Acta Sci. Pol., Administratio Locorum 25(1) 2026, 35–49.
https://czasopisma.uwm.edu.pl/index.php/aspal plISSN 1644-0749 eISSN 2450-0771 DOI: 10.31648/aspal.11502

ORIGINAL PAPER
Received: 03.06.2025 Accepted: 13.11.2025

REGULATION OF SUSTAINABLE LAND USE ISSUES IN THE UKRAINIAN CONTEXT

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ABSTRACT

Motives: The issue of sustainable and rational land use has become highly relevant due to military actions in Ukraine. The article identifies threats and risks to land use caused by warfare, analyzes foreign post-conflict land restoration practices, and considers their applicability to Ukraine. Current economic conditions necessitate creating an institutional framework and enhancing mechanisms for sustainable land use adapted to wartime specifics. A structural-graphic model has been developed to address these challenges. The study also highlights weak points in legislation and the cadastral system, offering recommendations grounded in international experience and tailored to Ukraine's ongoing reconstruction amid full-scale war.
Aim: To generalize international experience in sustainable land use systems; identify Ukraine's current land use issues under martial law; and propose regulatory solutions.
Results: Key land use threats due to war are outlined. The study confirms the need to develop regulatory and methodological tools, considering best global practices. A structural model is proposed, and specific recommendations for land use regulation in wartime Ukraine are provided.

Keywords: sustainable land use, rational land use, land resources, international experience, strategic directions

INTRODUCTION

In today's world of economic globalization and growing regional integration, human impact on land resources is increasing. At the same time exists greater need for improved living conditions. In these situations, spatial planning becomes important a tool for achieving goals sustainable development. Its feature lies in synergy and integration all areas of economic activity and management, which allows achieve economically effective work, social well-being and environmental security on individual territories.

Question sustainable and rational land use are becoming especially relevant and complex in Ukraine in the conditions martial law. Since 2014, the war Russia against Ukraine has violated the soil environment and caused large-scale and long-term degradation surrounding environments. Full-scale invasion from February 24, 2022 yet more exacerbated the problem of degradation soils, and high intensity combat actions

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in certain areas put under doubt safety use of affected lands from military impact (Tretyak et al., 2021b). Today, 30% of the territory Ukraine is a zone of high risk for rural economy. One of the negative factors are violations soil. These are, first of all, direct damage: mechanical deformation, thermal and chemical pollution, as well as surface pollution. According to previous estimates National Academy of Agrarian Sciences of Ukraine, Economic losses from degradation soils constitute about 40 billion hryvnias per year (Splodytel et al., 2023). In the case of uncontrolled land use, it leads to pollution and deterioration of the environment, also due to the lack of effective systems monitoring and control of land use. Despite the significant agricultural potential Ukraine, current conditions do not allow market participants in full to the extent use it to increase competitiveness national economy.

LITERATURE REVIEW

Analysis of scientific sources shows that prominent Ukrainian scientists and practitioners in recent decades have paid significant attention to studying the features of world experience in regulating the use of agricultural land (Koshel, 2015; Levek et al., 2017; Zinchuk & Dankevych, 2016); substantiating the theoretical and methodological foundations of regulating land relations (Hreshchuk, 2022; Ivanychyn & Dudzyak, 2018; Kovaliv, 2016; Lypchuk et al., 2019); mechanisms for sustainable use of agricultural land (Butenko & Bavrovska, 2015; Dankevych, 2017; Gatzweiler et al., 2002; Kalinowska et al., 2022; Korobska, 2019; Orel, 2016; Poprozman & Korobska, 2018; Ulyanchenko, 2015). Researchers have developed a conceptual model of mechanisms for the development of land relations in the context of sustainable and balanced use, protection, and reproduction of land resources as a component of spatial socio-economic development (Petrakovska & Mykhalova, 2018). The structure of mechanisms for the development of land relations, aimed at further improvement, was determined to substantiate specific instruments for forming a system of balanced use and reproduction of land resources (Ibatullin et al., 2012). Institutional principles of sustainable land use were also investigated as the basis for the development of the land management system in Ukraine (Datsenko et al., 2024; Drebot et al., 2021; Dubnytska et al., 2023; Dudyak, 2020; Hunko, 2022; Tretyak et al., 2014, 2021a; Vasilyeva et al., 2021). International experience in land resource management, regulation of relations, and practical recommendations for its adaptation to the economic conditions of Ukraine were analyzed in the works of Medvetska (2019), Skiba (2016), Lazareva et al. (2022), and Pavliv (2023). Issues of land fragmentation and the distribution of plots in rural areas were examined by Balawejder et al. (2021). In addition, planning tasks aimed at adapting the spatial structure of the territory to the needs of sustainable development using photogrammetric data were studied by Pijanowski et al. (2018).

