

BOOK OF ABSTRACTS  
20<sup>th</sup> International Scientific-Methodical Conference BALTIC SURVEYING'23



VYTAUTAS MAGNUS UNIVERSITY  
AGRICULTURE ACADEMY  
FACULTY OF ENGINEERING  
Department of Land Use Planning and Geomatics



# BOOK OF ABSTRACTS

20<sup>th</sup> International Scientific-Methodical Conference

## BALTIC SURVEYING'23

10<sup>th</sup> -12<sup>th</sup> of May, 2023, Kaunas, Lithuania



UNIVERSITY  
OF WARMIA AND MAZURY  
IN OLSZTYN



Latvia University  
of Life Sciences  
and Technologies



VYTAUTAS MAGNUS  
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BOOK OF ABSTRACTS: 20<sup>th</sup> International Scientific-Methodical Conference BALTIC SURVEYING'23. Vytautas Magnus University Agriculture Academy. 2023, 58 p.

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# PLENARY SESSION



**AGRICULTURAL LANDS TRANSFORMATION AND THEIR USE IN LAND PLANNING  
PROJECTS IN UKRAINE****Koshkalda Iryna<sup>1</sup>, Sadovyy Ivan<sup>1</sup>, Dombrovska Olena<sup>1</sup>, Gurskiene Virginija<sup>2</sup>,  
Maliene Vida<sup>2</sup>**<sup>1</sup>State Biotechnological University (Kharkiv, Ukraine)<sup>2</sup>Vytautas Magnus University (Kaunas, Lithuania)**Abstract**

An analysis of land management documentation was carried out regarding the mechanisms of transferring one type of agricultural land to another. The main establishment stages of a legal framework that regulates the agricultural land transformation are given. Looking for a balance between the establishment of regulated conditions for rational land use and the removal of artificial restrictions on economic activity, the legislative bodies created mechanisms for the development of land management projects that have both positive and ambiguous characteristics. Nowadays, land management projects that provide ecological and economic substantiation of crop rotation and land management make it possible to develop environmentally safe and economically feasible land use projects. But there is a number of issues that require clarification. In production, the above-mentioned projects are sometimes used to transfer ecologically stabilizing lands (pastures and hayfields) to arable land. This is controversial to all recommendations, conventions and programs that emphasize the need for reduced plowing of the territory. It is necessary to improve the control mechanisms of crop rotation and agrotechnical environmental protection measures. The introduction of land plots agricultural passports is an important but insufficient measure. The remote sensing data of the earth and the use of modern geoinformation technologies should become part of the state control over compliance with land management projects. There is already experience of using various indices at the state level to decipher agricultural crops. For example, on the Public Cadastral Map of Ukraine, the layer "Classification of crops 2019 (Spring) and (Winter)" was added. But this layer was only informative and was not updated afterwards. As a result of the research, we came to the conclusion that the use of land remote sensing data and modern geoinformation technologies in land management will make it possible to bring the indicators of plowed areas to a rational level, while not creating artificial restrictions on economic activity. The methodical and regulatory acts for the development of land management projects, which regulate the size of the ecologically safe land area need improvement.

**Key words:** agricultural lands transformation, land management project, pastures, hayfields, arable land.

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## LAND TAKE IN ESTONIA

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### Abstract

The Roadmap to a Resource Efficient Europe states the milestone: By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track, intending to achieve no net land take by 2050. OECD report Shrinking Smartly in Estonia (2022) presented that Estonia had the sixth-highest growth among OECD countries in the amount of built-up area per capita in the period from 2000 to 2014. Over the same period, the Estonian population decreased by 5%. Frequently, an increase in population is considered one factor that promotes land take. Despite depopulation, the amount of developed land is increasing in Estonia. During the Soviet period, the living space standard in Estonia was lower than in Western European countries, and it can urge urban sprawl, which is one factor of land take. The Estonian planning and land governance systems still need to be developed. These should be more prohibitive to utilise natural areas for development and insist on using the brownfields. The concept of land take needs to be added to Estonian legislation as it is currently missing despite the need to monitor land take. The presentation aims to clarify Estonian's state of the art of land take and land governance in this sector.

**Key words:** land take, land governance, spatial planning, Estonia

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**APPLICATION OF SURFACE MODELS  
OVERCOME CRISIS SITUATIONS**

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**Abstract**

Known that when the threat of crisis transform into development and escalation phases, in all cases the influencing factor is spatial situation of area. Impact of the spatial situation can assessed as individual, for each specific territory. Based on the knowledge of spatial situation, crisis management prepare decisions for crises predicting, development, limiting and managing coping proceses.

Cartographic material of territory served as the basic document of the exploration, which support situation modeling. Parallel with this used of threedimensional models of the territories, which creation of was timeconsuming and limited in usage, but shown understandable territory overview. With the development of digital technologies of using threedimensional, situation models improve in crisis management processes.

Inclusion develops by creating opportunities for users visually evaluate the situation of area and its influence in a 3D view, and usage automated or semi-automated analytical functions in computers to provide crisis management with most complete justifications of forecasts and actions plans for decisions. For monitoring the development of situation, usage of modeling products and options provides of quality and timesavings.

Existing situation in the use of three-dimensional terrain digital models in crisis management measures is in the stage of dynamic development. Usage limited by requirements for safe and proven solutions, which today's capabilities cannot yet support with experience and safety tests history. Focusing on the possibilities and ideas of these models, specialists work of taking place on the development of solutions and offers, their tests, with aim of integrating the results into crisis management processes.

**Key words:** Crisis management, cartographic, threedimensional models, 3D view, terrain digital models.

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# ORAL SESSION 1

**LEGAL AND ECONOMIC ASPECTS OF THE REAL ESTATE MANAGEMENT OF THE  
STATE TREASURY AGRICULTURAL PROPERTY RESOURCE IN POLAND**

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University of Warmia and Mazury in Olsztyn, Poland

**Abstract**

The province of Warmia and Mazury is distinguished among other Polish provinces by the share of rural areas in the total area. This percentage in Warmia and Mazury is the highest in Poland at 97.4%, whereas Poland's average value is 92.9%. The province of Warmia and Mazury is also characterized by the high degree of utilization of land for agricultural purposes.

Agricultural land may have many values and functions for different buyers at the same time. Quite often, agricultural properties are purchased with a view of alternative future development, other than for farming or forestry. This mostly concerns agricultural real estate located conveniently in relation to large cities, with good accessibility or high landscape value.

The research objective is to reveal the scale of the Polish state's interventionism consisting of exercising statutory rights such as the right of pre-emption and the right of purchase, as well as changes in the approach to the handling of real estate which belongs to the State Treasury Agricultural Property Resource. In addition, an attempt was made to determine the effect of the binding law on the agricultural land market in Poland. The analyses were based on declarations of intent to exercise the pre-emptive right and the right to acquire land, both being significant tasks delegated in 2016 to the KOWR Territorial Branches. Hence, the time period submitted to analyses spanned a period from 2016 to 2021. Based on the research results, it is evident that the Polish state's interventionism in the sale of agricultural land has an impact on the shaping of the agricultural system in Poland.

**Key words:** agricultural property; agricultural system; declaration of intent; state treasury reserve; national support center for agriculture

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Fields of interest: real estate valuation, agricultural market, renewable energy sources.

**TIME SERIES ANALYSIS OF LAND COVER AND LAND USE CHANGE OF KHARKIV  
REGION OF UKRAINE**

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National University of Life and Environmental Sciences of Ukraine

**Abstract**

The relevance of the topic is due to significant changes in the state of the environment of the studied region under the impact of many anthropogenic factors, including consequences of the military actions in 2022; there is a need to assess the scale of environmental changes under the influence of these factors, determining their relevant scale, spatial localization and environmental consequences.

The study is aimed to assess time-series of satellite imagery, including Landsat and Sentinel datasets, to create cartographic models for land cover and land use, that reflect parameters of the main components of the environment, spatio-temporal dynamics, assessment of the degree and scale of influence of factors that caused negative changes in land use of the studied region.

