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IMPLEMENTATION OF CLIMATE CHANGE MITIGATION INITIATIVES IN LAND MANAGEMENT MEASURES AND IN THE CONTEXT OF STRATEGIC ENVIRONMENTAL ASSESSMENT

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Abstract. *The paper considers the possibilities of implementing climate change mitigation initiatives in environmental land management measures, since land management itself is, by definition, a set of socio-economic and environmental measures. It is proposed to update land management projects providing ecological and economic substantiation of crop rotation and landscaping within the framework of decarbonization as an element of the European Green Deal with calculations of carbon sequestration from the atmosphere, depending on the crops provided for in crop rotations. The implementation of climate change mitigation initiatives is also proposed as part of the strategic environmental assessment of land management*

documentation in Ukraine, in particular, to assess planning decisions for the Climate and Air Quality criterion in the context of assessing changes in CO_2 release/absorption as one of the greenhouse gases that affect climate change.

In the context of The European Green Deal, the article examines approaches to assessing greenhouse gas absorption (decarbonization) which can be implemented in Ukraine both within the framework of strategic environmental assessment of land management documentation and in environmental measures for land management, since the principles of land management include ensuring the priority of environmental safety requirements, protection of land resources and restoration of soil fertility, productivity of agricultural land, and establishment of a regime for environmental protection, health, recreation, historical and cultural purposes.

Keywords: *strategic environmental assessment, land management, green housing, carbon sequestration, decarbonization, land management documentation, climate change, land management measures, rural areas, Ukraine.*

Problem statement. The Intergovernmental Panel on Climate Change's (IPCC) AR6 report on climate change confirmed the significant risks to the planet posed by climate change, global warming and associated extreme weather events. The reality of global warming is increasingly perceived by society and the risks it poses if the rise in temperature continues to rise and reach 1.5 °C above the pre-industrial level. At the same time, according to the first series of reports entitled "Physical Scientific Basis", which describes the state of the climate on Earth, the scale of changes in the climate system recently is unprecedented for many hundreds, if not thousands of years. At the present time, the world cannot ensure the prevention of extreme climate changes. In the 21st century, global warming will reach 1.5 °C and 2 °C, if during this decade there is no significant reduction in emissions of carbon dioxide and other greenhouse gases [1, p. 278-287].

An increase in the concentration of greenhouse gases in the Earth's atmosphere, global warming and climate change are the challenges that, to one degree or another, have been faced by almost all countries of the world and Europe, including Ukraine.

The southern dry steppe, the south of the Kherson region and the north of the Autonomous Republic of Crimea with a humidity coefficient (the ratio of annual precipitation to evaporation) of 0.25, according to some researchers, should already be considered a semi-desert zone. Aridification of the climate has been observed in the last 30 years, as well as significant temperature anomalies. Based on the scenario assessment, at the current rate of climate change, the average temperature will increase by 1.5-2.5 °C in the near future. At the same time, this development of the situation will not have a critical impact on Ukraine. Other scenarios assume an increase in the average air temperature by 3-4 °C. If such a scenario takes place, then mathematical models and paleoclimatic reconstructions suggest that the southeastern and eastern regions of our country may be threatened by desertification processes [2].

The provisions of the Association Agreement between Ukraine and the European Union provide for the adoption of measures that will bring Ukrainian legislation closer to EU law and policy in the field of environmental protection. One of the obligations of Ukraine within the framework of these processes is the implementation of the provisions of Directive 2001/42/EC of the European Parliament and the Council dated June 27, 2001 “on environmental impact assessment of individual projects and programs”. However, in practice, Ukraine lacks a practical component in the form of developed methodological recommendations that would embody both the provisions of the said Directive, in particular in the part of conducting a strategic environmental assessment of land management documentation, and the provisions of the UN Framework Convention on Climate Change and the Paris Climate Agreement [3].

