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TO THE QUESTION OF ASSESSING THE CONSEQUENCES OF THE NEGATIVE IMPACT OF HOSTILITIES ON THE LANDS OF THE TERRITORIAL COMMUNITIES OF THE DONETSK REGION

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The article examines the current ecological state of lands and ground cover that has been negatively affected by hostilities. Territorial communities, which are occupied, were studied, the types of land use of these territories were determined, and the area of their lands was calculated. The damages that were caused as a result of military actions were analyzed. The consequences of the negative impact of hostilities on the lands of territorial communities have been assessed. A fragment of the map showing the territories where hostilities are taking place and their analysis is provided.

Separate types and processes of soil degradation (compaction, pollution, disturbance and destruction of the soil cover, etc.) caused by hostilities were investigated and studied, and the scale of soil degradation, especially chernozems, was determined.

It is proposed to improve methodical approaches to determine the negative consequences of hostilities on soil cover.

Scientific, methodical and information provision of state assessment and prediction of changes in soil quality was carried out. It is proposed to improve methodical approaches to conducting local soil monitoring studies using remote research methods and agrochemical support for the cultivation of agricultural crops in conditions of reduced productive areas.

An analysis of the production of agricultural products was carried out and measures were proposed that could improve the quality of land in areas affected by ammunition explosions and the burning of military equipment.

There is a well-founded urgent need to simplify land management and urban planning procedures as much as possible and to speed up the implementation of restoration works to eliminate the consequences of armed aggression and hostilities during martial law and in the reconstruction period and after the end of hostilities, including their inclusion in those that require an assessment of man-made pollution of land and other natural resources, assessment of anthropogenic violations, detailed identification of ownership rights to land and property, etc.

Factors of damage to the land as a result of hostilities have been determined, such as: the passage of heavy military equipment, the explosion of rockets and other types of weapons, the construction of fortifications, and as a result of these actions, the structure of the soil is disturbed, which leads to the degradation of vegetation and increases wind and water erosion.

A recovery action plan is proposed, which involves the coordinated efforts of stakeholders and the involvement of foreign partners in solving security and development problems.

Key words: *war, land inventory, soil degradation, land conservation, chemical pollution, land monitoring, sustainable land use, restoration, rational use, damage assessment, land reclamation.*

Formulation of the problem.

The export potential of Ukraine is able to provide food products for about 400 million people in the world. Ukraine has long been a guarantor of food security in many countries of the world and plays a key role in establishing a leading position in the volume of trade in agricultural products, which is due to its soil and climatic features and gives it an advantage among all other countries.

The soil cover of Ukraine is represented by chernozems and chernozem-like soils, which occupy more than 60% of its territory, or almost 30% of the area of Europe and 9% of the world. The beginning of hostilities on the territory of Ukraine drastically affected the gross output of agricultural products. This had a significant impact on total agricultural production per unit area, adversely affecting one-third of the country's cultivated area.

Analysis of recent research and publications.

This question has attracted the attention of Ukrainian and foreign researchers for a long time. The consequences of military conflicts, their impact on land relations and their impact on the country's economy over the past two decades are being studied by: E. Afonin, M. Valli, G. Haydukevych, H. Lozhkin, V. Lytvynchuk, A. Paramonov, V. Samoilov, L. Sandakova, V. Sribny, S. Shteiffer, and others. In their works, the essence and content of conflicts in social organizations, including military ones, and the ways of their resolution are considered. However, these studies have many controversial issues that require detailed analysis and study.

The aim of the study.

Assess the consequences of the negative impact of hostilities on the lands of territorial communities and propose a set of measures to improve (restore) the quality of the land.

Materials and methods of scientific research:

Research was conducted using theoretical, monographic, empirical, methodological methods, as well as modeling and generalization methods.

Using the monographic method, the scientific works of scientists A. F. Kondratenko, O. M. Inozemtseva, O. M. Ivakhnenko, O. P. Burkovskyi, O. V.

Vasylyuk, V. O. Yeryomin, G. O. Kolomytsev, Bulygin S.Yu., Vitvitskyi S.V., Velichko V.A.

Empirical method - the condition of the lands that suffered losses as a result of the military actions of territorial communities in the Donetsk region was analyzed as the basic object of the study.

With the help of an expert method, the damage and pollution of lands and the analysis of relevant regulatory and methodological documents for the restoration of community territories were investigated.