We consider the scientific principles and methodological aspects of cartographic modelling of changes in the state of the environment at the level of the region, perform the formation and content filling of geoinformational and cartographic models reflecting the spatio-temporal dynamics of the current state of land use in the studied region, create a series of 1:1,000,000 and 1:100,000 scale electronic maps in the QGIS software to typify the effects impacts including consequences of the military operations and assess the scale of changes and factors affecting the region. Thus, we propose optimization action for overcoming negative changes caused by land use imbalance and causes of warfare. Methodological aspects of geo-informational and cartographic modelling of changes in the state of the environment at the level of the regional region were also reviewed.

**Key words:** land cover change, land use, time series, satellite imagery.

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**ADVANTAGES OF USING QGIS TO SOLVE SPATIAL PLANNING TASKS**

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**Abstract**

The article discusses the prospects and advantages of using QGIS geographic information system for solving spatial planning tasks. Attention is focused on the strengths of QGIS in comparison with other geographic information systems and the potential of the program to eliminate the monopoly position in the market by well-known manufacturers of geographic information systems. Despite the fact that QGIS is an open-source software, this software product is in most cases not inferior to expensive geographic information systems. At the same time, the advantages of QGIS include cross-platform, rich functionality, the ability to use different geographic information databases, the ability to connect and integrate various plugins into the program. Particular attention should be paid to the ability to independently write plugins for solving specific highly specialized tasks in the Python programming language and their quick integration into the QGIS software environment. Examples of QGIS application for solving specific spatial planning problems are given. The possibilities of using QGIS in solving the problems of settlement planning, territory management, land management and environmental monitoring are considered. The conducted research gives grounds to recommend QGIS for wide application by developers of project documentation, as well as by executive authorities and local self-government bodies for analyzing cartographic and project materials in making management decisions. This will help create a competitive environment among developers of urban planning and land management documentation. After all, today, many specialists cannot afford expensive commercial licenses of well-known developers of geographic information systems. And any legislative requirements that oblige them to use them in practice lead to monopolization of the market for these services by individual enterprises. At the same time, it has been proven that the use of the open-source geographic information system QGIS will not lead to a deterioration in the quality of project documentation. The program can ensure the proper quality, accuracy and interoperability of design and mapping materials created with its help, as well as to solve a wide range of tasks in the field of spatial planning.

**Key words:** geographic information system (GIS), spatial planning, project documentation, cartographic materials, territory management.

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**ASSESSMENT OF 3D GEOPORTALS OF CITIES ACCORDING TO SELECTED  
ELEMENTS OF CITYGML AND INSPIRE STANDARDS**

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**Abstract**

The continuous development of the three-dimensional models, representing the reality in a digital form, is one of the advantages of the contemporary computer technology development. Nowadays, the 3D models, integrating various features, may be applied as graphical representations of complex databases, used e.g. for the purposes of spatial planning, cadastre, archaeology, emergency management or tourism. The variety of the applications results in an increasing demand for 3D geoportals, representing the elements of the urban areas and supporting local authorities in the city management.

The aim of the research conducted is the multifaceted assessment of the 3D city geoportals, including the aspects of the selected CityGML and INSPIRE standards realization and provision of some other useful facilities. The analysis, based on 21 various criteria, has been carried out using 16 geoportals of cities in Europe, Asia and North America. The research resulted in a ranking, describing the technological advancement of the studied websites.

**Key words:** 3D model, geoportal, urban development, CityGML, INSPIRE.

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**DETERMINATION OF QUASIGEOID MODELS  
IN RIGA CITY AREA USING GNSS/LEVELLING METHOD****Līdumnieks Toms<sup>1</sup>, Celms Armands<sup>1</sup>, Ratkevičs Aivars<sup>1</sup>, Puķīte Vivita<sup>1</sup>, Brinkmanis-Brimanis Miks<sup>1,2</sup>**<sup>1</sup>Latvia University of Life Sciences and Tehnologies, <sup>2</sup>Geo Jūrmala Ltd, Latvia**Abstract**

The Global Navigation Satellite System (GNSS) is becoming increasingly important nowadays. Technological development and accuracy requirements in the future make it necessary to ensure a certain reliability of geodetic measurements, as well as to be able to repeat geodetic measurements, assess the probability to predict future displacements, deviations, movements of the Earth's crust. Sea, ocean and climate changes are rapidly affecting the size and shape of the Earth. In navigation, logistics, precision agriculture, geodesy, geology, surveying, civil engineering, territory planning, it is important to know the exact position and height above sea level in real time. Gravity and mass distributions within the Earth and tides arising due to the Sun and Moon are factors that affect both geodetic measurements and the shape of the Earth. The creation of a dynamic model of the Earth would be able to solve various types of problems.

The currently used precision levelling method is older and reliable; however, it is much more time-consuming and expensive. The normal height (altitude above sea level) obtained from precision levelling describes the topographic surface. The precision levelling method provides reliable support to control GNSS measurements. These GNSS measurements provide the ellipsoidal height that is calculated from the surface of a high-precision quasigeoid or geoid model. Dynamic quasigeoid, geoid model determination would provide higher precision GNSS measurements. By combining various methods of geodetic measurements and qualitative data, it is possible to model a high precision geoid and quasigeoid surface.

The study includes GNSS measurements on known Class 1 leveling line points - obtaining ellipsoidal height values at 8 selected points in the southern part of Riga city. The obtained measurements were processed and the data were compared with available geoid and quasigeoid models.

**Key words:** geoid, quasigeoid, GNSS/levelling, height systems.

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**THE STRUCTURE OF GEODESIC MONITORING IMPROVEMENT BY HORIZONTAL AND VERTICAL DISPLACEMENTS****Vynohradenko Serhii<sup>1</sup>, Makieieva Liudmyla<sup>1</sup>, Riasnyanska Alona<sup>1</sup>,  
Kriauciunaite-Neklejonoviene Vilma<sup>2</sup>, Balevicius Giedrius<sup>2</sup>**<sup>1</sup>State Biotechnological University, Kharkiv, Ukraine<sup>2</sup>Vytautas Magnus University, Kaunas, Lithuania**Abstract**

The purpose of the article is to present a combined approach that connects several methods and algorithms to increase the effectiveness of the geodetic network measurement structure for determining horizontal and vertical displacements of engineering objects. Determining the deformation of commercial objects and objects of practical value allows to assess their technical condition. In case of critical changes at such objects, appropriate planning of protection, reconstruction and modernization works is also provided and the negative impact of the environment and weather conditions is indicated. Regardless of the methods used, the measurement of movements and deformations of structures is always preceded by an analysis of the prevailing conditions, as well as a network of geodetic measurement determination and control. These analyzes are carried out taking into account manufacturability, economy, safe use of objects, human safety and environmental protection. The target function was defined, which in this case was chosen as the entropy of the geodesic observation network through the measurement of the parameters vector with true values. Analyzing the structure of the control and measurement network and improving its efficiency by the number of necessary observations becomes important for determining reliable changes occurring at the object and the ability to conduct the necessary measurements in the shortest possible time. At the same time, the improved network structure should ensure the redundancy of observations made to match the geodetic network with the modified methods. The optimal number of observations in the geodetic network depended on the observation structure informativeness. During the research, it was noticed that the use of a combined approach will allow selecting only those observations that are the most informative. This will reduce the measurement time without reducing the accuracy of the received movements. The obtained results of the numerical analysis showed the performance of the offered solution for increasing the efficiency of the geodetic network structure formation. It also allows faster and more economical performance of engineering structures geodetic measurements.

**Key words:** geodetic network, geodetic monitoring, combined approach, parameter vector

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## **ORAL SESSION 2**

## IMPACT OF CLIMATE CHANGES ON AGRICULTURAL LAND USE IN UKRAINE

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### **Abstract**

Climate change threatens crop yields through changes in temperature, precipitation, and more significant changes in weather conditions. Thus, it is important to monitor the potential impact of changing weather parameters on crop yields in order to adapt to climate change. Ukraine is of particular interest in this regard, as this country is an important player in the world grain market due to its large area of agricultural land. Historical climate data already indicate an increase in temperature in Ukraine, and climate forecasts show a further increase in temperature, especially in the South of Ukraine. Therefore, the purpose of the article is to determine the impact of climate change on agricultural land use in Ukraine.

The global trends of climate change, which is one of the most urgent threats with a long-term negative impact on the population, the environment and the economy, have been studied. The impact of global climate change on land resources, agriculture, forestry, water resources, energy, infrastructure, biodiversity, public health, emergency situations is analysed. The article describes the most noticeable manifestations of global climate changes on the territory of Ukraine, researches and summarizes their consequences on agricultural land use. The potential impact of climate change on the yield of major agricultural crops and possible economic losses are analysed.

