Proceedings of the 2023 International Conference "ECONOMIC SCIENCE FOR RURAL DEVELOPMENT" No 57
Jelgava, LBTU ESAF, 10-12 May 2023, pp. 516-527
DOI: 10.22616/ESRD.2023.57.051

ECONOMIC ANALYSIS OF LAND USE IN EUROPEAN COUNTRIES

Oleksandr Chumachenko[1], PhD, associate professor;
Ivan Openko[2], Doctor of economic science, associate professor;
Yevheniia Kryvoviaz[3], PhD, associate professor;
Ruslan Tykhenko[4], PhD, associate professor; **Oleg Tsvyakh**[5], PhD, associate professor;
Oleksandr Shevchenko[6], PhD, associate professor and
Oleksii Zhuk[7], PhD, associate professor

[1, 2, 3, 4, 5, 6, 7]National University of Life and Environmental Sciences of Ukraine

Abstract. The main idea of the study is to substantiate the dependence of financial and economic indicators on the efficiency of the use of land and resource potential in the structure of land use in European countries. Research is aimed at determining the influence of the land use system on the sectoral components of the economy of European countries. To achieve the goal, land use was grouped taking into account the types of economic activity and institutional sectors of the economy. Typification of land uses was carried out, taking into account the types of economic activity and institutional sectors of the economy of countries, and the corresponding types of land uses were formed, namely, food-forming, ecologically stabilizing, social-infrastructural, production-commercial - economic-forming. The proposed grouping system consolidated the following types of economic activity: forestry, agriculture, construction, industry, transport, trade, IT, scientific and technical, financial and insurance activities, administrative activities, defense, government, management, education, health care and social services, other services (taxes, arts, entertainment and recreation). As part of the study, the relationship between economic indicators of profitability (average GDP per unit area) and the use of land resource potential was identified, taking into account the institutional sectors of the country's economy. The conducted analysis demonstrates to what extent the income of a certain sector of the economy depends on the area of land use, which participates in the formation of economic benefits. Based on the circle-centric model, it was established that the increase in economic efficiency from the use of land-resource potential is proportional to the distance from the centre of the model (mainly food security) to the top (economy-forming industries of production).

Key words: economic analysis, land use, land-resource, economic indicators.
JEL code: Q24, Q5

Introduction

The conditions of prevailing economic advantage, which lead to increasing intensity of nature use, have a negative impact on biodiversity, which has led to a reduction of global wild animal populations by more than 50% in the last four decades. In the content of the reports presented at the economic forum, it was indicated that the system of nature management of the planet Earth produces more than half of the total income. At the same time, one of the global challenges of humanity is the problem of intensive climate changes, which, together with the ever-growing number of the population on the planet, face the problems of food security, environmental degradation and, in fact, the economies of most countries fall into direct dependence on the surrounding environment and available natural resources (Eurostat, 2022; Kryvoviaz, E. et al., 2020).

Global regional trends show that the young economies of some countries significantly contribute to the degradation of natural resource potential and reduce its self-recovery functions (Fig. 1).

[1] E-mail: anchumachenko@ukr.net
[2] E-mail: ivan_openko@ukr.net
[3] E-mail: zmenichka@ukr.net
[4] E-mail: rvtyhenko@ukr.net
[5] E-mail: 2231738@i.ua
[6] E-mail: shevchenko_ov90@ukr.net
[7] E-mail: stepchuck.yanina@gmail.com