Based on bibliometric analysis, it was found that various aspects of the development of a system of sustainable and rational land use are among the main topics of long-term research interests of the majority of leading foreign scientists. According to the titles of articles, abstracts and keywords, in the international scient metric base data Scopus was 975 documents found, published during the years 1987–2023. The first publication on the selected topic appeared in this base data in 1987. Gow (1987) notes that problems associated with long-term permanent development unstable lands, you can to consider from several different points sight, starting from purely technical and ending with critically desperate (hopeless). In the article offered integral development approach projects, which considers such key question as a political dialogue and change policies; land use; various programs involved participants; the role and participation of local population; and importance technologies. Among most often cited scientific works can to highlight following: 1) „Changes in land use and values ecosystem services on the plain Sanjiang, Northeast China" (Wang et al., 2006) – was nominated sprat proposals of future politician's land use and sustainable development ecosystems. These include adjustments agricultural politics „food above all, creation natural wetland

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reserves lands, creation systems rational water use, use degraded cultivated land and promotion development ecotourism. 2) „Protection of cultivated land and rational use in China" (Zhou et al., 2021) – authors claim that protection of cultivated land is a crucial measure to ensure food security, social stability and sustainability development. Therefore, the article dedicated use technology spatial analysis to study spatiotemporal patterns of illegal use of cultivated land in China. The results of the analysis indicate that majority publications on the topic under study belong to researchers from China (580 documents), the USA (72), Great Britain (580), Britain (30), Poland (26), India (22), Australia (21), Germany and Italy (20 each). In Ukraine, based on given criteria search was 20 documents were found.

An analysis of publication activity confirms that since 2005 there has been a growing scientific interest in studying the development of sustainable land use systems in the context of global economic transformations. Analysis trends using tools Google Trends also confirms high the level of global interest in the topic of „sustainable land use". Since 2004 to the present, the most popular related topics are: sustainable land use; sustainable development; land resources; sustainable using resources; sustainable using land resources; management land use; management land use; sustainable rural economy; sustainable farming; and politics land use and land degradation.

In Ukraine interest in issues sustainable land use was particularly noticeable for the last five years in Mykolaiv regions, Chernivtsi and Kirovohrad. Since 2004, the topic of sustainable land use was most popular in Mykolaiv region, while in Rivne region areas rational land use ahead permanent land use. In Kyiv question rational land use acquired special It is worth noting that over the last year question land use during wartime became especially popular in Poltava areas.

Based on the analysis of international experience development of sustainable systems land use carried out with the help of bibliometric and trend analysis, was it is established that each country has your specific features and differences. Let's consider some of them.

For example, in the United States there is no the only one legislation that regulates planning and development land use. Each state independently develops relevant documents according to one's own strategies development and territorial organizations. For this, state governments have special departments that are called offices Planning. Responsibility for development land use falls under the jurisdiction of the state, and some powers are delegated local authorities. In agricultural land use planning significant emphasis is placed on economic assessment and monitoring. Assessment of agricultural Land is a duty Services security natural resources, technical agencies under the Ministry rural US economy.

In Canada over 90% of land is in state ownership property. However significant part agricultural of land (about 98%) is in private ownership property. In some provinces are being introduced strict measures in cases non-target using agricultural Land registry in Canada directly is carried out Canadian land cadaster.

In Germany each the federal state is developing own comprehensive development plan land use in its jurisdiction. Inter-farm management land resources mainly include land consolidation and regulation land use.

In Finland management land resources are a function of both national and municipal organs authority. Territorial planning carried out both at the state and local level levels. Management rural land resources focused on measures to security surrounding environment.

In the United Kingdom territorial planning carried out on all level's governance – national, regional and local. The British government applies principles territorial planning Land use. Land and soil monitoring carries out Ministry Department for Environment, Food and Rural Affairs (DEFRA).