In this context, it is important to implement the elements of the European Green Deal, which is an integral part of the strategy of the European Commission. This strategy is focused on the implementation of the UN Agenda until 2030 and the achievement of the Sustainable Development Goals. The main goal is to put the sustainability and well-being of citizens at the centre of economic policy, and the goals of sustainable development at the centre of the policy and actions of the European Union [4]. From Figure 1 and the constituent elements of the European

Green Deal, it is clear that raising the EU's climate ambitions for 2023 and 2050 is one of the priority tasks, and solving climate and environmental problems is a key task of this generation.

Figure 1. The European Green Deal [4]

The implementation of decarbonization initiatives at the current stage is not just a pan-European and global trend, but also an important necessity. This is confirmed by the Climate Change Synthesis Report released on March 20, 2023, which became part of the Sixth Assessment Report (AR6) [5]. The IPCC finalized and released this report during the group's 58th panel session held in Interlaken, Switzerland, from 13 to 19 March 2023.

Changes in climate policy have also occurred in the United States, including through the executive order signed by the President of the United States on January 27, 2021 On Tackling the Climate Crisis at Home and Abroad [6], which contains several provisions related to carbon sequestration via preservation and restoration of carbon sink ecosystems, such as wetlands and forests. The regulations emphasize the importance of farmers, landowners and coastal communities in carbon sequestration,

including directing the Treasury Department to promote the conservation of carbon sinks through market-based mechanisms, and directing the Department of the Interior to collaborate with other agencies to create a Civilian Climate Corps to increase carbon sequestration in agriculture, etc.

In Ukraine, the Order of the National Agency for Ecological Investments of Ukraine No. 73 of 05.10.2009 "Methodical recommendations for the preparation of methods for the inventory of greenhouse gas emissions from anthropogenic sources" was developed and approved. The purpose of its development is: "to ensure the proper functioning of the national system for estimating anthropogenic emissions and absorption of greenhouse gases". And also: "implementation of the Procedure for the functioning of the national system for estimating anthropogenic emissions and absorption of greenhouse gases that are not regulated by the Montreal Protocol on Substances that Deplete the Ozone Layer" [9].

In turn, the national assessment system of anthropogenic emissions and absorption of greenhouse gases aims to fulfil the requirements of the Kyoto Protocol to the UN Framework Convention on Climate Change and take into account the decisions made at the Conference of the Parties to the UN Framework Convention on Climate Change. The task of the national system includes: "evaluation of data on anthropogenic emissions and absorption of greenhouse gases; preparation and presentation of the national inventory of anthropogenic emissions and absorption of greenhouse gases, as well as the national message on climate change in accordance with the Kyoto Protocol" [13].

Land management is a set of socio-economic and ecological measures, in accordance with the Law of Ukraine "On Land Management". At the same time, the principles of land management include: "ensuring the priority of environmental safety requirements, protection of land resources and reproduction of soil fertility, productivity of agricultural land, establishment of a regime of nature protection, health, recreational and historical-cultural purpose" [7]. Considering the above, the role of environmental measures should be strengthened in the context of the mentioned climate challenges.

Analysis of the latest scientific research and publications. Peculiarities of the introduction and development of strategic environmental assessment as a mandatory environmental policy management tool in Ukraine were studied by O. Ihnatenko, O. Riabukha, V. Potapenko, H. Marushevskyi, V. Fedorchak, V. Potapenko, O. Melen-Zabramna [10]. D. Palekhov [11] investigated the legal principles of conducting a strategic environmental assessment in Ukraine.

In Ukraine, the introduction of strategic environmental assessment in the field of land management was studied by O. Dorosh, R. Derkulskyi, B. Avramchuk, A. Dorosh, etc. The introduction of carbon farming in the EU countries, as an element of the implementation of the European Green Deal, was studied by foreign scientists: H. McDonald, A. Frelih-Larsen, A. Lóránt, L. Duin, S. Pyndt Andersen, G. Costa, H. Bradley and others.

The aim of the study. To study and assess existing opportunities and propose ways of implementing initiatives to prevent climate change by environmental measures in land management and in the context of strategic environmental assessment of land management documentation.