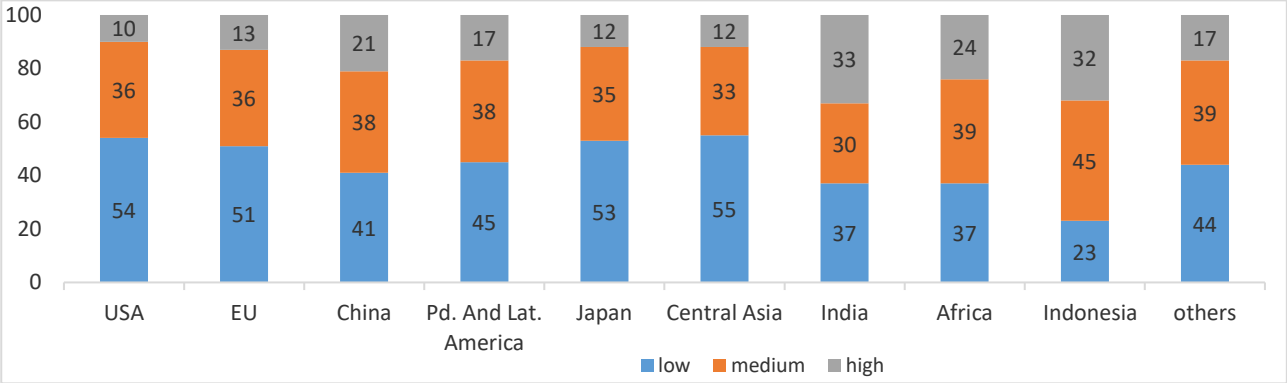


Fig. 1. **Regional nature dependence of GDP, % Eurostat, 2022**

Intensive use of nature in a number of countries in Southeast Asia and Africa forms a third part of the gross product. The economies of such countries as the USA, the EU and China are characterized by the largest absolute indicators of added value dependent on nature use, which is, respectively, 2.1 trillion. dollars, 2.4 trillion dollars, and 2.7 trillion US dollars, which proves a significant impact on nature as a whole. The formation of industry indicators of added value arises from heterogeneity in the use and imbalance of the system of environmental protection as a whole (Tykhenko, R. et al., 2021). Analysing the structure of the economy, it becomes clear that in such industries as agriculture and forestry, fish breeding, water supply, energy, food industry, indicators of gross added value significantly depend on the use of natural resources. Relatively low dependence on natural resources is characteristic of such industries as banking, management and insurance activities, digital and information communications, machine building, trade, transport and logistics activities, processing industry, heavy and chemical industry etc. Being in the risk zone, natural assets provide the formation of more than 44 trillion. US dollars of world gross domestic product (Eurostat, 2022). After conducting an analysis of sectoral nature use, it becomes obvious that the economic efficiency of certain industries, which amount to about 13 trillion. USD (13%) of world GDP, significantly depends on available natural resources. About 37% (USD 31 trillion) of world GDP is formed by industries partially dependent on natural resources (Frolenkova, N. et al., 2022).

The food industry (USD 1.4 trillion), agriculture (USD 2.5 trillion) and construction (USD 4 trillion) have the highest level of natural resource consumption. The natural environment, losing its ecosystem functions and ability to recover, reduces its potential to support nature-intensive sectors of the economy and, as a result, reduces their economic efficiency. Today it is becoming clear that the limiting factor in the growth of indicators of gross added value and gross domestic product, and therefore the economic growth of states, is the rather high dependence on nature of a significant part of the vital branches of production. Land resources are the spatial basis of natural resources, at the same time they are capital and an irreplaceable production resource, and therefore a determining factor of economic growth. The basis of our research is the idea of assessing the economic efficiency of the use of land resources and their impact on the basic indicators of economic growth in European countries. gross domestic product (GDP) is one of the most important indicators of economic development, which highlights the summary of the production activity of resident economic units (people) in the field of material and non-material production. It is determined by the value of goods and services produced by society for final use. GDP is the sum of gross value added (GVA) of industries, plus net taxes on products not included (indirect taxes, NP):

$$GDP = \sum GVA + NP \quad (1)$$

The basis for determining GDP indicators was the production method (value-added method), the essence of which is to calculate the added values of all branches of the national economy, which will allow to reveal the relationship and role of individual branches in the creation of the gross national product, to reveal the dynamics of changes in the structure, to conduct a comparative analysis of the gross national product domestic product of the country with a similar indicator of other countries. The methodological basis of this study is national approaches to determining gross added value and gross domestic income. The method involves the calculation of gross added value (GVA) by types of economic activity (Ukrstat, 2023). This method makes it possible to estimate the contribution of a specific type of economic activity and economic sector to the formation of the gross domestic product (Ukrstat, 2022). With the help of this method, it becomes possible to carry out an analytical assessment of the effectiveness of the functioning of the country's economy. Using this approach, we will try to estimate the impact of economic sectors on the value of the gross domestic product of European countries. One of the main tasks of the study is to establish the strength of the relationship between GDP indicators and the use of land resources in the formation of indicators of gross added value in various sectors of the country's economy. The constructed multifactorial model allows establishing the strength of relationships between established variables and factors dependent on them. The proposed multiple (multifactorial) regression of the influence of factors on the outcome variable as a function of several independent (explanatory) variables x_1, x_2, i.e. it is a model of the type:

$$y = f(x_1, x_2, \dots, x_n) \quad (2)$$

The following methods were used during the scientific research: synthesis - in the part of identifying the dependence of the use of land resources and macroeconomic indicators; grouping - when forming types of land use in terms of types of economic activity.

