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CONCEPTUAL MODEL OF LAND USE ADMINISTRATION IN WARFARE: CHALLENGES, SOLUTIONS AND PROSPECTS FOR RECOVERY

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Abstract. *The article examines key aspects of land use administration in conditions of military operations and the challenges facing local governments, state and military structures in terms of land resource management, as well as the prospects for land restoration after the end of hostilities. A conceptual model that encompasses legal, informational and organizational mechanisms for ensuring effective land management, protecting the rights of land owners, planning for territorial development, protectionism of individual territories to protect strategically important or vulnerable territories from uncontrolled use of resources, destruction or other threats aimed at protecting individual regions or territories from external influences, controlling strategically important territories and restoring land potential after the end of the conflict is proposed. The paper focuses on the importance of integrating digital information from the state land cadastre to identify the boundaries of occupied or liberated territories and adapting the legal framework to martial law conditions. The need for coordination between military, civilian, and international actors to ensure effective land administration in wartime and post-war recovery is discussed. The model offers a balanced approach to territorial development and long-term sustainability of land management, focused on sustainable development after the end of hostilities.*

Key words : *land use administration, land cadastre, martial law, land restoration, legal regulation, information systems integration, territorial management, strategic resources, land management*

Problem statement. Land management during military operations faces serious challenges related to both direct management of territories and protection of land rights. Violation of the integrity of state land cadastre data, uncontrolled use of land resources, loss of land rights by owners in occupied or liberated regions, as well as damage or loss to land plots as a result of military operations require the development of new land use management models. The problem is how to create an effective conceptual model that will allow the state and local authorities to manage lands during hostilities, preserve the rights of owners, and ensure recovery after the war.

The aim of the article is to develop a conceptual model of land use administration in conditions of military operations , which would ensure effective management of land resources, protection of owners' rights, support of strategic control over territories, and also create conditions for rapid restoration of land resource potential after the end of the war. The article offers solutions for adapting existing legal and information systems to war conditions, identifies ways of integrating military and civilian structures into land use management processes, and emphasizes the need for international cooperation to achieve sustainable development after the end of hostilities.

Analysis of recent scientific research and publications. Recent research in the field of land use administration increasingly focuses on the integration of modern technologies and legal mechanisms to improve the efficiency of land management, particularly in crisis situations such as military conflicts.

According to research by the International Federation of Land Surveyors (FIG), the Food and Agriculture Organization of the United Nations (FAO), land administration should take into account not only technical but also socio-economic norms and rules within which land managers and administrators should act in relation

to land. The balance between protecting the rights of landowners and using resources for the needs of the state in military conflicts becomes especially important [1, p. 5].

Scientific works of L. Svyrydova indicate the importance of coordination between state authorities and local communities for effective administration of land use [2, p. 354]. And in conditions of military operations, coordination should be especially strong, since it is necessary to make quick decisions regarding land rights, its use and protection of resources. In this context, there is a need to create an institutional framework that will help ensure the stability of land use in wartime.

Research conducted by I. Williamson, S. Enemark, J. Wallace in the scientific work "Land Use Administration for Sustainable Development" emphasizes that effective administration of land resources is impossible without accurate and up-to-date cadastral data. In conditions of military operations, the cadastre becomes a critically important tool for managing territories and making decisions regarding their use. The introduction of digital land information systems allows for effective monitoring of land use and storing information even in unstable conditions. Scientists point out that land use administration is a process carried out by the government of the country through public or private agencies that regulate relations related to land ownership, land value and their use [3, p. 453].

I. Perovych also emphasizes that land use administration is based, first of all, on objective and reliable cadastral information. It is important to note that the cadastre is a tool for regulating and administering land and property relations of the state. Accordingly, it plays an important role in: planning the development of territories; forming fiscal policy; protecting property rights to real estate (land); establishing and developing the land market; protectionism of individual territories; modernizing the legislative and regulatory framework. [4, p. 111]. The cadastre as a tool is critically important for restoring the economy and stability after the end of hostilities. After all, cadastral data serve as the basis for making decisions regarding the reconstruction of territories, planning new infrastructure facilities and compensating land owners for losses.

In the studies of R. Kuryltsiv, the land use administration system is considered as a system filled with two interconnected subsystems, namely, the management and informational subsystem. The management subsystem plays an important role as a tool for implementing land policy, in particular in the context of land use management and the use of natural resources as components of an integrated land use management system. Informational includes geospatial data infrastructure, land information systems and an electronic management system [5].