In the Netherlands planning land use carried out at the national, provincial and municipal levels. Territorial development corresponds national plans developed for 10–20 years. More detailed plans are developed at the provincial and municipal levels and aimed at ensuring stability management land resources. Permanent land turnover in the country did

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territorial planning is the basis for all events of land use and protection.

Land policy France determined using regional schemes development and municipal Zoning within these planning plans determines dynamics pricing for the following five years. Land politics countries implement Ministry supply, transport and housing – communal Farming measures rational using lands are developed on the basis of projects land management, created different companies. In France dominate rental relations. Tenants even offered help in searching land plots and are provided credit benefits for support agricultural business development. Relationships between land and property in France to a large extent are forming Land banks and funds. SAFER (Agency for Land and Rural Development) settlements) plays key role in addressing issues such as increasing productivity rural economy, support development rural districts, protection surrounding environment and promotion local development in cooperation with local projects self-government.

In Austria territorial management land resources are well developed and fall under jurisdiction all levels management. At the federal level are being developed main laws that regulate land use. At the local levels task focused on planning all over territories that is located under their control, including development of a land use and development plan, as well as a concept development.

In Italy planning land use mainly driven strict ecological requirements that regulate targeted using different Land categories. They are determined by zoning and are enforced by fines for violating land use rules.

In Portugal land relationships and development land management based on dominance rental relations. For tenants who use hired labor, minimum wage term rent set at 10 years.

As Zinchuk & Dankevych emphasize (2016), the European practice of forming and developing systems land relations confirms that market mechanisms are not self-sufficient and require direct intervention According to researchers, the components of effective formation and stable functioning of the agricultural land market in EU member states is: state regulation; land cadaster; specialized land institutions; market mechanisms assessments land; and leasehold relationships.

Now state policy of Ukraine, aimed at ensuring sustainable and rational land use, as well as the creation ecologically safe driving conditions agricultural activities, is implemented on the basis of next: fundamental provisions of the Land Code (Law No. 2768-III adopted October 25, 2001); Laws of Ukraine «On Land Lease» (No. 161-XIV adopted October 6, 1998), «On Land Management» (No. 858-IV adopted May 22, 2003), «On the State Land Cadastre» (No. 3613-VI adopted July 7, 2011), «On State Registration of Corporeal Rights to Real Estate and Their Encumbrances» (No. 1952-IV adopted July 1, 2004), «On Amendments to Certain Legislative Acts of Ukraine Regarding the Terms of Turnover of Agricultural Land» (No. 552-IX adopted March 3, 2020), «On Amendments to Certain Legislative Acts of Ukraine on Improving the System of Management and Deregulation in the Field of Land Relations» (No. 1423-IX adopted April 4, 2021), «On Amendments to Certain Legislative Acts of Ukraine Concerning the Sale of Land Plots and Acquisition of the Right to Use Them Through Electronic Auctions» (No. 1444-IX adopted May 18, 2021), «On Amendments to the Tax Code of Ukraine and Certain Legislative Acts of Ukraine on Ensuring the Balance of Budget Revenues» (No. 2245-VIII adopted December 12, 2007) (which provides for a number of changes in regulation tax load on agricultural producers), «On Amendments to Certain Legislative Acts of Ukraine on Creating Conditions for Ensuring Food Security under Martial Law» (No. 2145-IX adopted March 24, 2022); the Resolution of the Cabinet of Ministers of Ukraine «On Approval of the Concept of the National Target Program for Land Use and Protection» (No. 70-p adopted January 19, 2022), etc.

Analyzing the economic mechanism of state regulation of land use, it is important to emphasize that the main subjects of this process are the Cabinet of Ministers of Ukraine, which acts as the main administrator of budget funds, a number of state financial institutions and relevant executive bodies.

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The main purpose of applying economic regulation methods is to encourage land users to use agricultural land more effectively, which is considered a key production resource.

Considering the administrative and organizational aspects of the mechanism of state regulation of land use, it should be noted that the main actors here are the state executive authorities and local self-government bodies. A distinctive trait method this mechanism, except their direct impact on land users, are their mandatory and directive in nature. The main purpose of using such methods is to fully elimination or reduction negative consequences economic activities that is carried out subjects' management in the agricultural sector.