Research results and discussion

In the modern world, the gross domestic product (GDP) indicator is an indicator of the nation's economic prosperity and a measure of the level of well-being of the country's population. Over the past 13 years (Shevchenko, O. et al., 2021), GDP indicators in the EU countries have grown annually. The economic recession (-6.1% of GDP) in the EU in 2019-2020 depended on the COVID-19 pandemic (Kryvoviaz, E. et al., 2020). Over the past 15 years, the average annual growth of the EU GDP was 0.8% on average (Fig. 2).

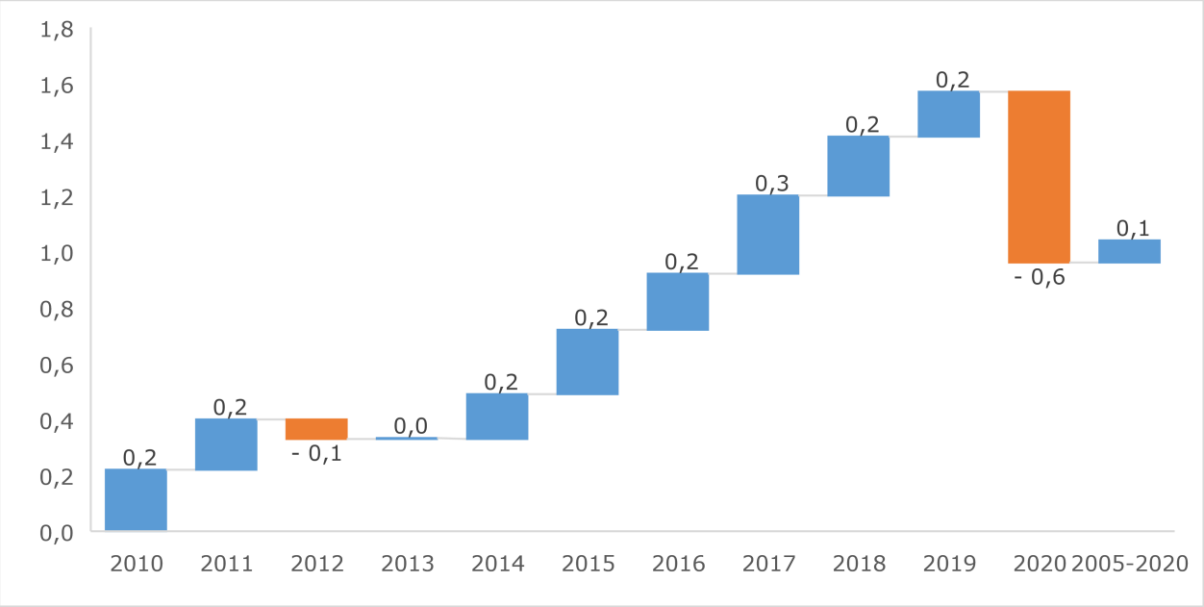
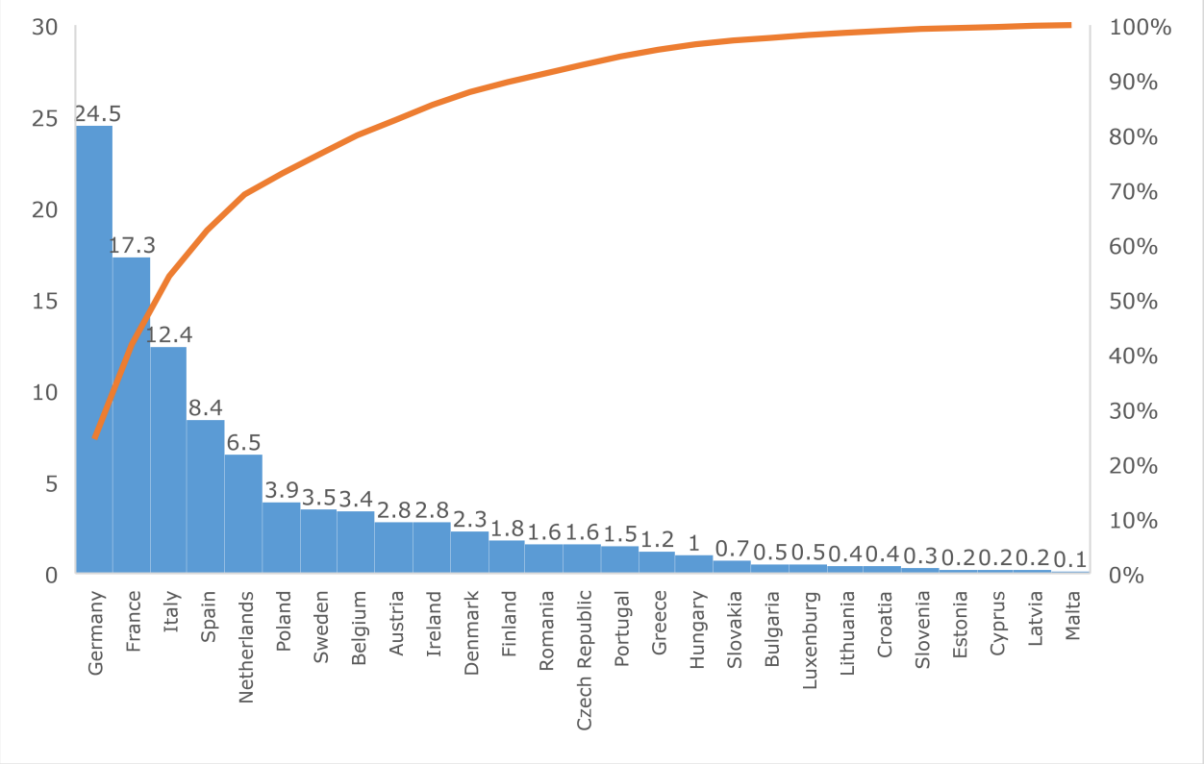