Thus, research in the field of land use administration confirms the importance of creating a flexible and effective model of land management, especially in conditions of military operations. An important component of such models is the integration of modern information technologies, protection of owners' rights, and international legal regulation.

Materials and research methods. Methods of general scientific and special nature were applied. In particular, it is important to highlight the following: *scientific analysis* – for the purpose of studying existing approaches to land use administration; *monographic analysis* – for scientific and literary search for studies related to various aspects of land use administration; *scientific modeling* – for the purpose of developing a conceptual model of land use administration in conditions of military operations.

Research results and their discussion. For the first time, the concept of land administration was given in 1996 in the basic document of the United Nations Economic Commission for Europe (UNECE): "...Land administration: the processes of recording and disseminating information about the ownership, value and use of land in the implementation of land management policies" [6].**Ошибка! Источник ссылки не найден.**In the modern sense, as evidenced by the above studies, the essence of this concept is considered from a different perspective, namely, there is a transition from the administration of land information processes to the formation of a comprehensive system of land use administration, within the framework of which the concept of sustainable development will be implemented.

The land use administration system is a triad of optimal relationships – rights, responsibilities and restrictions, which should ensure the management of private,

public and state interests of land use as an object of law, providing land relations with social, environmentally oriented development, land management, organizational, economic and legal regulation of land use and protection.

Despite this, it is the state administration itself that must ensure the unity of management of rights, restrictions, obligations and risks regarding property, land and natural resources. The right to use land and other natural resources must be regulated together with restrictions on their use and the obligations of those who use them. In the land use administration system, considerable attention is paid to the regulation of restrictions and obligations regarding the use of land and its protection.

From the author's point of view, **"land use administration"** is coordinated actions regarding the formation of infrastructure (institutional environment, regulatory framework, standards, information on land rights and other natural resources, formation of institutions of land use restrictions, legal liability, dissemination of systems and technologies) for the implementation of land policy and land use system management strategy in order to achieve sustainable (balanced) development.

Given that Ukraine is in a state of war, land use administration can play a key role in the context of territorial management, particularly on occupied, liberated or strategically important lands. In this regard, the following are subject to research: **ownership and control over land use; land valuation and taxation; territorial development planning; protection of land ownership rights; information from the state land cadastre.**

During times of war, land ownership can be contested. Effective land administration helps determine who is the rightful owner or user of land. This is crucial to ensuring the legitimacy of military and government actions. Managing land registries can prevent the illegal appropriation of land or resources, which is especially important in post-conflict periods for the reconstruction of territories.

Land is often the source of critical resources such as water, minerals and can also be used for food production. In combat situations, control over resources becomes critical. Governance can facilitate access to strategic resources and infrastructure, ensuring their effective use for military purposes.

Military operations can cause significant property losses and violations of land rights. Land administration in conflict situations also involves recording changes in ownership, assisting in the restoration of documents, which is important for the reintegration of territories after the end of hostilities.

For example, after the military conflict on the island of Cyprus in 1974, the territory of Cyprus was divided into a northern (controlled by Turkey) and a southern (controlled by Cyprus). The distribution of land and the determination of ownership on both sides became a key issue. Land registries and administration helped to establish property rights, which reduced social tensions and laid the groundwork for negotiations on a possible unification [7].

In the Ukrainian context, land use administration should also be considered as a tool for monitoring the formation and use of arrays of agricultural land plots, the concept of which was reflected in Ukrainian legislation relatively recently [8]. The importance of their administration is explained by the fact that the actual use of land plots within such arrays differs from the registered rights to their use.

Valuation and taxation of land during hostilities is a complex process, influenced by economic, legal, political and social factors. A plot of land in conflict situations can significantly lose its value due to the destruction of infrastructure, reduced demand or pollution as a result of hostilities. A significant amount of agricultural land has become inaccessible due to active hostilities in eastern Ukraine, especially in the Luhansk, Donetsk, Zaporizhia and Kherson regions. This has led to a significant decrease in their value or loss of market value altogether. On the other hand, some strategically important lands located near military lines or transport hubs have received a higher assessment due to their strategic importance, in particular for the location of military facilities.