Importantly emphasize the growing role of economic instruments in state regulation activities land users. Article 205 of the Land Code of Ukraine (Land Code of Ukraine, 2001) provides economic incentives to promote rational land use and protection, in particular:

- granting financial benefits individuals and legal entities who, at their own expense, implement measures defined in national and regional programs land use and protection;
- allocation funds from the state or local budgets individuals and legal entities for recovery the original state of lands damaged through no fault of their own;
- release from land tax for plots that are in the process of agricultural development or improvement in accordance with state and regional programs;
- compensation landowners and land users for losses income caused by temporary conservation degraded and low-productive lands, if such degradation It was not their fault – that financed from the state budget.

Analysis shortcomings in practical implementation economic incentives for rational land use emphasizes importance financial encouragement as a tool regulation activities land user. Among others functions it performs stimulating, educational and coordinating roles. Research speakers change quantities active subjects land use reveals negative trend. According to the data State Statistics Service of Ukraine (Splodytel et al., 2023), the number agricultural enterprises in 2023 decreased by 30% compared to 2015, and the number individual entrepreneurs in the sector land use decreased more than 37%.

Important tool regulation activities land users are available different species sanctions, in particular legal responsibility that provides compliance with land legislation. Article 211 of the Land Code of Ukraine (Land Code of Ukraine, 2001) outlines legal responsibility for a number of violations committed agricultural market entities.

Zoning is also important instrument of state regulation Land use. Land zoning by use and category determines options their permitted use. Zoning rural territories aims to protection of lands from expansion bridge and security surrounding environment. In many developed countries non-agricultural use of land intended for agricultural purposes, is prohibited. The state may also regulate land use by establishing rules for implementation operations, land planning and other methods. It is worth noting that in many countries the state can directly intervene in land markets. Several of them have created special institutions with the authority to buy and sell agricultural land, provide benefits during the sale of land, etc. (Kushniruk et al., 2022).

To improve the efficiency of regulation land use significant number countries The European Union already automated your official systems land information. As a result, such automation an expanded range of documents and various types related data from agricultural lands, began to be processed and transmitted in the field of electronic commerce. This raised the question choice most suitable approach to management accounting land use based on available information systems and technologies that requires certain technical solutions and modifications existing financial mechanisms (Koval et al., 2023). In Ukraine main manager of large volumes information in the field of land use is the State Service of Ukraine for geodesy, cartography and cadaster.

As the analysis showed national politicians land restoration in countries that suffered from military conflicts, reconstruction post-war territories

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is a priority component of their safe development. However, exist significant regulatory gaps requirements for land restoration, and there is also no a clear legal obligation of liquidation pollution surrounding environment caused by military actions. Efforts remain unsystematic and carried out individually in each case. For example, in the United States, lands contaminated military-technological substances, falling under the jurisdiction Ministry of Defense. Therefore, the Ministry is responsible for land restoration measures and has no right to lease such areas for rent until research confirms their suitability for intended use. At the same time territories that earlier suffered from military-technogenic activities and are responsible local organs authorities, can independently initiate processes recovery.

Department of Defense controls approximately 1,400 soldier's objects general area of 10 million acres. Recognizing importance military lands for preservation biodiversity, the US initiated restoration former military landfills for use them as reserves (Coates, 2014). According to from Under US law, the responsible authority must develop a land use plan. To sell or to lease land for a specific use, the Ministry of Defense is required to conduct various assessments risks to determine appropriate events of restoration (United States Environmental Protection Agency, 2005), depending on the type and degree pollution.

In the United Kingdom pollution military-technological substances happened because of numerous airstrikes and use various weapon systems since Second world war. This led to a policy according to which responsibility for land pollution lies with landowners, not the military. Moreover, the local the government often cooperates from landowners and divides responsibility for land restoration. Post-war management system land resources in the Great Britain puts bigger responsibility for civilians' landowners. Given such regulatory approach, the government does not issue specific recommendations of management these territories and does not have official quantitative standards to ensure ecological and geochemical estimates. Even in the absence of detailed instructions for the management of land contaminated by military-technological substances, a regulated quantitative risk assessment approach is applied to the associated land pollution (Environment Agency, 2020).