Research materials and methods. The research uses general scientific methods, in particular: monographic, analysis, forecasting, generalization, abstract-logical method. In the processing scientific publications of scientists on the issues of climate change prevention, decarbonization, strategic environmental assessment of land management documentation, the method of monographic analysis was applied. The analysis method was used to study the existing system of strategic environmental assessment of land management documentation and the possibilities of institutional implementation of decarbonization initiatives. Conclusions regarding the implementation of climate change prevention initiatives in land management measures and in the context of strategic environmental assessment were formulated using the method of generalization and the application of the abstract-logical method.

Research results and their discussion. In Ukraine, certain types of land management documentation are subject to the SEA procedure: “land management schemes and feasibility studies of land use and protection of administrative-territorial

units, territories of territorial communities, general plans of settlements, detailed plans of territories, comprehensive plans for the spatial development of the territories of territorial communities, which are at the same time, documentation with land management and urban planning documentation" [7; 8].

In the context of the strategic environmental assessment of the proposed measures in land management, which are defined according to the components, the component "Climate and air quality" is subject to assessment. Within this component, the strategic environmental assessment report must contain: "a detailed description of the impact on the environment, including the consequences for public health. This is assessed in various aspects, such as secondary, cumulative, synergistic, short-term, medium-term, long-term (respectively 1, 3-5 and 10-15 years, and if necessary 50-100 years), as well as permanent and temporary, positive and negative effects" [8].

That is why, as part of the preparation of the environmental report (SEA report) on the measures proposed in the land-use documentation, the description of the consequences for the environment must include an assessment of the "Climate and air quality" component, in particular, changes in the volume of absorption/emissions of greenhouse gases, depending on the planning decisions provided for in the documentation with land management at the level of administrative-territorial units (districts), territorial communities, settlements or individual land parcels. At the same time, the description of the consequences and the corresponding evaluation can be carried out according to various methodological approaches, some of them will be given below.

The Ministry of Environmental Protection and Natural Resources of Ukraine recommends using the method of assessing actual structure or planned changes in land use to estimate greenhouse gas emissions from different types of land cover. In accordance with the recommendations of the Secretariat of the UN Framework Convention on Climate Change, the methodological approach to the inventory of emissions and absorption of greenhouse gases is defined in the documentation of the Intergovernmental Panel on Climate Change [12].

This methodical approach defines certain components for assessment:

- classification of types of land cover, which by analogy with norms in Ukraine are «types of land», the classification is based on accounting data of the actual (existing) and prospective (project, planned) structure of land types;
- calculation of emissions/absorption from each type of land;
- calculation of emissions/absorption during the planned change of one type of land to another type;
- calculation of positive/negative changes, within the framework of the implementation of planning decisions, which are provided for in the land management documentation.

Calculations of emissions and absorption of greenhouse gases are expected to be carried out using data on the actual composition of land at the level of an administrative district, territorial community, settlement, etc. In addition, prospective changes in the distribution of land according to different types of land, which will arise as a result of the implementation of planning decisions, are taken into account.

The mentioned technique provides for the comparison and implementation of the appropriate assessment of the existing state (A) with the planned (B) distribution of 6 types of land, namely: FO – Forest Lands, CR – Croplands, GR – Grasslands, WE – Wetlands, SE – Settlements, OT – Other Lands. At the same time, the methodology defines its characteristics for the specified lands. Through spatial analysis, a matrix is created that reflects the planned transformation from (A) to (B). This matrix provides answers to questions about the size and nature of the impact of planned changes in the structure of land use on emissions/absorption of greenhouse gases, in particular CO_2 [12].

It should be noted that the issue that needs to be resolved is the ratio of the list of land types defined by the above-mentioned Methodology and the one according to the Classification of Land Types, which are defined by the State Land Cadastre Management Procedure.

At the same time, despite the need to improve the mentioned approaches, the inventory of emissions/absorption of greenhouse gases and assessment in the future

should be components of the report on strategic environmental assessment of land management documentation.

According to the methodical approaches recommended by the Ministry of Environmental Protection and Natural Resources of Ukraine for the assessment of greenhouse gas emissions from land cover (land types) and the assessment of realized or planned changes in the territory of the district, territorial community, settlement, etc., it is recommended to use the average value of CO_2 absorption/emission , which is given as an example in the last column of Table 1. This table is given as an example and was formed on the basis of data from three inventory reports of Ukraine for 2015-2017, provided in accordance with the UN Framework Convention on Climate Change, so such data are subject to correction.