As for land taxation, this process is complicated by the fact that local budgets are under significant pressure, and land tax revenues may decrease due to the loss of the population’s ability to pay or the loss of access to land in conflict zones. On the other hand, land taxation can be an important tool for economic recovery and ensuring revenues for the local budget. The state can establish tax incentives for those engaged

in the restoration of agricultural land or infrastructure to stimulate investment in destroyed areas.

Ukraine has introduced a special military tax that applies to all income, including income from land use. Initially, this tax was 1.5%, but in the context of a protracted conflict it was increased to 5% to mobilize additional funds for defense. For active combat zones, the government has provided tax benefits or tax exemptions for those who have lost access to their land or cannot cultivate it due to military operations [9, 10].

In times of war, mass migration occurs, leading to changes in ownership or loss of land use rights. Governments should develop special mechanisms for the temporary management of such lands or for their valuation in conditions of uncertainty over ownership rights.

To ensure effective resource management, population security, and economic recovery in the context of hostilities, **territorial development planning becomes particularly important** as an important mechanism for temporary land management.

During the war, large areas became dangerous due to mining and destruction of infrastructure, which can be converted into buffer zones or used to locate military bases and logistics centres. As for the need to restore or develop infrastructure in captured or liberated territories, this can be implemented through land use administration, which includes planning for infrastructure development (this concerns roads, military bases, logistics routes).

Spatial planning should also help attract investment for the recovery and development of post-conflict areas. The creation of special economic zones or recovery programs can help stimulate the economy and provide employment. This also applies to providing tax incentives for businesses in areas affected by war.

In the context of the war in eastern and southern Ukraine, regional development planning is focused on restoring critical infrastructure and ensuring security. By 2023, over 2,000 km of roads and electricity networks damaged by attacks have been repaired. The private sector is also involved in the reconstruction, mobilizing investment for housing, social facilities and agricultural land, which plays an important

role in the return of displaced people to their homes and ensuring the country's food security.

The total estimated cost of Ukraine’s recovery is over $486 billion over the next ten years, which includes not only immediate needs but also a long-term strategy to rebuild a modern, climate-resilient, and inclusive infrastructure [11, 12, 13, 14].

Thus, planning the development of territories in wartime requires an integrated approach that takes into account both immediate security needs and a long-term strategy for economic and infrastructure recovery.

As for the information of the state **land cadastre**, during hostilities they play a strategic role in providing objective and reliable information about territories, their borders and resources. This becomes especially important in conditions of military conflicts, when the situation on the ground changes dynamically, and territories can come under the control of different parties. It is no less important for military planning, since it is possible to obtain data on the accessibility of resources available in a specific territory – agricultural lands, water resources, industrial facilities, etc. Also, cadastral information allows you to establish clear boundaries of territories, which is important for defining the zone of hostilities and restricting access of civilians to dangerous zones.

During war, cadastral data can be used to record changes in territorial control and the formation of new administrative units after the liberation or occupation of territories. This helps maintain legality within the newly formed administrative units and simplifies the processes of land registration, resource redistribution, and coordination with humanitarian organizations for the provision of assistance.

In 2023, a damage assessment in eastern and southern Ukraine, prepared with the support of the World Bank, the European Commission and the UN, highlighted the importance of the State Land Cadastre for the restoration of critical infrastructure and territorial planning. The cadastre allows for the definition of zones of control and recovery after hostilities. This approach helps to identify and document damaged or destroyed lands and facilities for further reconstruction [11, 13].

For example, after the end of the conflict in Kosovo, cadastral data was used to

restore territorial integrity and land management. This allowed for the clear identification of the boundaries of areas under military control and the restoration of legality in land ownership issues [13].

After the end of the war in Iraq, cadastral information was essential for the restoration of property rights and the distribution of land among returning displaced persons, which contributed to the restoration of the economy and social stability in the region [14].

Thus, after the liberation of the territories, the information of the State Land Cadastre will allow to promptly begin the recovery processes, in particular the reconstruction of infrastructure and the proper use of the existing land and resource potential. Also, updated information of the State Land Cadastre will allow to avoid disputes over property rights, which can be critically important for the restoration of economic stability in post-conflict regions.

So, The information of the State Land Cadastre is not only a tool for recording land ownership rights, but also an important strategic resource that provides accurate information for decision-making during military operations and after their completion.