The Ministry of Defense uses assessments quality of lands that include: research terrain based previous strategic assessments and prioritization; field and desk research; detailed research area; assessment options recovery; and answers local organs authorities. Despite the common responsibility landowners and the Ministry of Defense for the post-war land restoration, a comprehensive methodology for effectively identifying restoration measures not yet developed (Linkov et al., 2014).

In Germany military-technological pollutants concentrated in numerous areas. Government policy provides for, what all former military educational playgrounds should be examined and potentially restored before there can be used for civilian's goals. Abandoned since 1991 military the objects were transferred to the ownership of the German government, which carries responsibility for the majority contaminated lands. As a rule, these the areas were not cleared from unexploded ammunition, and the state of contamination many decommissioned landfills remains unknown. When the German government sells land to private individuals to the owners for reconstruction, these owners carry responsibility for conducting renewable measures (Jentsch et al., 2009).

Military objects are considered potentially contaminated until research confirms that the area does not pose a danger to the environment and/or health in such cases object falls under action ecological laws and standards federal land. On the territory whose it located. National legislation regulates stages restoration contaminated land (Mulisch, 2007).

The First World War significantly changed the soil and vegetation cover in France, where most of the fighting took place on the Western Front. The West Flanders Restoration Service was one of the first organizations to address the issue of restoring agricultural land in war-torn areas. This organization advised local farmers and helped in the restoration arable land. Post-war recovery efforts territory's part

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were carried out by both domestic and international non-profit organizations. A well-known example is the Committee devastated regions France (Comté American) pour forest Regions Dévastées, which contributed not only to social rebuilding the village of Jena, but also distributed seeds and livestock (Jacobs, 2021). In the decade after end wars majority former front-line territories was restored: the forests were restored again planted, and agricultural land returned for processing.

Exception was a "red zone" that stretched out from Lille in the North France to the south west to Nancy. The French government announced this territory uninhabitable due to chemical pollution and unbroken ammunition. These were regions where the cost land reclamation exceeded economic value land, therefore priority was provided reforestation. The purpose of zoning post-war territories there was an assessment of the potential their restoration to normal economic activity. To the criteria danger zones have been added economic Considerations: cost cleaning some lands were too high, considering cost demining. Until 1919, the French Ministry released territories divided affected districts into three zones depending from degree damage: „green zones" with minimal damaged; „yellow zones" with heavy, but limited damage; and „red zones" which were usually closest to the former front lines and completely the „green" and "yellow" zones were relatively quickly returned to civilian life use, while the "red" zones mainly suffered significant landscape disturbances. These zones were only superficially cleaned, and in most cases, they were simply sealed. The French Civil Service protection, responsible for land restoration, has estimated that under current pace complete cleaning France from all remains shells and grenades of the times First world wars maybe take up to 700 years (Jacobs, 2021).

The former Yugoslavia (Southeastern Europe) experienced a series of armed conflicts between 1991 and 2001, which caused significant environmental damage and resulted in the contamination of surface and groundwater, soil and air in the Balkans with over 100 toxic substances (Jacobs, 2001). One of the main challenges in post-war reconstruction faced by the war-affected countries was institutional failure, particularly in addressing environmental issues. The main threat was that environmental management systems were so broken that it was impossible to adequately address post-war environmental issues. At the international level, the main body of the European Union responsible for the reconstruction of war-affected areas in Serbia (including Kosovo), Montenegro and North Macedonia was the European Agency for Reconstruction. One of the areas of focus was surrounding environment, and ecological question were addressed in sectors such as development rural districts, water facilities and infrastructure.

Of development sustainable land use in Ukraine, issues rational land use, protection land resources and implementation ecologically safe methods land use has long been central priority of government, business, science, education and representatives' civil society. Ukraine has considerable landed potential. Before the war general area Ukraine amounted to 60.3 million hectares (6% of the territory) Europe, of which 41.4 million hectares was classified as agricultural lands (19%).

MATERIALS AND METHODS

Materials

The theoretical basis is formed by scientific works of domestic and foreign scientists in the field of natural resource management, land use and environmental protection, legislative and regulatory acts, methodological and instructional materials, statistical and analytical data of ministries and departments of Ukraine, public organizations in the field of land use and socio-economic development of the regions of Ukraine.

Methods

For bibliometric and trend research (using Google Trends) the relationship between the terms "sustainable land use" and "rational land use" the method

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of analysis and synthesis was used. Based on the study and generalization of international experience, specific features and differences in the development of sustainable land use in individual countries were identified. This method was also used to analyse the experience of implementing national land restoration policies by countries affected by military operations.