The article summarizes the results of studies of the dynamics of changes in climate indicators (air temperature and precipitation), the main consequences and risks of climate change for the agricultural sector of Ukraine are given. The positive and negative effects of climate change on land use in agriculture in Ukraine are studied. It has been established that an increase in temperature and an increase in the amount of precipitation can slightly increase the growing season and lead to a small increase in yield on less fertile soils in northern Ukraine. To protect future crop yields under climate change, more investment is needed in regional adaptation strategies, such as improved agricultural management and selection of drought-resistant varieties.

**Key words:** global changes, climate changes, agricultural land use, productivity.

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**PROTECTION OF NATURE CONSERVATION LANDS IN UKRAINE**

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**Abstract**

Nature conservation and recreational lands are very important for the life and well-being of the society of any country, and therefore require increased attention and protection. Humanity is aware of the importance of preserving natural territories and tries to manage them efficiently and rationally.

The main goal of the article is to identify the problems of land management of the nature reserve fund in Ukraine and justify the ways to solve them, in particular, regarding the establishment of boundaries, encumbrances and restrictions, registration of title documents and entering information into the state land cadastre. The article also explores the issue of restoration of nature reserve lands in Ukraine that were damaged as a result of Russian aggression.

Ways of legal and economic regulation of the territories of the Emerald Network are proposed because Ukraine is a member of the Berne Convention, within the framework of which it fulfills its obligations regarding the creation of the Emerald Network of particularly valuable natural territories for the preservation of rare species of flora and fauna and types of natural environments protected in the European Union. The modern Emerald network of the country consists of 377 territories with an area of about 8 million hectares. However, they do not have legal status, which makes it impossible to assess damages in the war-affected territories. About 200 territories of the Emerald Network with an area of 2.9 million hectares are under threat of destruction.

**Key words:** land protection, nature conservation land, Emerald network, damages, natural territories.

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**EFFECTIVE USE OF DEGRADED AND UNPRODUCTIVE AGRICULTURAL LAND:  
PLANNING ASPECT****Suska Anastasiia<sup>1</sup>, Shevchenko Serhii<sup>1</sup>, Valčiukiene Jolanta<sup>2</sup>, Jukneliene Daiva<sup>2</sup>,  
Opashniuk Anna<sup>1</sup>**<sup>1</sup>State Biotechnological University, Kharkiv, Ukraine<sup>2</sup>Vytautas Magnus University, Kaunas, Lithuania**Abstract**

In Ukraine, intensive agricultural use involves a significant area of land with degraded and unproductive soils, which is economically impractical and ecologically dangerous. One of the tasks of sustainable development of Ukraine is to stop the process of land degradation, to achieve a neutral level of land cover degradation and to promote the restoration of their productivity. This can be achieved by growing energy crops on degraded soils. Energy crops can grow on infertile soils and accumulate a significant amount of biomass, which is an important argument in favour of the development of green energy. The root system of energy crops enriches the soil with organic substances and increases its fertility during long-term cultivation in one area. The advantages of energy plants as phytoremediants are outlined. Such aspects of phytoremediation technology as immobilization of organic and inorganic pollutants by transformation into immobile forms of the soil complex, absorption of pollutants by roots and movement to the above-ground part, extraction of pollutants from the soil and release of volatile non-toxic compounds into the atmosphere, increase of microbial metabolism in the rhizosphere are considered. The data on the use of energy crops for the restoration of degraded soils have been summarized and systematized. A list of energy plants is provided and the feasibility of their cultivation to increase soil fertility is substantiated.

**Key words:** soil, phytoremediation, technogenically polluted soils, pesticides, energy crops.

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**ASSESSING THE IMPACT OF WARTIME CONDITIONS ON THE LAND SURVEYING  
INDUSTRY IN UKRAINE: ADAPTATION, CHALLENGES, AND RECOVERY  
STRATEGIES**

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**Abstract**

This article examines the impact of the Russian federation's full-scale aggression in Ukraine on the market of land surveying and topographic-geodetic services. The study found that the market for land surveying services decreased by 60-70% due to restrictions in the functioning of the land cadastral system, the introduction of the permit procedure for field geodetic works, and the adaptation of procedures for granting land to citizens during wartime conditions. Technological limitations, such as the use of GNSS networks at the beginning of the war, also played a role in the decline of the industry. The article highlights the prospective needs for land surveying work for post-war reconstruction, including accounting for war damage and mapping affected territories, spatial planning for affected communities, infrastructure restoration, and land reclamation in areas where hostilities took place. The article provides insights into the challenges and opportunities faced by the land surveying industry in Ukraine during wartime conditions and emphasizes the importance of adopting appropriate strategies for recovery and growth. It is shown that despite the war, the development of the industry depends on further digitalization, improvement of the cadastral system, gradual liberalization of access to cadastral geodata, the introduction of special rules for regulating the activities of the surveyor in the territories where hostilities were fought.

**Key words:** land surveying, geodetic works, Ukraine, wartime, land cadastre.

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## THE POTENTIAL OF RENEWABLE ENERGY ON AGRICULTURAL LAND

**Puziene Ruta<sup>1,2</sup>, Anikeniene Asta<sup>3</sup>**

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### Abstract

The need for electricity and its extraction without stimulating climate warming processes are currently more relevant than ever. Using wind energy to generate electricity is one of the most promising methods. When designing wind energy parks, it is necessary to choose a suitable place for their installation. This study examined the suitability of plots for the construction of these structures in the areas of abandoned land in non-urbanized and non-urbanized areas. In the course of the research, various limitations were examined, the territory was analyzed using geoinformation systems. Modelling of the selected territory has been carried out, areas suitable for the installation of wind energy plants have been identified. It was established that the total area of land that can be used for the installation of wind energy plants is small and the criterion of abandoned land is not the indicator on the basis of which it can be stated that the territory is suitable for the construction of wind energy plants.

**Key words:** abandoned land, wind energy plants, protection zones, geoinformation systems.

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## FARM HOLDINGS OPTIMIZATION

**Aleknavičius Audrius**

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### **Abstract**

The main objective of the paper is to analyse the distribution of large farm plots and opportunities for their optimization. In the context of intensive changes in the management and use of agricultural land, it is particularly important to optimise the land holdings of large farms. Most large farms are characterised by a fragmented, uncompacted spatial distribution. 15 large farms were selected for analysis in Jonava municipality. There are 22 separate fields on average per holding, 2/3 of the farm centres (farmsteads) are located in large settlements, 1/3 of the farm centres are located in one-farm settlements and in small villages. It was found that the average area of individually cultivated fields is 14.9 ha, the average distance from the farmstead to the fields is 4.35 km. Land holdings are very fragmented – fragmentation coefficient  $K_2$  value range from 2.64 to 8.81 (average 3.62) for selected farms. It is proposed to draw up municipality land use planning schemes, which would project the prospective boundaries of land holdings, and to legalize by law the right of pre-emption for the farm owner to acquire the ownership of the plots of land to be sold within these boundaries in order to increase the compactness of farm land holdings. State can facilitate sporadic land consolidation by farmers through the preparation of the proposed municipality land use planning schemes.

**Keywords:** land holding, land plots fragmentation, land use planning schemes, sporadic land consolidation.

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# ORAL SESSION 3

**INTEGRATION OF THE CADASTRAL AND REMOTE-SENSING DATA FOR THE PURPOSES OF THE LAND CONSOLIDATION WORKS DIFFICULTY ASSESSMENT****Leń Przemysław<sup>1</sup>, Maciąg Klaudia<sup>2</sup>, Maciąg Michał<sup>2</sup>**<sup>1</sup>University of Life Sciences in Lublin, Poland<sup>2</sup>Subcarpathian Bureau of Surveying and Agricultural Areas in Rzeszów, Poland**Abstract**

The land consolidation and exchange procedure, carried out for reduction of the unfavorable land fragmentation and optimization of the agricultural area spatial structure, is one of the essential operations aimed for the sustainable development of the rural areas. The maximization of the land consolidation works effectiveness, focused on the efficiency of the tasks realization and the land owners' satisfaction, is a vital and current subject of the research conducted all over the world.