Research results and discussion.

The concept of "martial law" is defined simultaneously in two Ukrainian laws "On the legal regime of martial law" and "On the defense of Ukraine" [https://ips.ligazakon.net/document/T150389], while important plans must be implemented in accordance with the principles of sustainable development . Restorative socio-economic, ecological, urban, rural and other measures related to the spheres of land management and urban planning. Now there is a serious problem among builders, companies, architects and communities of development and organization of the territory.

However, it is important to consider the tools. Establish a comprehensive approach to territorial zoning, then land management and urban planning, where "sustainable land use" is the main unit of the economy and creates industrial and economic relations.

Undoubtedly, land plots with destroyed productive lands as a result of hostilities, acts of terrorism, sabotage through military aggression need restoration through land reclamation, land conservation or land improvements to bring them into a state suitable for further targeted use.

According to soil survey and data correction data, 5.1 million hectares of arable land may be subject to conservation, of which 54.3% are washed away and degraded, 11.5% are waterlogged and swampy, and 9% are saline-alkaline lands. [9] This area is 1.4 million hectares. less than estimated by experts, which requires restoration measures. However, the analysis of the actual situation in Ukraine

indicates that the areas of land that need to be restored must be constantly updated with the help of remote sensing data, and their area may increase by 6.5 million hectares. in case of continuation of the active phase of hostilities. For example: during the war years, 3.5 million hectares of spring crops were not sown, which has negative consequences for gross outputs of agricultural production and food exports of our country.

The current ecological state of the lands and soil cover of the Donetsk region was formed under the influence of urban and industrial development of the region, as well as as a result of agricultural activity. For decades, the territory of the region, the area occupied by cities, industrial zones and agricultural lands, has been increasing, while the area of natural soil and vegetation cover is gradually decreasing. [1].

Most of the territory of the Donetsk region is represented by chernozems, which belong to highly fertile and fertile soils [2].

The analysis of departmental data of the State Statistics Service, the Main Department of the State Geocadastre in Donetsk region, the Department of Ecology and Natural Resources regarding the structure of the land fund of the region for the period from 2014 to 2022 [3–4] showed that the most frequent, 77–78% of the total territory is occupied agricultural land. Such a high indicator indicates a violation of the ecologically acceptable ratio of arable land and natural agrolandscape. Agricultural development of land in the region exceeds ecologically acceptable.

Thus, the condition of the soils of the Donetsk region during the last decade is characterized as unsatisfactory. As a result of improper exploitation of land, which does not correspond to the characteristics of soils, their properties and regimes, as well as the conditions of natural formation, a considerable share of the fertile layer is lost annually and degradation processes have developed [1, 5].

The total area of such soils, which may belong to degraded and unproductive ones in the territory of Donetsk region, is more than 12.3 thousand hectares [3, 6]. At the same time, degraded for various reasons lands of the Donetsk region make up

86% of the total area of agricultural land, and degraded arable land - about 90% of the total arable area [1].

According to the authors [7], degrading soils are an ecologically dangerous natural object, because they inhibit the performance of natural and economic functions and begin to initiate the processes of general desertification of the earth's surface and deterioration of natural and climatic conditions.

In addition to the improper exploitation of land, since 2014, the soils of the Donetsk region have been under the negative influence of military operations, as a result of which, first of all, natural landscapes and agricultural fields were significantly affected. Russia's military aggression on the territory of the Donetsk region of Ukraine since 2014 and other regions of Ukraine led to the involvement of heavy weapons systems, a large number of human casualties and destruction of infrastructure [7].

Obvious threats related to war are mostly related to mechanical damage to landscapes or temporary loss of state control over violations and technological processes in the war zone [8].

The main negative factors that led to the damage of natural landscapes and agricultural lands include [1, 8–12]:

1. Driving through the territory of heavy equipment (tanks and other types of tracked equipment, which leads to soil compaction and degradation).

2. The use of anti-tank and anti-personnel mines, which leads to changes in landscapes, relief and soil degradation.

3. Shelling and bombing of the territory, which leads to the formation of craters and mixing of soil horizons. Canisters in the places where shells fall are not only a factor of landscape damage and destruction of vegetation, but also a factor of soil pollution: they leave in the soil a significant amount of metal, sulfur and sulfur compounds, heavy metals, ammonia, phosphorus, coal dust, sulfuric acid and sulfate compounds, formaldehydes , lead, mercury.