To build a structural-graphic model of the complex for solving issues of sustainable and rational land use in Ukraine, the method of structural-logical generalization and a comprehensive approach with the definition of various types of relationships was used.

Research methodology is based on the following basic principles: the general dialectical principle of general connection and interaction; the principle of causality, which is related to the principles of general connection and development; the principle of systematicity in cognition.

RESULTS

Land use in Ukraine is an industry that requires a well-thought-out state policy and the use of effective forms and mechanisms of state regulation. In general, state regulation should be understood as the influence of the state on economic entities aimed at achieving the goals of its economic policy. The state regulates land use through a number of mechanisms, the main of which are legal, economic, and administrative--organizational.

Analyzing legal government regulation mechanism land use, trace to note that key subject performs legislative body of the state The essence of the legal method of regulation consists in developing regulatory and legal acts in the field of land use, which include laws, decrees, resolutions, instructions and standards. Compliance accepted legislative acts and relevant regulatory documents provided general legal norms that regulate land use, and established legal criteria liability for violations committed subjects Management.

Research violations ecological legislation in the context intensive rural economy in Ukraine

Environmental problems were not a priority in Ukraine after full-scale invasion in 2022, but they should become an integral part the process of „green" recovery and alignment of Ukraine's agricultural sector with the goals European Green Deal for potential EU membership. Achievements long-term changes in agricultural sector Ukraine will require active participation different interested parties. For this research (we analyze land deals from the database Land Matrix, 2025) for evaluation compliance national legislation, in particular Article 88 of the Water Code of Ukraine, which provides installation protective coastal 25 meter wide lanes along shores rivers and around ponds for small children rivers, streams and ponds area less than 3 hectares, was selected plots near left tributary of the river Teteriv – the Mykha River – and the right tributary of the river Bystrievka, the so-called Mala Myka River, within the protective coastal lanes in Zhytomyr areas (Figs. 1 and 2a–b). Unfortunately, there is anxious trend – general level awareness is low. According to the dialogue with key stakeholder's: representative's local authorities, farmers and state employees, there is a lack of understanding degradation surrounding environment and its consequences. For example, one community, relying on satellite pictures from 2020, suggested the presence big protective coastal stripes, while the other community was unaware of the existence the Mala Myka River on its territory, considering its just nameless irrigation canal, because he was marked on the map, which has not been updated since the Soviet era times. This example highlights importance understanding differences between river and irrigation canal, as the rivers are applied different (and more strict) ecological standards. These question yet more are getting complicated privatization land plots along rivers – a process that has been going on since the 2000s. Another disturbing the conclusion is that key government agencies are either unable or unwilling use immediate measures. For example, although

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Management aquatic resources swimming pool rivers Pripyat confirmed that The Myka River falls under the effect of the Water Code, this the department does not have powers provide compliance ecological legislation. Therefore, any violation trace report to the State Geocadastre or State ecological inspections for further investigation (Land Matrix, 2025).

The study also found that land documentation, which is essential for managing land relations, rarely defines restrictions on land use, such as agricultural activities. Specific codes restrictions and defined zones must be clear outlined, and then included in planning and cartographic materials and included in the list types land use. Considerations of protection slopes and conservation surrounding environments should also be integrated into projects land management during the environmental and economic feasibility study crop rotation and methods management land resources, but this is often not the case. In this regard limitation of using land is relatively new phenomenon in Ukraine that maybe explain their absence in some cases. Moreover, an example of the community's

Fig. 1. Plowed land coastal areas protective zone Mala Myka River
Source: own elaboration based on Land Matrix data (2025).

Fig. 2. Ploughing of the coastal protection strip of the Mala Myka River: a) – cadastral number of the land plot: 1825682000:16:000:0028 and b) – cadastral number of the land plots: 1822586700:02:000:0406, 1822586700:02:000:0407
Source: Land Matrix (2025).

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ignorance of the existence of the Mala Myka River on its territories demonstrates that historically protection surrounding there was no environment priority.

This also illustrates how different and numerous interested sides carry liability for negligence ecological aspect in agricultural development, from land managers when setting restrictions and community representatives when allocating land plots to landowners when leasing land and agricultural farms that lease or purchase land.