Digital technologies also play an important role in coordinating efforts between military, civilian and international structures during wartime. In Ukraine, digital platforms are actively used both to identify occupied and liberated territories, as well as to monitor changes in land use. The military transmits information on the status of control over territories, and local and international civilian organizations use this data to plan the restoration of infrastructure and land resources after liberation. Such initiatives are supported by international structures, in particular the European Union (EU), through technical assistance and recovery programs.

Post-conflict land rehabilitation requires significant resources. International financial institutions, such as the World Bank or the International Monetary Fund (IMF), provide financial assistance to support land rehabilitation and infrastructure programs. For example, after the end of hostilities in the Balkans, the international community provided significant resources for the cleanup and rehabilitation of contaminated areas. Such assistance is coordinated through military and civilian

channels, ensuring a comprehensive approach to addressing land rehabilitation issues [15].

Accordingly, a conceptual model of land use administration in conditions of military operations has been proposed (Fig. 1), which provides for:

- creation of an integrated digital land administration system (ensuring access to cadastral data, geospatial information, and land rights registers for military and civilian administrations);
- adaptation of the legal framework to martial law conditions (development of special legal regimes that will regulate land use in wartime, including temporary management of strategically important territories);
- institutional coordination (establishing a system of cooperation between military, state and international organizations for the joint management of territories and resources);
- implementation of mechanisms for land restoration after the war (implementation of programs for environmental rehabilitation and restoration of land resources, as well as providing compensation for land owners who suffered as a result of hostilities;
- protection of property rights (implementation of mechanisms for recording changes in land rights during the war and after its end, in particular through the creation of state guarantees for the restoration of owners' rights).

Land use administration in wartime must be continuous, purposeful, and its effectiveness will be assessed by the ability to administer land in an effective, efficient, and not costly manner.