Table 1. Average permanent characteristics of land types in the context of release or absorption of CO_2, t/ha [12]

land type/land cover	2015	2016	2017	3 years average
1) FO – Forest Lands	- 4,80	- 4,73	- 4,82	- 4,78
2) CR – Croplands	+ 1,17	+ 1,30	+ 1,08	+ 1,18
3) GR – Grasslands	- 0,03	- 0,03	- 0,02	- 0,03
4) WE – Wetlands 4а) permanent waters (ponds, lakes, swamps) – WE1	0	0	0	0
4б) peat extraction land – WE2	+ 19,52	+ 24,71	+ 20,35	+ 21,53
5) SE – Settlements	0	0	0	0
6) OT – Other Lands	0	0	0	0

Table 2 shows the approximate form of assessment of an administrative-territorial unit, the territory of a territorial community, a settlement, or a separate land plot during the transition from state (A) to state (B), as a result of the implementation

of measures provided for by land management documentation in the short-, medium- and long-term perspective.

In our opinion, the introduction of initiatives to prevent climate change and decarbonization (carbon absorption) into land management should not be limited to the framework of SEA, because by its purpose, land management provides: "forecasting, planning and organization of rational use and protection of land at the national, regional, local and separate land use levels" [7].

Table 2. The form for an assessment of the consequences of planning decisions provided for in the land management documentation in the context of the impact on CO_2 absorption

land type/land cover	Coefficient, t/ha	State A, area (ha) in ___ (year)	CO_2 emissions in ___ (year)	State B, area (ha) in ___ (year)	CO_2 emissions in ___ (year)	Yearly emissions difference, t/ha
1) FO – Forest Lands	**- 4,78**	-	-	-	-	-
2) CR – Croplands	**+ 1,18**	-	-	-	-	-
3) GR – Grasslands	**- 0,03**	-	-	-	-	-
4) WE – Wetlands 4а) permanent waters (ponds, lakes, swamps) – WE1	**0**	-	-	-	-	-
4б) peat extraction land – WE2	**+ 21,53**	-	-	-	-	-
5) SE – Settlements	**0**	-	-	-	-	-
6) OT – Other Lands	**0**	-	-	-	-	-
Sum	-	-	-	-	-	-

In addition, the purpose of land management is: "the organization of the territory of agricultural enterprises, institutions and organizations with the aim of creating spatial conditions for the ecological and economic optimization of the use and

protection of agricultural land, the implementation of progressive forms of land use management, improvement of the structure and placement of land, acreage, systems of crop rotation, mowing and pasture rotation" [7]. In this regard, ecological measures of land management can be supplemented for another type of land management documentation provided for by the Law of Ukraine "On Land Management", namely: "land management projects providing ecological and economic substantiation of crop rotation and landscaping".

The purpose of developing such land management documentation is defined as: "organization of agricultural production and regulation of agricultural lands within the boundaries of land ownership and land use for effective agricultural production, rational use and protection of land, creation of a favourable ecological environment and improvement of natural landscapes" [7].

Ecological substantiation of measures provided for by this type of land management documentation can be supplemented by calculations of CO_2 absorption/release changes and the introduction of elements of carbon farming, which is directly related to crop rotation and land management. Thus, we are talking about the prospect of introducing compensatory environmental payments for agricultural producers who grow crops with a high level of carbon absorption on their agricultural land. The above-mentioned land management projects also determine the organization of land ownership and land use with the allocation of crop rotation, based on ecological and economic conditions.

Carbon farming is currently an environmental trend in the EU and the US, but from a business perspective, carbon farming only makes sense for farmers if the benefits outweigh the costs they face. From a societal perspective, public authorities or institutions implementing elements of carbon farming must ensure that the benefits of implementation (including climate change mitigation, biodiversity conservation and other benefits) outweigh the costs including costs faced by both farmers and bodies of state power and local self-government [15, p. 32].