Finding compromises: can Ukraine combine economic, social, and environmental needs?

With the launch of the second phase liberalization of the land market in 2024 demand for relatively increased safe territories in the west Ukraine. Many ecologically valuable territories in this region are converted into agricultural lands that rent big companies, often with violation legislation on protection surrounding environment. This highlights critical question: necessity improvement monitoring compliance ecological legislation Ukraine. Such control should be effective organized both at the national and public levels.

In our opinion, advancing reforms will be difficult task due to the influence of the powerful agricultural lobby in Ukraine, which has significant government both locally and nationally levels and provides priority economic benefits. It is worth noting that active military actions and difficult economic situation yet more reinforce this position. This influence causes serious concern, especially considering increased control that large companies now have enterprises, because they cannot only to rent land, but also to buy her.

For sustainable restoration the state of Ukraine must find a balance between the urgent need to support economic activity and long-term goals preservation healthy ecosystems and ensuring fair distribution of land. Solving the problems of sustainable and rational Land use in wartime requires a comprehensive approach that determines sprat types relationships (Fig. 3), which includes the following steps: *demining and land clearance* – organization of systematic demining agricultural lands, especially in areas of active combat actions; use modern technologies for detection and neutralization mines and explosives devices; engagement international assistance and experts to accelerate land clearing efforts; *restoration infrastructure* – repair and reconstruction damaged agricultural infrastructure, including irrigation systems, storage and roads; implementation programs support farmers in recovery theirs activities, including financial assistance and access to equipment; *monitoring and recovery surrounding environment* – creation systems monitoring soils, water resources and ecosystems for assessment influence environmental wars environment; assessment of water quality as one of the key elements sustainable development; development and implementation programs restoration ecosystems, including afforestation and reclamation degraded lands; creation forecasting tools environmental impact environment; *implementation permanent agricultural technologies* – use precision farming technologies that minimize environmental impact environment and enhance efficiency using resources; support organic agriculture, which contributes preservation soils and biodiversity; increasing the efficiency of use resources; development innovative storage and processing systems products nutrition; *adaptation to change climate* – development strategies adaptations rural farms before change climate, including using drought-resistant crops and effective methods irrigation; preparation farmers to change climatic conditions through educational programs and consulting services; implementation new events erosion control soil; *support local communities* – development programs socio-economic support farmers and rural communities affected from wars; reconstruction and development local markets agricultural products; *international cooperation and support* – involvement international organizations for technical and financial support in the recovery of the agricultural sector; cooperation with other countries for exchange experience and implementation of best practices in rural economy; involvement international experts to overcome consequences military actions.

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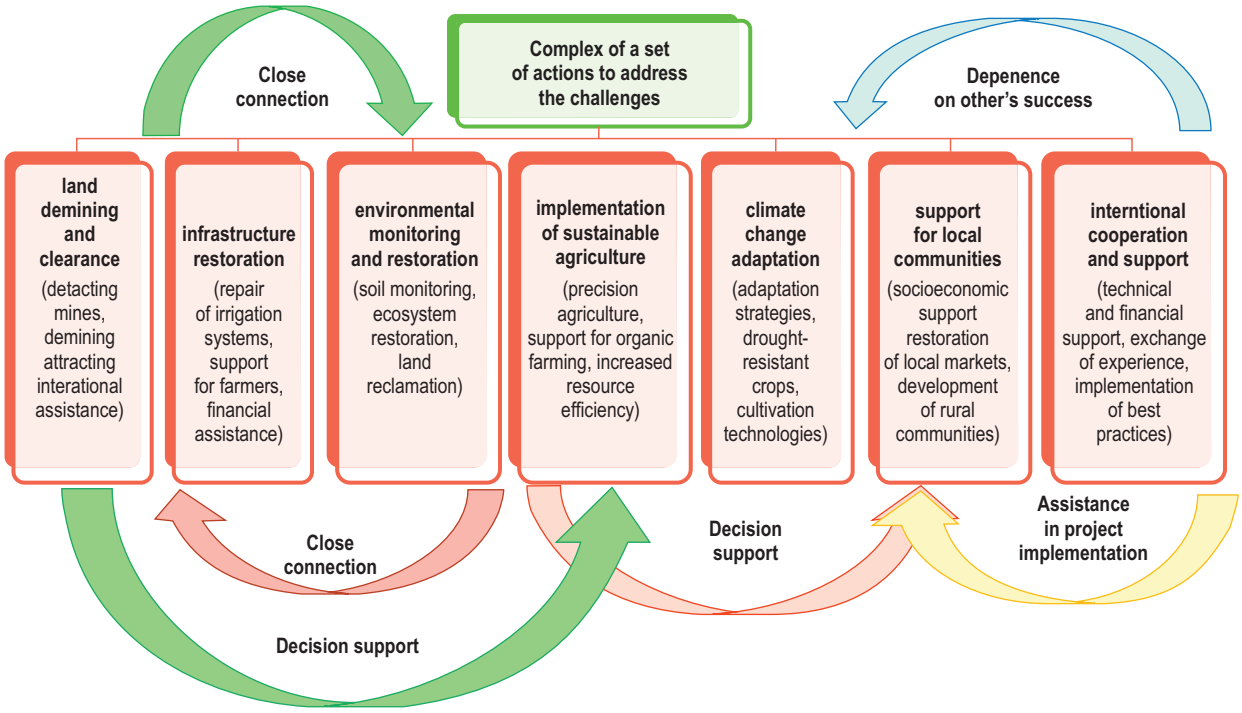