One of the main conditions of the land consolidation efficiency is a reasonable work planning, enabling the optimal distribution of the time and financial resources. Making an appropriate decision requires the acquisition of a reliable information about the consolidated object characteristics, including i.a. factors determining the duration of the particular procedure stages. The presented authors' algorithm, intended to be used in Subcarpathian Voivodeship (Poland), has been designed for the purposes of the assessment of the land consolidation objects difficulty. The tool enables to conduct a preliminary analysis of the necessary works scope at the stage of the land classification and land use patches survey. The spatial analyzes are conducted using contemporary GIS techniques. The algorithm, realizing the calculations based on the cadastral data and the open remote sensing data, has been tested and optimized using the real land consolidation objects. When the desired efficiency had been reached, the solution was implemented in Subcarpathian Bureau of Surveying and Agricultural Areas in Rzeszów (Poland).

**Key words:** land consolidation, algorithm, GIS, cadastre, remote sensing.

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**LAND CONSOLIDATION EDUCATION-EXPIERIENCE FROM MOLDOVA****Horjan Oleg**

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**Abstract**

Provides data on the current state of the land fund of the Republic of Moldova and the level of agricultural land consolidation in the state. Currently in Moldova as a result of the agricultural land consolidation, mostly spontaneous, their surface is approximately 985.52 thousand ha or 58.1% of all private-owned agricultural land, but considering public-owned land – 1256.42 thousand ha or 62.1%. Most of this land were consolidated by transferring them to lease. Thus, in 2021, more than 805 thousand ha of land were leased, which constitutes near 47.5% of all private owned agricultural land. But only more than 43 thousand ha, or 2.5% of their area, were in long-term lease. Peasant farms, as a rule, are distributed into 3-4, and sometimes into 7-12 sectors of land, of irregular shape with the long side located in the direction of the slope, at a distance of 5 - 15 km from each other. Such properties are not used on the land market, and their cost on average oscillates between 2000-3000 euros/ha, and only around large cities it reaches 5000 - 6000 euros/ha. Thus, the consolidation of agricultural land is an actual problem and it should be placed under the control of the state. State should also organize the training of specialists for the implementation of this task. In this regard, the importance of training highly qualified specialists in this field is emphasized. The experience of Moldova in the training of land surveyor engineers in this specialty is described. The first attempt to give students at least an idea of land consolidation was made in the 90-s of the XX century, when were introduced the topic of land consolidation into the regional land use planning course. During this period, within the framework of the land privatization project "Pământ", which means "Land", especially in its final stage, the allocation of land plots was already planned, grouping them according to interests around individual leaders.

At the first stage, personnel training was carried out within the framework of pilot projects by organizing various seminars and in other ways proposed by international experts. In the second stage, the training of personnel was entrusted to the State Agrarian University of Moldova, both on the basis of short-term courses and within the framework of study programs at the level of bachelor's or master's programs. The aim of this program was that the master's level specialist in agricultural land consolidation will have sufficient theoretical and practical training to successfully work in: agricultural land consolidation, sustainable development in the rural area, management of land resources and legal assurance of patrimonial rights. Having studied the state of affairs, it was decided to organize the training of specialists in the field of land consolidation and sustainable development of rural areas according to a separate master's program. For the master program, the training scheme proposed during the training of specialists in the framework of pilot projects, the proposals of the World Bank experts, as well as the curricula of some of European universities were taken as the basis. This curriculum was later accredited by the National Agency for Quality Assurance in Education and Research. Program profile is Architecture and construction. The list of studied modules includes: Theory of science, Negotiations and communications, Sustainable development of rural areas (with thesis project), Forecasting and planning the use of land resources, Regulation of land relations within the framework of agricultural land consolidation, Consolidation of Agricultural Land Using the SIG Technique (with thesis project), Valuation of rural real estate, Legislation in the domain of agricultural land consolidation, Practical internship. The development of graduation master's thesis is the final stage in the teaching process of masters.

**Key words:** agricultural land consolidation, education

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10<sup>th</sup> -12<sup>th</sup> of May, 2023, Kaunas, Lithuania

**IMPACT OF DAM REMOVAL ON THE SOCIOECONOMIC VALUES OF AREAS  
SURROUNDING POND**

**Kasiulis Egidijus**

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**Abstract**

In Lithuania there are over 1500 dams. Majority of them were build between 1960 to 1980 with agricultural, recreational, and general landscape improvement functions. These aging dams need good management strategy with increasing finances to keep them in good shape, which is not always a case. The four dam accidents that happened last year only highlighted this problem. From the environmental point of view the solution seems obvious. Removal of the dam and restoring river continuity can be cheaper than restoring the dam into good shape. In this case the socioeconomic value that is created by the dam and the created pond is usually overlooked. This value can be lost or significantly reduced by dam removal. In this study impact of dam removal on generated renewable energy, value of the property (land) surrounding the pond, ecological value of the pond corresponding to the value of pond fishes, overall recreational value of the area and flood mitigation is assessed. Additionally, limiting aspects such as state of the dam and finances needed for annual maintenance was considered. The results showed that the highest socioeconomic loss is expected if the dams with large ponds that have hydropower plants would be removed, e.g., Antalieptė, Motiejūnai dam. The lowest socioeconomic loss would be if, for example, low dams with small ponds would be removed. The number of such dams in Lithuania are quite high. The removal of such dams can even be beneficial as they usually do not have an owner responsible for maintaining them.

**Key words:** dam removal, socioeconomic value, Lithuania

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# ORAL SESSION 4

## SETTLEMENT OF THE LAND OWNERSHIP IN SLOVAKIA

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Faculty of Civil Engineering

### **Abstract**

The state of the land ownership in Slovakia is characterized by fragmentation of land and ownership, dispersion of land parcels of an owner, inconsistencies in the land records, unsettled legal relationship to some of the real properties, agricultural land controlled by the state (82%), unknown owners (20%), separation of the land usage from the land ownership and low technical quality of the cadastral documentation. The problems are so serious that their correction is manageable neither through cadastral nor judicial proceedings.

The land consolidation process was established in 1991 as a tool to improve the state of the land ownership. However, after 32 years of execution of the land consolidation, the impact of historical events, which weakened the private ownership and separated the land usage from the ownership, is still visible. In fact, this caused that a significant part of landowners can neither fully make use of their ownership rights outside the built-up areas, nor seek a legal protection of their rights.

The paper assesses the strong and weak aspects of the land consolidation process. The reasons why it is necessary to adopt further legislative measures are explained, and particular solutions are proposed. Together with the land consolidation, these solutions can bring desired synergic effect, which would be appreciated by the landowners, municipalities, as well as the state. Settled land ownership is the essence of a prospering society.

**Key words:** land reform, land consolidation, unknown owners, fragmentation of land and ownership.

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**ASSESSMENT OF THE NEEDS FOR LAND CONSOLIDATION IN KAUNAS DISTRICT,  
LITHUANIA**

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**Abstract**

Agriculture is the most important branch of economy. However, agriculture faces unemployment, emigration, lack of education/ qualifications and fragmented land, which hinder the expansion and competitiveness of rural regions and the formation of efficient agriculture in Lithuania.

Land consolidation (LC) could support strengthening farmers providing their fragmented land in efficient shape and size for agriculture production. As LC process is expensive for state, there is a need to evaluate potential districts/regions in Lithuania to lead through LC process.

The aim of the research is to assess the needs for land consolidation for sustainable agriculture in Kaunas district, which is the largest districts in Lithuania.

The secondary data, including cadastral and statistical, and the results from the farmers survey (primary data) allowed to assess cadastral areas in Kaunas district to prioritize them for LC. The analysis on intensity of land use, crop declaration and livestock register data in each cadastral area carried out. Expert and multiple criteria decision analyses (MCDA) were applied to distinguish cadastral areas and prioritise them for LC according following criteria: irrationally located land plots, the largest cultivated land areas, level of land fragmentation, number of problems that could be resolved by LC, land consolidation efficiency indicator.

The results of the study showed that more than half of all cadastral areas in Kaunas district have potential for land consolidation. Based on experts' analysis approach and the results from applied MCDA, the cadastral areas: Daugėliškiai, Lapės, Pagynė and Zapyškis have the highest potential to proceed for LC.