Fig. 2. **Change in the EU GDP, % compared to the previous year (Kryvoviaz, E. et al., 2020)**

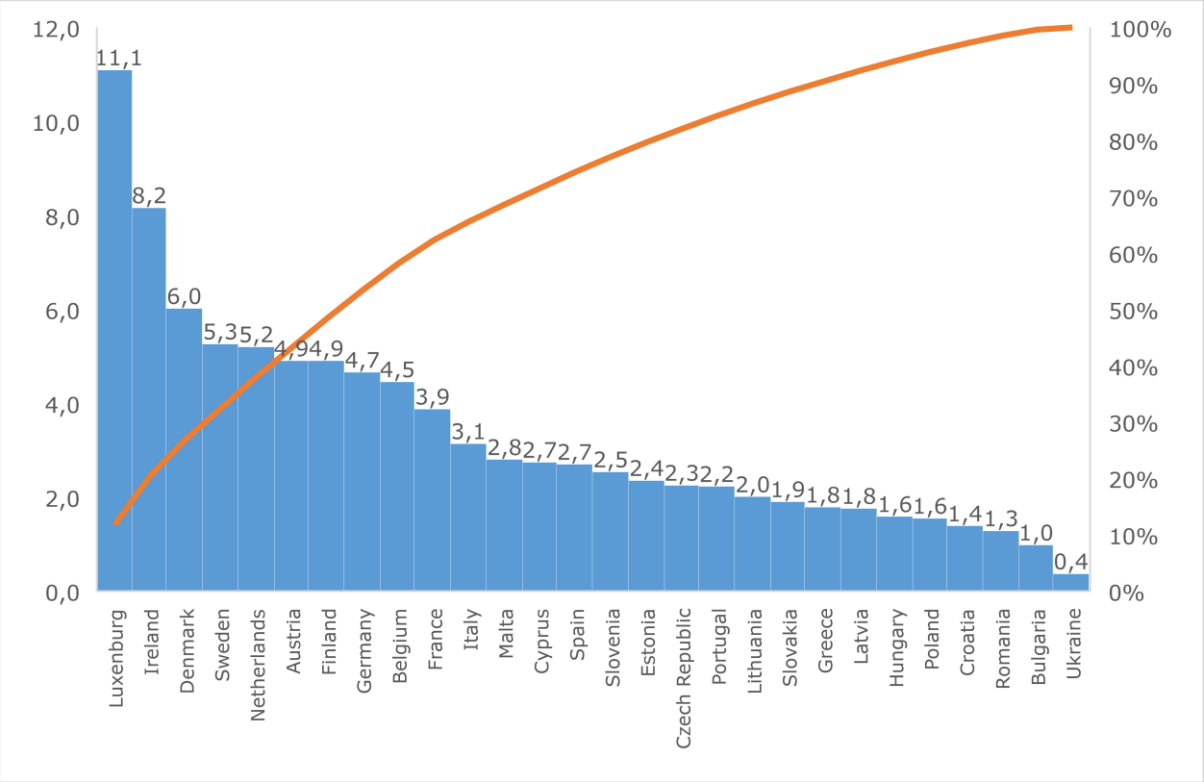
The growth of GDP indicators in the EU countries differs significantly. About 60% of the GDP of the European Union is formed thanks to the economies of Spain, Italy, France and Germany. As of 2020, the share of Germany's economy in the EU GDP structure is 24.5%, France's - 17.3%, Italy's - 12.4%, Spain's - 8.4% (Fig. 3).