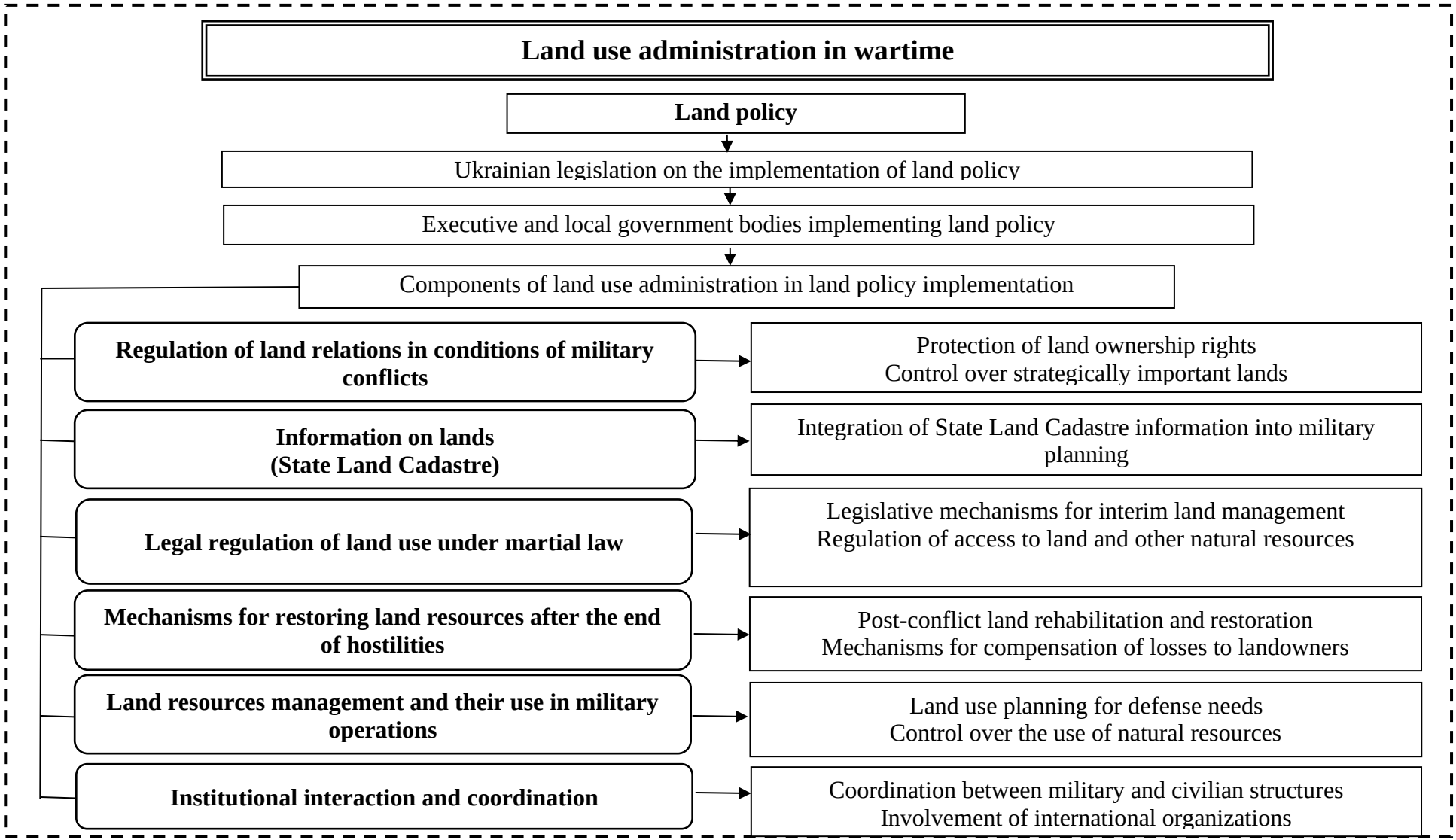

Fig. 1. Key components of the conceptual model of land use administration in conditions of military operations

Joint activities in the areas of security, legal regulation, digital monitoring, and ecological restoration allow not only to minimize damage to lands, but also to create the prerequisites for sustainable development of territories in the long term.

Conclusion:

Coordination of efforts between military, civilian and international structures is a key factor in successful land management during and after conflicts. Joint activities in the fields of security, legal regulation, digital monitoring and ecological restoration allow not only to minimize damage to lands, but also to create the prerequisites for sustainable development of territories in the long term.

Land use administration in wartime is an important tool for managing territories, protecting the interests of the state and land owners, and ensuring the effective use of land resources.

The proposed conceptual model of land use administration in conditions of military operations will contribute to the preservation of property rights, support of the state's defense capability and restoration of land potential after the cessation of hostilities. Such a model also provides for coordination between military and civilian authorities and the involvement of international assistance for the restoration of territories. This model should integrate digital, legal and organizational solutions that ensure control over land resources in periods of instability.

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КОНЦЕПТУАЛЬНА МОДЕЛЬ АДМІНІСТРУВАННЯ ЗЕМЛЕКОРИСТУВАННЯ В УМОВАХ ВОЄННИХ ДІЙ: ВИКЛИКИ, РІШЕННЯ ТА ПЕРСПЕКТИВИ ВІДНОВЛЕННЯ

Анотація. *У статті розглядаються ключові аспекти адміністрування землекористування в умовах воєнних дій та виклики, які постають перед органами місцевого самоврядування, державними й військовими структурами щодо управління земельними ресурсами, а також перспективи відновлення земель після завершення бойових дій. Запропоновано концептуальну модель, що охоплює правові, інформаційні та організаційні механізми для забезпечення ефективного управління землями, захисту прав власників земельних ділянок, плануванню розвитку територій, протекціонізму окремих територій щодо захисту стратегічно важливих або вразливих територій від неконтрольованого використання ресурсів, руйнувань або інших загроз, спрямованих на захист окремих регіонів або територій від зовнішніх впливів, контролю за стратегічно важливими територіями та відновлення земельного потенціалу після завершення конфлікту. У роботі акцентовано увагу на*

важливості інтеграції цифрових відомостей державного земельного кадастру для ідентифікації меж окупованих або звільнених територій, адаптації правової бази до умов воєнного стану. Розглянуто необхідність координації зусиль між військовими, цивільними та міжнародними структурами для забезпечення ефективного адміністрування земель в умовах війни та післявоєнного відновлення. Модель пропонує збалансований підхід до розвитку територій та забезпечення довгострокової стабільності управління земельними ресурсами, орієнтований на сталий розвиток після завершення бойових дій.

Ключові слова: *адміністрування землекористування, земельний кадастр, воєнний стан, відновлення земель, правове регулювання, інтеграція інформаційних систем, управління територіями, стратегічні ресурси, землеустрій.*