**Keywords:** land consolidation, consolidation efficiency, multiple criteria decision analysis.

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**PROBLEMS OF THE FORMATION AND USE OF ROADS OF LOCAL SIGNIFICANCE  
AND THEIR SOLUTION WAYS IN THE MUNICIPALITY OF ŠIAULIAI REGION**

**Livanas Dovydas, Kriaučiūnaitė–Neklejonovienė Vilma**  
Vytautas Magnus University Agriculture Academy, Lithuania

**Abstract**

A road is a very important engineering structure that provides transportation opportunities for the public. Roads are divided into categories according to their importance: national and local roads. In Lithuania, the formation and use of local significance roads are usually the responsibility of local authorities. These roads connect cities, villages, and rural areas within a municipality or district. They play an important role in connecting communities and supporting economic development. In Lithuania, maintenance and development funding of local significant roads are usually the local authority's responsibility, but lowest-level roads often lack this funding. Due to the emerging problematic nature, it is appropriate to detail the peculiarities and problems of the use of local roads and find ways to solve them. The aim of the article is to detail the problematic nature of the road, and cadastral measurements of unregistered local roads of the Kairiai ward of the Šiauliai district were carried out. It showed more than 4 km. inconsistencies with the solutions of the 2018 Šiauliai District Special Plan. To ensure the proper use of land in Lithuania, state control of land use is carried out. During the case analysis, photos of the condition of the roads were taken, from which it was observed that the lowest-level roads lack the funds allocated by the Republic of Lithuania and the European Union for road maintenance and development. So, the Studies showed that cadastral measurements are an excellent way to capture problematic points of roads. To detail these problems, 29 unregistered roads measurements were carried out in the Kairiai ward of the Šiauliai district, which showed that the lowest link roads were often in very poor condition, due to which the roads can no longer fulfill their main purpose. Poor road condition indicates the lack of road maintenance and development, but during 2018 – 2022 average government funding was about 2,06 million Eur, for the Šiauliai district. During the cadastral measurements of the local roads, it was noticed that the adjacent plots of land were formed without considering the actual position of the roads. To address these challenges, local authorities can implement a variety of solutions, such as increasing funding through partnerships, developing comprehensive road construction and maintenance plans, implementing traffic management strategies, investing in road safety infrastructure, and promoting sustainable transport options.

**Key words:** road, road category, local road, road planning, road maintenance.

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**SELECTION OF CADASTRAL AREA FOR LAND CONSOLIDATION USING MULTI-CRITERIA ANALYSIS**

**Karvelytė Toma, Pašakarnis Giedrius**  
Vytautas Magnus University, Lithuania

**Abstract**

In the strategic and spatial planning documents valid for the territory of Biržai district municipality, the main directions of rural development are increasing the competitiveness of agriculture, developing organic farms, managing land reclamation facilities, overcoming rural recreational and tourism resources, paving gravel roads, increasing forest cover, protecting and using natural resources. Based on the experience of other countries, such goals can be achieved through land consolidation projects. Taking into account the aspects of sustainable development, social, economic and environmental criteria were selected for the study and a multi-criteria analysis was carried out, the purpose of which is to determine in which cadastral area of Biržai district municipality it would be most effective to carry out a complex land consolidation project in order to achieve strategic goals. The PROMETHEE method of multi-criteria analysis is used to carry out the study, and the information of alternative indicators was collected using data provided by the Lithuanian Spatial Information Portal ([www.geoport.lt](http://www.geoport.lt)) and Biržai district municipality and elderships. During the study, 35 (out of 39) located in the territory of Biržai district municipality were analyzed, where it is appropriate to implement a complex land consolidation project. Thus, taking into account the  $\phi^+$  and  $\phi^-$  values and the results of the ranking, it was established that in order to achieve the strategic goals of Biržai district municipality, the most effective complex land consolidation project would be implemented in the cadastral areas of Rinkušiai and Obelaukiai.

**Key words:** land consolidation, multi-criteria decision analysis, ranking, Biržai municipality.

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## **POSTER PRESENTATIONS**

**METHODOLOGICAL BASIS OF THE DEVELOPMENT OF THE INSTITUTIONAL ENVIRONMENT OF THE LAND MANAGEMENT SYSTEM****Tretiak Anton<sup>1</sup>, Hunko Liudmyla<sup>2</sup>, Hetmanchyk Ivanna<sup>2</sup>, Zamlynskyi Serhii<sup>2</sup>**<sup>1</sup>Bila Tserkva National Agrarian University, Ukraine<sup>2</sup>National University of Life and Environmental Sciences of Ukraine**Abstract**

The main purpose of the article is to research and study the institutional environment of the land management system. Institutions and institutes are the key to understanding the relationships between all subjects of the economic system of land management, and institutional changes determine the direction of its development and are the pronounced tendency at present. It is substantiated that the institutional concepts of the latest behavioral and institutional economic theory should be placed in the methodological basis of the development of the institutional environment of the land management system.

The institutional system in the field of land relations, land use and land management is a set of organically interrelated institutes and institutions that are a certain logically complete, integral unity capable of self-development and self-reproduction, as well as organizations and individuals acting within the given institutional restrictions on land relations and organization of land use.

In the process of research, we have found that there is a certain hierarchy and subordination between institutes and institutions of the land management economy system. It is determined that by ensuring effective harmonization of interests of all participants of land relations in the process of land management, the institutional structure stimulates market transactions with land management objects.

**Key words:** land surveying, economics of land planning, land relations, land use.

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**SYSTEMATIZATION OF THE PROBLEMS OF ORGANIC AGRICULTURE LAND USE  
ORGANIZATION IN UKRAINE**

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<sup>1</sup>National University of Life and Environmental Sciences of Ukraine,

<sup>2</sup>Land Management Institute of NAAS of Ukraine

**Abstract**

The transition from traditional methods of agriculture with the use of intensive agricultural production technologies to organic farming is a rather long process (from 2 to 3 years). A significant role in this process is played by the certification process of all branches of the agricultural enterprise. In this regard, the experience of European countries in providing financial assistance for the certification of farms was studied. Agricultural lands must meet the requirements regarding the level of their contamination by harmful substances. The process of transition to organic farming in Ukraine is accompanied by certain risks and the need to solve several problems (low technological culture of agricultural production at all levels; lack of appropriate regulatory and legal support; a rather low level of awareness among people and producers regarding the benefits of organic farming). The restraining factor in the development of organic production is the imperfect institutional support for the organic sector, the lack of state financial support, and the lack of developed and approved rules and standards. Problems related to the organization of land use of organic agriculture at enterprises of Ukraine were systematized. Further development of organic production in Ukraine needs the expansion of the organic farming area with the land not contaminated with agrochemicals. It is necessary to create proper organic agricultural producers' stimulation rules, to reduce the risks of organic production, to develop a system of state certification and quality control of organic products, to increase the competitiveness of domestic organic products.

**Key words:** organic agriculture, certification, organic farming, enterprise.

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**PECULIARITIES OF CONSOLIDATION OF AGRICULTURAL LAND MASSIFS  
IN UKRAINE**

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**Abstract**

The process of consolidation of agricultural land massifs and its features has been studied in this research. Consolidation of land massifs is considered as a set of measures for the exchange of land plots, rights to use them, as well as land management measures, which consist in changing boundaries and lands, dividing and combining land plots with the aim of ensuring sustainable land use. First of all, the changes concern the procedure for exchanging plots. Exchange is the simplest means of consolidation. The object of the study is the territories of the private agricultural enterprises "Mykolai-Plus" and "Sort" within the Berezanska urban territorial community, Brovarsky district, Kyiv region.

The terms of land leases were analyzed and it was established that the vast majority of leases expire in 2025 with a total area of 355 hectares and in 2031 with an area of 348 hectares, while the leases of other tenants expire in 2040, the land area is 2,982 hectares.

8,645 land plots were synchronized and 192 land plots were found to be missing from the registers. An analysis of land users in these village councils is provided: land used by the studied agricultural enterprises - 1067.6 hectares; lands leased by other land users - 9,565 hectares; land without registered lease rights - 1724.7 hectares.

Established features of consolidation: 1) it is allowed to exchange land plots of state and communal property, located in an array of agricultural land, for equivalent land plots of private ownership in the same array; 2) tenants of land plots located in the same massif are given the right to enter into mutual sublease agreements, which makes it possible to consolidate without coercive measures.

