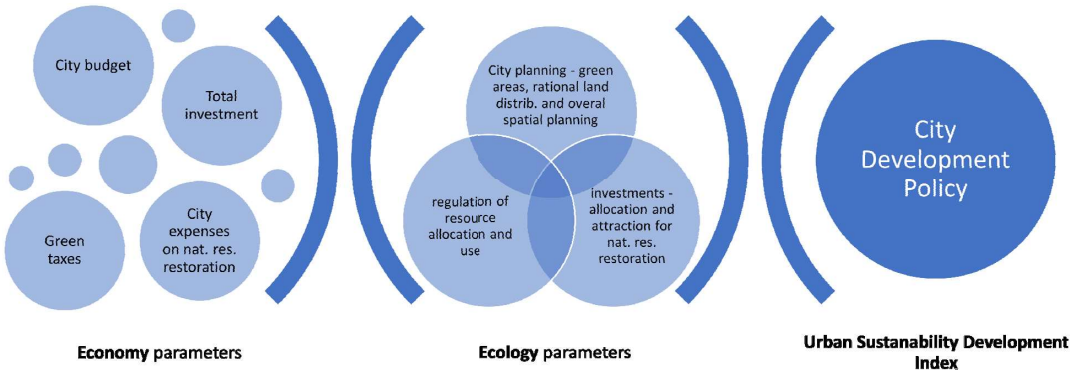

Figure 2. Sustainable urban land development plan components

ning. This plan takes into account the volume of internal and external investments under annual environmental development programs, the volume of total investments received in the development of the city, all expenditures from the city budget related to the environment and maintenance and restoration of natural resources, waste, emissions, CO_2, etc., and the volume of total budget expenditures, which can be used for planning and forecasting costs associated with urbanization. The author had used statistical analytics, mathematical correlation, polynomial and linear approximations, percentage analysis, utility curves, profit curves, and growth models to conduct the analysis.

Discussion

Based on the results of the research, it had been concluded that it is necessary to introduce the Sustainable Land Management and Planning Framework, which is based on the profiles of urban and suburban land use, focusing on their similarities and differences, using environmental and economic indicators. It is necessary to consider sustainable development, the development and allocation of resources and the construction of spatial areas. To provide forecasts, key economic parameters are considered, namely: the city budget, capital investments, various types of taxes, as well as expenditures on the restoration

of natural resources. Such data can be used in the future to build linear models of function dependencies and diagrams based on computational data. The cities that have been explored have developed and expanded their boundaries for various reasons, the main ones being the following: around an appropriately ordered natural habitat; around the centers of economic activity and industrial development, for various socio-political reasons, as well as the expansion of cities, was based on new investments and the industrial development of the regions.

References

1. Nazarenko, V. A. (2018). Suchasni vykluky urbanizaziyy – economichniy poglad [Current challenges of urbanization - economic view]. *Land management, cadastre and land monitoring*, 2, 97-104.
2. State Statistics Service of Ukraine. (2021). Available at: http://www.ukrstat.gov.ua.
3. Agency for the development of infrastructure of the stock market of Ukraine. (2021). Available at: https://smida.gov.ua.
4. The publicly available information database of the National Securities and Stock Market Commission on the securities market. (2022). Available at: https://stockmarket.gov.ua.
5. CIA US. The World Fact Book: Ukraine. (2020). Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/up.html.
6. Department of Urban Planning and Architecture. General plan of the city of Kyiv for the period until 2020 (current). (2020). Available at: https://kga.gov.ua/generalnij-plan.
7. Izakovicova, Z., Miklos, L., & Spulerova, J. (2019). Basic principles of sustainable land use management. Current Trends in Landscape Research, 395-423.
8. Portney, K. E. (2013). Taking sustainable cities seriously: Economic development, the environment, and quality of life in American cities. MIT Press.
9. Tang, H. T., & Lee, Y. M. (2016). The making of sustainable urban development: A synthesis framework. Sustainability, 8(5), 492.
10. Hualou Long, Yi Qu. (2018). Land use transitions and land management: A mutual feedback perspective. Land Use Policy, 74, 111-120. https://doi.org/10.1016/j.1andusepol.2017.03.021.

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КОНЦЕПЦІЯ СТАЛОГО ВИКОРИСТАННЯ ЗЕМЕЛЬ НА ПРИКЛАДІ МІСТ УКРАЇНИ

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Анотація. *В умовах стрімкого розширення міст і продовження використання природних земельних ресурсів необхідно вивчати землекористування з декількох напрямків і комплексу кластерів даних. Для цього були ретельно вивчені, згруповані та використаны в дослідженні дані та матеріали, надані науковим співтовариством, а також державними установами та організаціями і комерційними компаніями. Ця методологія довела свою ефективність у прийнятті правильних припущень та допомогла побудувати ефективну модель розвитку землекористування у майбутньому. Земельні та лісові ресурси безсумнівно відіграють важливу роль у формуванні та розвитку міст. Наявність, значна кількість та їх використання впливають на економічний розвиток та екологічну ситуа-*

цію міст та прилеглих до них територій. Наявні лісові, земельні та продовольчі ресурси особливо важливі для забезпечення життєдіяльності великих міст. Ретельне планування, облік та аналіз різних факторів повинні бути спрямовані на відновлення земельних і природних ресурсів, планування витрат на впровадження нових ефективних енергозберігаючих та інших сучасних технологій. У фокусі цієї дослідницької роботи – кейс-стаді міського землекористування за програмою сталого розвитку України на основі даних до 2023 року. У результаті дослідження представлено концепцію сталого розвитку земель. Цю концепцію слід розглядати як ключову частину загальної програми розвитку міста. Результат використання запропонованої програми сталого розвитку відкриває можливість для розробки нової політики управління земельними ресурсами та містом, результатом якої стане збереження природних ресурсів, в окремих випадках відновлення природних ресурсів та покращення якості життя мешканців міст.

Ключові слова: *урбанізація, сталий розвиток, планування землекористування, сталий розвиток.*