4. Construction of trenches and other protective shelters for military personnel and equipment (soil disturbance and degradation).

5. Fires in natural areas and agricultural fields. As a result, the fertile soil layer burns out, dehydration and "sterilization" occurs - both pathogenic microorganisms and useful biota die, nutrients are lost. On the basis of [1, 5, 8–10], for the purpose of summarizing the data, a diagram of the influence of hostilities on the condition of the soil was created (Fig. 1).

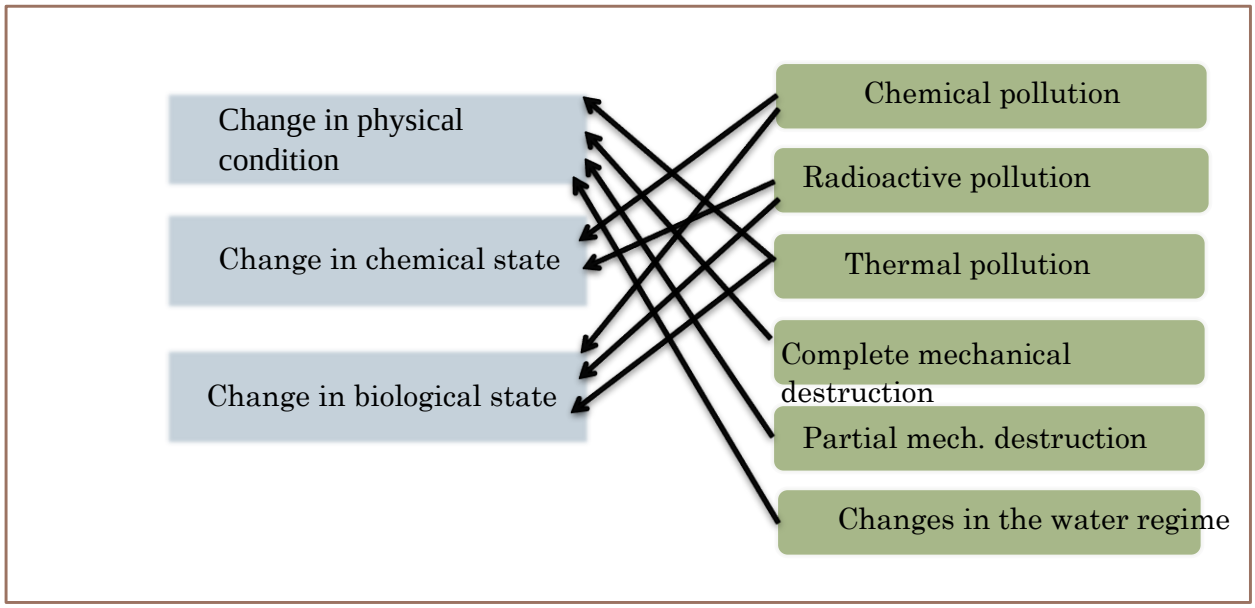

Fig. 1. – Impact of hostilities on soil conditions

Summarizing the above, it can be asserted that military operations affect changes in the physical, chemical, and biological state of soils and cause their degradation.

The forced circumstances of the war led to catastrophic environmental consequences, namely the destruction of the soil cover. The role of the soil is twofold: on the one hand, the soil strongly absorbs most of the negative substances, reducing their availability for the plant, and secondly, it fixes these substances in a solid phase, keeping them in the upper layers of the soil. for a long time, preventing them from moving out of the root zone.

Given that many chemicals do not break down for hundreds of years, it is clear that the effects of war-induced changes in the physical, chemical, and biological state of the region's soils will stretch the effects of war for decades.

If the degradation processes are not slowed down in the coming years, it will lead to an aggravation of the country's food problem and deterioration of the ecological situation [10].

Since the amount of information about environmental problems in the conflict zones in eastern Ukraine has increased rapidly, uncertainty and disagreements in the interpretation of data related to this information have increased [12].