**Key words:** consolidation, agricultural land, land users, legal regime, state of land use.

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## ANALYSIS OF THE EVOLUTION OF THE GENERAL CADASTRE WORKS IN ROMANIA

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### Abstract

This paper provides a perspective on the evolution of the General Cadastre works in Romania. In 1996, Law No. 7 on Cadastre and Real Estate Advertising was adopted, which extended the land registry system to the entire country. In the first months after the implementation of this law, numerous problems arose related to the introduction of provisional land registries. At that time, there was no obligation to record the legal act in order to produce its effects between the parties. This law provided for the creation of final land registries only after the completion of measurements and cadastral plots at the level of an administrative-territorial unit. The law was republished due to multiple modifications and additions. Being a long-term project, an accurate estimation of the completion of the general cadastre works cannot be made even now. Our goal is to analyze this complex process and identify the factors that influence implementation. The general approach is based on investigations, on the study of current legislation and on comparisons with other European countries. Both in the data collection in the field and in the data processing stage, problems have arisen in the achievement of the general cadastre. This analysis provides us information about the technical, financial and management problems that have caused delays in the modernization and improvement of the property registration system, which would allow a better property management, better urban planning, and more efficiency in the taxation procedure.

**Key words:** general cadastre, implementation, investigations, delays, comparisons

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**ANALYSIS OF LAND WITH SELF-GROWING TREES IN LITHUANIA**

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**Abstract**

The research is analysis of forest cadastre plots in Lithuania, which are not on forest land, but are covered with forest. The research was carried out in Dubrava regional division of the Lithuanian State Forest Enterprise. The study covers the forest districts of Ežerelis, Karmėlava, Padauguva, Sitkūnai and Vaišvydava.

The main aim of the article is analysis of self-growing forest growth on non-forest land.

Data from the Forest Cadastre of Lithuania (non-forest plots covered with forest) were used for the research. Orthophotographic maps of different periods (1995-2023), soil spatial data and other spatial data set were analysed in this research.

135 non-forest land plots covered with forest in the Forest Cadastre, with a total area of 146 ha were found after analyzing 5 forest districts. Reasons of self-growing is land abandonment, small plots sizes, low productivity of the land and lack of land reclamation.

**Key words:** self-growing trees, forest.

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**TREES AND SHRUBS GREENERY AREA CHANGES IN KLAIPEDA COUNTY (2002-2022)**

**Ivavičiūtė Giedrė**

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**Abstract**

Greenspaces are an important component of the complex ecosystem. Trees and green spaces are also very important to human well-being as well. It is established that trees and green spaces give environmental, social, economic and psychological benefits. They affect microclimates to reduce the heat effect, improve air quality. Understanding the relationship between population size and the quality and quantity of green spaces is vital for the sustainability, health and resilience of areas.

The aim of this article is to perform an analysis of the change in the trees and shrubs greenery area of Klaipeda county in 2002 - 2022. Analysis of the current situation of the trees and shrubs greenery area in Klaipeda county was accomplished. The study also provides the trees and shrubs greenery area changes analysis in Klaipeda county and in the municipalities of the county.

In Klaipeda county the area under trees and shrubs in 2002 was 4,758.14 ha. In 2022 the plantation area amounted to 10,793.50 hectares. From 2002 to 2022 the area of tree and shrub plantations in Klaipeda county increased by 6,035.36 ha or 126.84 percent. The development of plantation areas has been positively influenced by the creation of an appropriate legislative framework and the implementation of plantation programmes in municipalities.

**Key words:** trees and shrubs, greenery, area change.

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**ESTIMATION OF THE FOREST GROWING POTENTIAL OF LANDS BY SOIL INDICATORS IN THE FLAT PART OF UKRAINE**

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**Abstract**

In the forestry of Ukraine, an indirect approach is mainly used to assess the forest growing potential of lands. For these purposes, a comparative ecological (forest typological) method is used to assess soil conditions according to their forest growth effect. The species composition of the forest stand and its productivity are the main indicators of the forest growth effect. The undoubted advantages of this method are high forestry value, low labor intensity and cost, and the main disadvantages are the subjectivity of determining the types of forest conditions (especially derivatives and artificial plantations), its insufficient environmental sensitivity, and the complexity of application in places where there is no forest vegetation. The aim of the study was to quantify the quality of forest land and develop markers of the forest-growing potential of soils. The studies were carried out by synthesizing two methodological approaches - forest typological as the leading method for assessing the potential of habitats and direct study of soils (field and analytical). Based on the establishment of a correlation between the productivity of forest stands (height, quality class) and soil indicators (thickness of the humus part of the profile, pH, content of clay particles, humus, total and exchange forms of N, P, K, Ca, Mg), packages of markers were developed to assess forest potential of soils. The package of markers consists of the following soil indicators: the content of physical clay particles ( $d < 0.01$  mm), the content of silt particles ( $d < 0.001$  mm), the thickness of the humus part, as well as the content of Ca, K, Mg and depends on the type of soil.

**Key words:** productivity of forest soils, indicators, tree stand.

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## REVIEW OF THE PROSPECTS OF LAND DEGRADATION NEUTRALITY IN UKRAINE

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### Abstract

In Ukraine, land degradation is a significant factor causing reduction of agricultural land fertility and ecosystem ecological stability. The extensive kinds of degradation include humus loss, soil compaction, water and wind erosion, ravine formation, acidification, water-logging, salinization, pollution with radionuclides, pesticides and heavy metals, as well as deterioration of the land and soil quality due to hostilities.

The research is based on the principles of the Land Degradation Neutrality (LDN) concept which aims to support quality of land resources for producing ecosystem functions and services in order to satisfy needs of the present and future generations. The following LDN principles are considered, namely: to support or increase the terrestrial natural capital; to apply the hierarchy of “Avoid > Reduce > Reverse land degradation” reaction; to balance economic, social and environmental sustainability. The achieved results of LDN are assessed by some indicators, particularly reduction of land plowing; expansion of the area of grassland, hayfields, forests, reserved area, organic farming. A particular focus is made on the necessity to include the LDN mechanism into the process of integrated land use planning. Basing on land zoning, types of land should be determined according to the ecological conditions of their soil and quality of land cover. Referring to the type of land, it is proposed to take appropriate measures to combat land degradation (conservation, renaturalisation, agroforestry, etc.). During the study, land cover of Lviv and Volyn region was analyzed. To achieve the LDN goal, a set of measures are proposed to take in some communities of the regions. The work provides theoretical justification of the measures on recovery of the land cover of agricultural landscapes and natural areas which have experienced a destructive effect of hostilities.

**Key words:** land degradation, sustainable land management, land use planning, indicator, land cover.

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**THE ISSUE OF INCREASING ACIDITY OF SOILS IN UKRAINE**

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**Abstract**

The escalating acidification of Ukrainian soils is an alarming problem that could potentially jeopardize the stability of Ukraine's agricultural production and pose a threat to its food security. This deterioration in soil quality has led to decreased crop growth and yield, putting financial pressure on farmers and risking the future food security of the nation. The government and relevant stakeholders must act promptly to address this environmental problem. To preserve the well-being of Ukraine and its people, liming, introducing organic matter to soil, and teaching farmers about good land husbandry is essential. Failing to do so can have grave repercussions in the future. This study aims to find solutions to preserving yields and ensuring food security for future generations. This research will dive into current studies, explore techniques to reduce soil acidity, and analyze the economic and social consequences for Ukrainian agriculture.

**Key words:** biochar, precision agriculture, Ukrainian soil, soil acidity.

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**THE CURRENT STATE, PROBLEMS AND PROSPECTS OF THE USE OF LAND  
RESOURCES OF UKRAINE IN CONDITIONS OF WAR**

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**Abstract**

The state of land resources in the majority of Ukraine was characterized as tense, and in some places crisis. The main reason for this situation is the irrational use of the land resource potential of the state, the deterioration of the qualitative state and decrease in the productivity of the land, the irregularity of the change in the nature of the functioning of the land as a means of production in market conditions, the absence of a unified state system of land protection.