Several pilot projects are already being implemented in Ukraine, among which the Bayer company's programs to reduce the impact of agriculture on the

environment in Europe [16]. The main goal of these initiatives is to reduce greenhouse gas emissions (decarbonization) in key elements of the food system, with a focus on the activities of agricultural producers. These projects bring together agricultural producers and other market participants to decarbonize and contribute to the fulfilment of the objectives of the European Green Deal.

Research on carbon accumulation (decarbonization) by grain crops was conducted in Ukraine under the coordination of the Department of Agricultural Resources of the Institute of Water Problems and Land Reclamation of the National Academy of Sciences of Ukraine. Calculations were based on data from research institutions of the National Academy of Sciences of Ukraine located in the Polissia, Forest Steppe, and Northern Steppe zones. The obtained results indicate that the largest amount of carbon, or CO_2, accumulates in the biomass of corn and winter wheat [17].

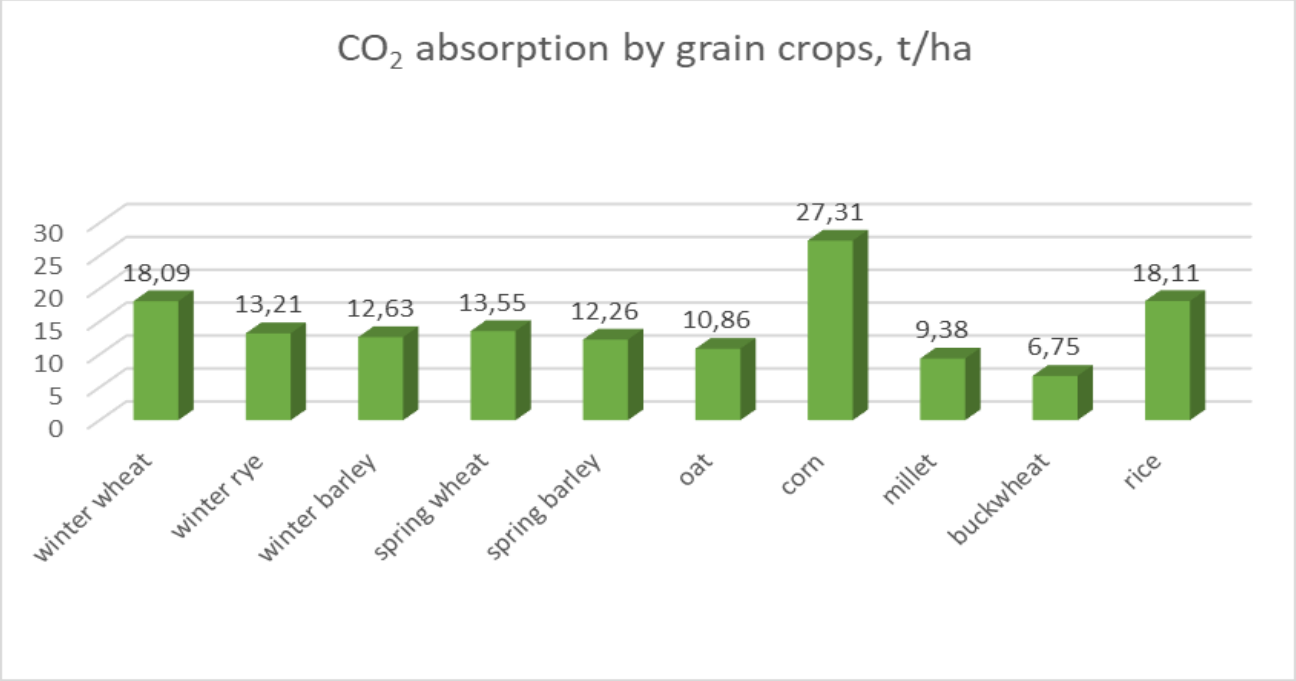

Figure 2. Volumes of CO_2 absorption by grain crops, t/ha [17]

From an economic point of view, the value of each ton of absorbed CO_2 has a monetary expression, and in many countries elements of the carbon market are being

introduced, where the corresponding carbon units are bought and sold in the form of carbon offsets, carbon credits, compensation payments, etc.