The most important problem of monitoring on the battlefield is the lack of monitoring opportunities in specific conditions in a part of the territory of Donetsk region, the actual absence of monitoring bodies and constant shelling, which do not allow an objective assessment of the damage caused to the environment during the armed conflict at the national level. [11, 12]. As a result, there is a need to improve the traditional system of monitoring agricultural resources and operational information support of the agro-industrial complex through the introduction of remote sensing technologies of the Earth, which will contribute to the rapid updating of thematic data regarding the structure and agro-ecological state of agricultural landscapes, land use systems, soil cover, water resources, forest improvement measures, irrigated of land and crops [13].

Thus, the implementation of remote sensing technologies of the Earth creates conditions for significant improvement of the existing traditional system of agro-ecological monitoring, which will make it possible to make timely management decisions and implement soil protection measures based on the reproduction of agricultural resource potential in the territories affected by hostilities.

The territory of Donetsk region is under Ukrainian

The territory of Ukraine, temporarily occupied

Fig. 2. Map of combat forces on the territory of Donetsk region

At the moment, 17 territorial communities of the Donetsk region are occupied, they make up 57% of the total area of the territory.

Soil is one of the most vulnerable ecosystems during war. There are several main factors of land destruction: the passage of heavy military equipment, explosions of rockets and other types of weapons, construction of fortifications. As a result of these actions, the structure of the soil is disturbed, which leads to future degradation of vegetation and increased wind and water erosion.

Risks associated with damage to communications, businesses and other facilities that cause more damage to the environment are particularly important, as these phenomena can increase the scale of negative impacts in the absence of control and the ability to neutralize negative consequences.

Of particular interest is the characteristic of land use in the war zone. It is worth noting that no type of land use has been canceled in the occupied territories, only certain restrictions and amendments are present in order to preserve the legal foundation and restore the structure of land use in the post-war period.

Thus, it was established that the land fee (land tax; rent for land plots of state and communal property) is not calculated and paid from March 1, 2022 to December 31 of the year following the year in which martial law ends or is abolished , according to the following criteria:

• areas that are located on the territory of which hostilities are or were being conducted.

• sites that are located in territories temporarily occupied by armed formations.

• sites contaminated with explosive objects or those with fortifications.

Important for farmers is the introduction of automatic renewal of agricultural land lease contracts.

Thus, if the term of the contract of emphytheusis, superficies, land servitude of the agricultural plot of land expires after the introduction of martial law (24.02.2022), it is automatically considered renewed for one year, without the intention of the parties and without entering information about the renewal of the DRRP contracts.

Thus, such land use contracts do not lose their validity and are automatically extended for the next year by law.

Law No. 2120-IX establishes a "tax holiday" for the payment of rent for land plots, communal property in areas of hostilities and in temporarily occupied territories.

After analyzing the data in fig. 2 determined that the length of the front line in the Donetsk region is 252.14 km.

After examination and demining, the reclamation of such soils to return them to agricultural production is carried out by mechanical grinding with scrapers of bulldozers and graders, without taking into account the internal structure of the soil and the increase of genetic horizons. Restoration of soil fertility after rough reclamation in degraded areas is predicted to take decades depending on the degraded areas, making it difficult to grow sustainable, high-quality crops and requiring large financial investments.

Action plan for areas affected by explosions and fires of military equipment

1. Demining the territory.

2. Terrain digitization using the UAV ground surveillance satellite coordinate system. All areas must be digitized, regardless of the scale of the print.

3. Sampling in and around explosion zones (individual).

4. Analysis of the content of pollutants. First of all, heavy metals.

5. Make decisions regarding agricultural potential and further targeted use.

6. Cleaning the territory from sources of pollution.

Restoration of areas affected by the explosion:

- fill shallow funnels, pits (maximum 0.5 m) with lumps left at the explosion site, followed by leveling of the surface.

- deep funnels (>0.5 m).

Recovery options:

1. Falling asleep with lumps may not be economically justified. The order of soil layers should be close to undamaged areas, with the top layer (20-30 cm) being the most fertile. In case of chaotic backfilling, such areas will be less productive for crops, and their restoration will require additional measures (application of organic fertilizers, recultivators, improvement of plants, etc.).
2. Leave for natural restoration and planting of trees. In the absence of vegetation, such areas are at risk of erosion. Land plots with destroyed productive lands as a result of hostilities, acts of terrorism, sabotage through military aggression require restoration through land reclamation,

land conservation or land improvements to bring them into a state suitable for further targeted use.