The article examines topical issues of problems and prospects for the use of land resources of Ukraine in the conditions of martial law and post-war reconstruction. In connection with military actions, the land resources of Ukraine are subject to large-scale destruction, deterioration of soil quality, degradation processes are intensifying, land resources are being damaged, and owners and land users are suffering losses. Agricultural lands suffered two significant types of damage – mine contamination, both on the frontline and in occupied (or formerly occupied) territories, and direct physical damage, from contamination by mines and unexploded ordnance. As of March 20, 2022, the area of damaged soil cover was 6,582.0 hectares, out of 1,655,845.3 hectares of surveyed arable land. In this regard, the tasks of adjusting the state land policy, improving the legal framework for the use and protection of land, in particular, regulations in the field of land protection and reproduction of soil fertility, including those damaged as a result of armed aggression and hostilities, become priorities.

**Key words:** land protection, mine pollution, dangerous areas

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**NEW TECHNOLOGIES IN LAND MANAGEMENT**

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**Abstract**

This article discusses the impact of new technologies on land management practices. Technologies such as Geographic Information Systems (GIS) allow land managers to collect, store, analyze, and visualize spatial data related to land use, topography, and environmental factors. Remote sensing is another technology that uses satellites, drones, and other sensors to collect data about land use and environmental conditions. Artificial intelligence (AI) can analyze large amounts of data to detect patterns in satellite images, for example. Blockchain technology can create a secure and transparent record of land ownership and transactions to prevent fraud and corruption. While these new technologies have the potential to improve the efficiency and sustainability of land management practices worldwide, there are also challenges associated with their use such as data management and privacy protection. Therefore, it is important for land managers to understand the benefits and risks associated with these technologies and to use them ethically and responsibly.

**Key words:** land management, geographic information systems (GIS), remote sensing, artificial intelligence (AI), blockchain technology.

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**GIS TOOLS FOR IMPROVING THE QUALITY OF THE SOCIAL WELFARE  
MANAGEMENT SYSTEM**

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**Abstract**

Various social assistance programs are being launched worldwide to eliminate or alleviate social problems. Different solutions have been proposed around the world. Still, welfare systems in all countries share the following standard features: social assistance is necessary and underfinanced, and social workers struggle to cope with caseloads. As a result, welfare work is stressful and not highly effective. This study proposes modern Geographic Information System (GIS) tools for supporting the employees of social assistance centers (SACs). Nonparametric kernel density estimation analyzed the data relating to welfare beneficiaries and divided it into five datasets. The kernel density tool in ArcGIS Pro software (Esri Polska sp. z o.o., Warsaw, Poland) was used to visualize areas with a relatively high prevalence of social problems and places where the neighborhood can deliver synergistic effects. A multicriteria analysis (MCA) procedure for mapping social problems was proposed, and an algorithm was developed in the GIS environment. The generated maps deliver helpful information for supporting SAC employees and monitoring, planning, and initiating preventive measures. Above all, the presented method was designed to improve living conditions by facilitating the management of welfare workers' duties. Therefore, the proposed approach had to be effective and easy to use without advanced knowledge of GIS tools.

**Keywords:** GIS, social assistance, multicriteria analysis.

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**APPLICATION OF GIS TECHNOLOGY IN THE STUDY AND EVALUATION OF  
AGRICULTURAL LAND**

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**Abstract**

This article discusses the application of GIS technology in the evaluation of agricultural land. To visualize the Food and Agriculture Organization (FAO). An analysis of the yield of irrigated wheat in Kazakhstan was carried out using the Global Agro-Ecological Zones (GAEZ) image service. Wheat yield is displayed by comparing local and global scale using histograms. Some indicators are reflected that characterize the main trends in agriculture, the yield deficit, and regions where this deficit is not decreasing are identified. With the help of this data, regions are identified where yields may increase in the future. The assessment of lands that are used for growing crops, which is of economic and geographical importance, is also considered. Methods developed for land resource valuation that will be key to land use change in agriculture are disclosed. The formation of a cadastral valuation and the problem of economic valuation is carried out on the example of land for growing wheat.

**Key words:** land resources, GIS, agricultural land, wheat, cadastral valuation, economic effect.

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**APPLICATION OF GEOINFORMATION SYSTEMS IN LAND MANAGEMENT AND  
CADASTRE**

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**Abstract**

The special value of land resources in the economic activity of the company is the basis of socio-economic development of the country. At the same time, rational use of land plays an important role, and this, in turn, is impossible without effective land management. The effectiveness of management is based primarily on high-quality and reliable information about the state of land. The sources of such information are land management and cadastre. That is why they play a crucial role in regulating land relations.

To solve these problems, a unified information system of land management and cadastral information should be created, which will be used in making decisions on ensuring the rational use of land. In this regard, works related to automation of spatial data processing and their representations in geographical information systems are becoming important.

Geoinformation technologies are the best tool for continuous updating of spatial data; it has a number of advantages over paper media: the process of updating information becomes less time-consuming, more qualitative, and allows you to classify information about management objects at the time of its input.

Prospects for the use of geoinformation systems are the basis of land resources management and the source of all spatial data on objects of land management. It is a tool for their processing, solves the most complex analytical tasks and acts as an integral tool in making managerial decisions. However, the most complete implementation of the functions and capabilities of geoinformation systems allow their application at the regional level of land management.

**Keywords:** GIS, land management, land cadastre.

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**THE USE OF ARTIFICIAL INTELLIGENCE IN THE MANAGEMENT OF THE STATE  
TREASURY REAL ESTATE IN POLAND**

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**Abstract**

Artificial intelligence (AI) can be used in various ways to manage real estate, from streamlining property management tasks to improving the buying and selling process for real estate agents and their clients. Property management is a complex and complicated process. Decisions concerning the manner of management of a given property from the State Treasury Agricultural Property Reserve (Polish acronym ZWRSP) are made individually. Each time, it requires a great deal of work and the collection of the necessary data on the basis of which a decision can be made on the disposition of a given property. The time-consuming procedures, the complexity of the process and the large number of plots of land remaining in the ZWRSP, which are managed by the National Support Center for Agriculture (Polish acronym KOWR), is the basis for undertaking actions aimed at streamlining the decision-making process in the management of properties remaining in the KOWR stock. This problem is particularly noticeable in the case of plots of up to 2 ha, which, in accordance with the regulations in force, are the basis for actions in the process of permanent disposal, i.e. mainly sale. The improvement is to consist in automating and optimising the decision-making process regarding the disposal of plots of land from the KOWR stock. Such possibilities are provided by modern tools using artificial intelligence algorithms. The use of AI in real estate management can help improve efficiency, reduce costs, and optimize the use of properties.

**Key words:** agricultural property; artificial intelligence, state treasury agricultural property reserve, National Support Center for Agriculture.

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Fields of interest: real estate valuation, agricultural market, renewable energy sources

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Fields of interest: spatial planning, rural areas, agricultural land, sustainable development

**THE ROLE OF SPATIAL PLANNING IN THE PROTECTION OF AGRICULTURAL AND FORESTRY LAND. CASE STUDY IN POLAND**

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**Abstract**

Spatial planning plays a crucial role in protecting agricultural and forestry land by guiding the use and development of land in a sustainable manner. In many countries, including Poland, governments have implemented various policies and programs aimed at promoting sustainable agriculture and forestry practices while preserving the natural environment. The development of local spatial development plans and land-use plans, which are designed to guide land use at the local level, is an essential aspect of spatial planning. These plans take into account various factors, such as environmental protection, the needs of local communities, and the preservation of cultural heritage, and involve a participatory process that includes public consultations and stakeholder involvement.

A review of Polish laws, foreign literature and the calculated values of the CLI (conversion loss index) denoting the area of agricultural and forest land intended for conversion to other purposes in MMP indicates that the land conversion process has to be controlled. Cohesive and well-designed spatial policies are needed to address the demand for land in an era of rapid rural development and urbanization. Own research shows that the risk of farmland and forest loss is highest in 4 out of 16 Polish voivodeships (Mazowieckie – 3,67 %, Podkarpackie 3,00 %, Małopolskie – 3,88 % and Pomorskie – 4.06 %). The calculated CLI points to considerable variations in demand for new land across Polish voivodeships. Farmland and forests are most extensively converted to other purposes in the proximity of large urban centres. The presented results also indicate that the responsibility for developing rational land-use policies rests with the authorities at all levels of national administration, but mainly with local governments.