Conclusions and perspectives. In Ukraine, the implementation of initiatives to prevent climate change in land management measures requires further research and substantiation, as these trends seem inevitable on the way to European integration and the introduction of elements of the European Green Deal. Partly due to the implementation of the provisions of Directive 2001/42/EU dated 27.06.2001 "on environmental impact assessment of individual projects and programs", the adoption of the Law of Ukraine "On Strategic Environmental Assessment", certain initiatives to prevent climate change are already being implemented. At the same time, we state that conducting a strategic environmental assessment of land management documentation requires the development of new and improvement of existing methods, taking into account the specifics of conducting such an assessment specifically for land management schemes and feasibility studies of land use and protection of administrative-territorial units, territories of territorial communities, general plans of settlements, detailed plans of territories, complex plans of spatial development of territories of territorial communities.

Given that land management by definition is a set of socio-economic and environmental measures, and land management projects providing ecological and economic substantiation of crop rotation and landscaping are developed, in particular, to create a favourable ecological environment, such projects within the framework of decarbonization as an element of the European Green Deal, it is proposed to be supplemented with calculations of carbon absorption from the atmosphere, depending on the agricultural crops in crop rotations.

At the same time, it should be noted that in the future, the question of developing an economic mechanism for supporting carbon farming in Ukraine will arise, such a mechanism can be implemented through the system of state support for agriculture or as a function of a special climate fund.

Since such instruments as Verra Verified Carbon Standard, Gold Standard for Global Goals and others operate on an international scale, the possibility of

international cooperation is important in this context, in particular within the framework of the mechanisms defined in Article 6 of the Paris Agreement (in the context of cross-border cooperation under Article 6.2 of the Paris Agreement and the new project mechanism for sustainable development under Article 6.4 of the Paris Agreement).

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ВПРОВАДЖЕННЯ ІНІЦІАТИВ ІЗ ЗАПОБІГАННЯ ЗМІНІ КЛІМАТУ В ЗАХОДАХ ІЗ ЗЕМЛЕУСТРОЮ ТА В КОНТЕКСТІ СТРАТЕГІЧНОЇ ЕКОЛОГІЧНОЇ ОЦІНКИ

Анотація. *У статті розглянуто можливості впровадження ініціатив із запобігання зміні клімату в екологічних заходах із землеустрою, оскільки сам землеустрій за визначенням є сукупністю соціально-економічних та екологічних заходів. Проекти землеустрою, що забезпечують еколого-економічне обґрунтування сівозміни та впорядкування угідь в рамках декарбонізації, як елементу Європейського Зеленого курсу, запропоновано доповнювати розрахунками поглинання вуглецю з атмосфери, залежно від сільськогосподарських культур, які передбачені сівозмінами. Також впровадження ініціатив із запобігання зміні клімату запропоновано в рамках реалізації стратегічної екологічної оцінки землевпорядної документації в Україні, зокрема, щодо оцінки планувальних рішень для критерію «Клімат і якість повітря» в контексті оцінки зміни обсягу викидів CO_2 , як одного з парникових газів, що впливають на зміну клімату. У контексті Європейського зеленого курсу (The European Green Deal) у статті досліджено підходи до оцінки поглинання парникових газів (декарбонізації), які можуть бути запроваджені в Україні як в рамках стратегічної екологічної оцінки землевпорядної документації, так і в екологічних заходах із землеустрою, оскільки до принципів землеустрою відносяться забезпечення пріоритету вимог екологічної безпеки, охорони земельних ресурсів і відтворення родючості ґрунтів, продуктивності земель сільськогосподарського призначення,*

встановлення режиму природоохоронного, оздоровчого, рекреаційного та історико-культурного призначення.

Ключові слова: *стратегічна екологічна оцінка, землеустрій, зелене житлове будівництво, секвестр вуглецю, декарбонізація, документація із землеустрою, зміна клімату, заходи із землеустрою, селітебні території, Україна.*