After examination and demining, the reclamation of such soils to return them to agricultural production is carried out by mechanical grinding with scrapers of bulldozers and graders, without taking into account the internal structure of the soil and the increase of genetic horizons. Restoration of soil fertility after rough reclamation in degraded areas is predicted to take decades depending on the degraded areas, making it difficult to grow sustainable, high-quality crops and requiring large financial investments.

For land reclamation by land reclamation, the most effective land reclamation measures from the list should be used, according to the disturbed area:

- Creation of special hydrotechnical structures for restoration and regulation of the water regime in the soil;

- Uprooting of broken and burned trees, leveling of the earth's surface (after the explosion of shells, rockets; backfilling of trenches and trenches), for the cultural compatibility of the territory;

- Works on plastering, liming and phosphating of soils in connection with the absorption of harmful substances, as well as due to the long-term lack of supervision of the territory;

- Formation and restoration of forest plantations, as a large number of forest protection plantations have been disturbed or disappeared altogether due to hostilities.

I consider it important to note that these procedures should be used based on all the factors of a specific land plot in order to get the maximum benefit from the above operations. Having analyzed in detail all anthropogenic and natural factors of the area.

Conclusions and suggestions.

In view of the above, an urgent question arose of assessing the consequences of the negative impact of hostilities on the lands of territorial communities and

overcoming the negative consequences of hostilities. Environmental assessment measures to determine the extent of environmental damage should be one of the priorities for solving environmental problems in combat areas. The need to set standards and goals when restoring disturbed lands. Create unified pollution monitoring centers in war zones and temporarily occupied territories. The formation of such an information base will allow to determine damages and carry out further reclamation of disturbed lands and their restoration within territorial communities.

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Бутенко Є.В., Кузнецова О.В., Сохацька М.С.

До питання оцінки наслідків негативного впливу бойових дій на землях територіальних громад Донецької області

У статті досліджено сучасний екологічний стан земель та ґрунтового покриву що зазнав негативного впливу бойових дій. Досліджено територіальні громади , які є окупованими визначено види землекористувань цих територій та підраховано площі їх земель. Проаналізовано збитки ,які були завдані внаслідок воєнних дій. Оцінено наслідки негативного впливу бойових дій на землях територіальних громад. Наведено фрагменти карт на яких вказано території на яких ведуться бойові дії та проведено їх аналіз.

Було досліджено та вивчено окремі види і процеси деградації ґрунтів (ущільнення, забруднення, порушення та руйнування ґрунтового покриву тощо), спричинених збройною російською агресією та масштабів деградації ґрунтів, особливо чорноземів.

Запропоновано вдосконалення методичних підходів щодо визначення негативних наслідків бойових дій на ґрунтовий покрив.

Було проведено науково-методичне та інформаційне забезпечення оцінювання стану і прогнозування зміни якості ґрунтів. Удосконалення методичних підходів до локальних моніторингових досліджень ґрунтів із використанням дистанційних методів досліджень та агрохімічне забезпечення вирощування сільськогосподарських культур в умовах зниження продуктивних площ .

Здійснено аналіз для вирощування сільськогосподарської продукції заходів, які можуть поліпшити якісний стан земель. Для районів, які постраждали від вибухів боєприпасів та загоряння військової техніки.

Визначена нагальна необхідність максимально спростити землевпорядні та містобудівні процедури та прискорити здійснення відновлювальних робіт з ліквідації наслідків збройної агресії та бойових дій під час дії воєнного стану та у відбудовний період і після закінчення воєнних дій, у тому числі щодо їх включення до таких, що потребують оцінки

техногенного забруднення земельних та інших природних ресурсів, оцінки антропогенних порушень, детальної ідентифікації прав власності на землю та майно тощо.

Визначено фактори шкоди землі в результаті бойових дій як: проїзд важкої військової техніки, вибух ракет та інших видів зброї, зведення фортифікацій і як наслідок цих дій,- порушується структура ґрунту що призводить до деградації рослинного покриву та посилює вітрову і водну ерозії.

Запропоновано план дій з відновлення, який передбачає скоординовані зусилля зацікавлених сторін та залучення іноземних партнерів до вирішення проблем безпеки та розвитку.

Ключові слова: *війна, інвентиризація, деградація ґрунтів,консервація земель, хімічне забруднення, моніторинг.*