**Key words:** conversion to other purposes, environmental protection, farmland, forests, spatial planning,

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Fields of interest: land management, spatial planning, real estate market.

**CHANGES IN THE REGISTRATION OF LAND USE FROM THE ESTABLISHMENT OF  
THE REAL ESTATE CADASTER TO THE PRESENT**

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**Abstract**

The issues of the real estate cadastre and the scope of data collected therein have been the subject of many discussions. Man's relationship to the earth has been dynamic throughout history. This dynamism had a direct impact on the creation of cadastral systems and the subsequent evolution of their functions. Historical obstacles such as partitions, wars, political changes had an impact on the land and building records currently functioning in Poland (real estate cadastre). After regaining independence in 1918, three types of cadastres operated in parallel in Poland: Prussian, Austrian and Russian. Therefore, work has been undertaken to unify the real estate cadastre. Work on creating a uniform cadastral system was interrupted by World War II. The decree of 1947 on land and building cadastre became an act initiating the creation of a uniform cadastral system and had an impact on the legal acts functioning in later years regulating the detail of registered land use in the real estate cadastre. The subject of the research is legal provisions that had an impact on the currently registered land in the land and building register (real estate cadastre) in Poland from 1947 to the present.

**Key words:** cadaster, land use, land cover.

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**FEATURES OF CREATING AN INTERACTIVE MAPPING WEB APPLICATION FOR THE ANALYSIS OF SPACE IMAGES**

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**Abstract**

In the era of the high level of technological achievements of remote sensing of the Earth and the high level of development of web cartography, there is an opportunity for quick and effective analysis of the territory, its management and the possibility of predicting potential ways of development of individual areas of the earth's surface, and quickly respond to possible unforeseen natural disasters or cataclysms. Such monitoring and management of data about the earth's surface is achieved using highly specialized software products and special web platforms that provide data in the form of processed aerospace images. In our time, cartographic web platforms are gaining more and more popularity. Analyzing such web platforms, we can see that they act only as a source of data, based on which the necessary interactive map web application can be created separately. Taking into account the latest achievements of web cartography, such development option may not be entirely convenient and leads to an increase in development terms and additional financial costs. To solve the specified range of problems, there are special cartographic web platforms that exist not just as sources of aerospace survey data, but accompanied by built-in web-oriented integrated development environments (IDE). Such IDEs allow you immediately create a full-fledged interactive map web application using the built-in APIs of various programming languages. The purpose of the article is to highlight the main characteristics, functionality and advantages of the special Google Earth Engine cartographic web platform in creating an interactive cartographic web application for the analysis of space images, using the example of changing the NDVI index.

**Key words:** web cartography, interactive web application, aerospace images, integrated development environment.

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**LEGAL SUPPORT FOR LAND MONITORING AND PROTECTION IN UKRAINE:  
CURRENT STATUS AND DEVELOPMENT PROSPECTS**

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**Abstract**

The article analyzes the current state and prospects for the development of monitoring and protection of land relations, and also analyzes the theoretical and legal aspects of land observation. The author also considers the trends in the development of monitoring of relations based on available data due to the existing need to introduce monitoring of land relations as a constantly updated information system that would ensure the accumulation of information, its analysis and forecasting, and the development of scientific sound recommendations for making effective management decisions on this basis. The study of the issue of establishing a proper organization for the use of monitoring information will make it possible to assess quantitative and qualitative indicators of the land condition, to evaluate and predict changes. The article also addresses the issue of the lack of free access to information on land relations, which creates favorable conditions for the misuse of land, evasion of compliance with the requirements of land and environmental legislation of Ukraine, and the spread of corruption.

**Key words:** land monitoring, land resources, land use, land relations, monitoring of land relations.

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**SCIENTIFIC ASPECTS OF GEOSPATIAL MODELING IN THE PROCESS OF MASS LAND VALUE ASSESSMENT WITHIN AN AMALGAMATED HROMADA**

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**Abstract**

The main aim of the article is to develop scientific approaches to the process of mass land assessment using geospatial modelling for the implementation of an improved land tax collection system.

On the basis of the conducted studies, it was established that mass assessment models using standard tools for assessing market value of land plots have a higher probability of deviating from the true value than the value calculated by an individual (expert) method, but at costs that are much lower than when conducting individual assessment.

Three main approaches for the construction of mass models of land evaluation are defined: regression, geo-informational and neural network, which, in turn, can be static, dynamic and complex.

Considering the principles of problem solving in the mass assessment of land value, it should be noted the commonality between these problems, theoretical and mathematical problem solving, and the theory of preferences. That is, land evaluation is either the basis for decision-making, or the basis for conducting additional empirical ones of research. At the same time, before making a decision, the assessment subject collects information from various information sources. Based on them, he builds an information model, which is the basis for decision-making.

In this aspect, the development of information and geospatial models adequate to the modern requirements of the mass assessment of the value of land as the main basis for taxation in the land sector is gaining special relevance, they are based on the wide use of computer and geo-information technologies.

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**THE AGRARIAN LANDSCAPE AND THE CHANGE IN ITS SUBDIVISION OF PLOTS**

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**Abstract**

The article presents an analysis of changes in the agrarian landscape and the subdivision of its plots, using three Lithuanian municipalities as examples (Kaunas, Trakai and Šilutė). Statistical, comparative and multicriteria analysis methods were applied in the study. It was found that in all the studied municipalities, the area of the agrarian landscape was decreasing during the study period. The largest decreasing trends were in the municipality of Šilutė district, where the area covered by agrarian landscape decreased by more than 3%. At the same time, in the municipalities of Kaunas and Trakai districts, the area of agrarian landscape decreased quite evenly and did not reach 3%. It was also found that the number of agricultural holdings also decreased: by 27% in Kaunas district municipality and by over 33% in Trakai district municipality, but the area of agricultural holdings increased in all of the studied municipalities: in Kaunas district by over 5%, in Trakai district by over 37% and in Šilutė district by over 8%. The average size of a farm in Kaunas district remained rather stable, increasing by only 1%, in Šilutė district municipality the average farm size increased by more than 71% and in Trakai district municipality the tendency was the opposite, i.e. the average farm size decreased by more than 36%. The multicriteria analysis shows that the most common factors influencing changes in the agrarian landscape and its subdivision of plots vary between municipalities, but in general the following factors influence the changes in the agrarian landscape and its subdivision of plots: the land productivity score, the number of inhabitants, the distance to the centre of the city, the average size of the farms, the number of holdings, and the amount of land area occupied by bodies of water. The information collected and the results obtained show that in the municipalities analysed, the causes of change in the agrarian landscape and its subdivision of plots have a positive impact on the sustainable development of agriculture and rural areas.

**Key words:** landscape, agrarian landscape, subdivision of plots, change.

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**METHODOLOGY OF ESTABLISHMENT THE LIMIT SIZES OF LOT LANDS OF THE  
AGRICULTURAL USE**

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**Abstract**

The purpose of this study is to develop a methodology for determining and calculating the maximum size of agricultural land plots that can be leased by individuals and legal entities of the Republic of Kazakhstan. The article substantiates for agricultural production after the end of the current long-term lease terms. The basic condition is the formation of land use, in which there is a close dependence on conditions and factors of production, where land, material resources, and labor are in certain proportions and balanced.

The main criteria for determining the limiting (maximum) sizes of land are: land area, leased to a single entity should not exceed 1/3 of the area of farmland rural district specific administrative area, and the physical person no more than 15% of the area of agricultural enterprises of the same specialization. Emerging land uses should be subject to zonal specialization in accordance with natural and agricultural zoning; take into account the minimum thresholds for the area of crop rotation in the crop production sectors and the size of livestock in herds of different types of livestock in accordance with the breed composition in the livestock industry.

**Key words:** limiting (maximum) size, land plot, natural and agricultural zone, specialization, competitiveness, efficiency.

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**BOOK OF ABSTRACTS**  
20<sup>th</sup> International Scientific-Methodical Conference BALTIC SURVEYING'23

**BOOK OF ABSTRACTS: 20<sup>th</sup> International Scientific-Methodical Conference BALTIC SURVEYING'23. Vytautas Magnus University Agriculture Academy. 2023, 58 p.**

10<sup>th</sup> -12<sup>th</sup> of May, 2023, Kaunas, Lithuania