Fig. 3. Structural and graphic model of a set of actions to address the challenges of sustainable and rational land use in Ukraine
Source: own elaboration.

In our opinion, these measures can much reduce risks and promote sustainable development of the agricultural sector of Ukraine, even in conditions ongoing military conflict.

To ensure sustainable and rational land use in Ukraine, taking into account the best world practices that used in most countries' world, it is important to develop a comprehensive set of provisions and recommendations. This has comprised improve mechanisms software sustainable land use in the system land relations that provides for the definition of institutional, regulatory, financial and investment, informational and organizational and economic mechanisms. These mechanisms must be equipped specific instruments aimed at strengthening synergistic effect – ecological, economic and social – in the field of land resources.

In addition, it is necessary to develop methods for determining the extent of soil damage as a result of military actions, as well as establish procedures for passporting and documenting (passports) of soils in post-war landscapes. An effective economic mechanism for regulating land relations regarding compensation to landowners or tenants in cases of land use restrictions should be introduced, which will ensure preliminary and full compensation for the cost of expropriated land plots.

In addition, extremely importantly to define and systematize indicators military and man-made pollution, which can use for monitoring changes qualities soil. It is necessary to introduce economic incentive mechanism to promote rational use, protection and restoration of lands, regardless of from forms property or the purpose of the land.

To achieve long-term results necessary development National programs development systems sustainable land use in Ukraine, as well as the creation National strategies restoration of soils in post-war landscapes by 2032 and the Action Plan of its implementation. It is also necessary realize pilot projects on DE occupied territories in order to monitor and evaluate the effectiveness of rehabilitation measures that apply to specific post-war lands.

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CONCLUSIONS

Determined problems, threats and risks for land use related to the military actions. Analyzed experience implementation national politicians land restoration in countries that suffered from armed conflicts, with the possibility of extrapolations this experience in the area Ukraine. It has been established that modern economic conditions in Ukraine require creation relevant institutional framework and improvement mechanisms software sustainable land use taking into account specifics wartime. Therefore, creating conditions for interaction between stakeholders involved in the use geographical information about land and related land rights interests, has decisive importance for effective regulation land use, support social stability, protection surrounding environment and regulation development rural territories in conditions decentralization.

In this context, to ensure access to land information, it is necessary expand current list sets data that provided by the State Service of Ukraine for geodesy, cartography and cadaster. For example, data on boundaries land use, groups soil agricultural production, topography, categories land use and others relevant parameters must be available for support planning land management and development projects land use.

Thus, improvement systems regulation land use directly depends from quality and efficiency of the State Land Cadastre system in Ukraine, as it contains important information about the land and its characteristics, boundaries land use and property rights.

Developed by structural and graphical model of the countermeasure complex challenges sustainable and rational land use in Ukraine, and also defined unresolved question. A set of recommendations has been proposed of regulation sustainable land use in modern realities Ukraine, but key role should be to take away. Only the state is capable of to develop effective regulatory framework, acting as a guarantor of national food security and promoting balanced land use.

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