Source: Kryvoviaz, E. et al., 2020

Fig. 3. **Structure of the EU GDP, billion dollars USA**

To conduct a comparative characterization of the level of well-being and differences in the quality of life of most countries, both in Europe and the world, the indicator of the share of GDP of a country's citizen is used.



Source: Kryvoviaz, E. et al., 2020

Fig. 4. **Share of GDP of the EU and Ukraine (2020), USA dollars per person**

As of 2020, our calculation shows that on average one resident of the EU accounts for USD 32.6 thousand. As it can be seen from Fig. 4, the indicators of GDP per capita of the EU countries are quite heterogeneous. The economies of Bulgaria (USD 9.8 thousand), Romania (USD 12.9 thousand), and Croatia (USD 13.9 thousand) are characterized by relatively low GDP indicators per person. A high standard of living is typical for Denmark (60.2 thousand dollars), Ireland (81.6 thousand dollars), and Luxembourg (111.0 thousand dollars). The GDP indicator in Ukraine before the full-scale invasion of Russian troops was 3.7 thousand dollars per person.

The next step of our research will be the substantiation of GDP and its heterogeneity in the studied countries. Determining the influence of sectoral production on the state of economic indicators, we will try to establish dependencies between GDP and sectoral types of economic activity, such as: forestry, agriculture, construction, industry, transport, trade, financial and insurance activities, information technologies, administrative and scientific and technical activity, social service and health care, education, defense sector, public administration and other benefits. The sectoral grouping is shown in the economic-statistical model in tabular form (Table 1). During the study, the grouping of types of economic activity was carried out, given on the website of the World Bank, Eurostat and the State Statistics Service of Ukraine with the aim of carrying out a comparative characterization of the impact of various sectors on absolute indicators of GDP.

Table 1

The structure of GDP of European countries (2020), billion US dollars

GDP billion US dollars										
value of GDP	**total**	**Agriculture, water management**	**Forestry**	**Industry**	**Construction, residential development**	**Trade, transport**	**Insurance and financial activities, IT**	**Scientific and technical, administrative activities**	**Public administration, defense, education, health care and social services**	**other services (taxes, arts, entertainment)**
country	Y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
Austria	435.7	4.5	1.2	92.8	79.7	88.0	35.7	41.0	81.0	11.8
Belgium	523.4	4.1	0.1	83.7	81.1	92.6	58.6	80.1	114.6	8.4
Bulgaria	70.3	2.4	0.3	15.3	10.6	13.4	10.0	4.8	12.0	1.5
Greece	192.4	9.0	0.1	27.3	36.9	44.4	16.9	9.2	42.9	5.6
Denmark	362.0	5.4	0.4	64.7	60.4	68.3	36.9	38.3	77.4	10.1
Estonia	31.5	0.4	0.3	5.9	4.9	6.5	4.3	3.0	5.5	0.8
Ireland	425.1	4.2	0.0	166.7	38.3	38.7	93.5	37.8	43.4	2.6
Spain	1302.5	44.4	1.1	212.1	245.9	257.6	108.0	114.5	266.7	52.0
Italy	1915.9	40.0	2.1	373.6	356.3	379.3	172.4	183.9	337.2	70.9
Cyprus	24.2	0.5	0.0	1.9	4.2	5.4	3.7	2.6	4.9	1.0
Latvia	34.0	0.8	0.6	5.1	6.7	7.9	2.9	2.9	6.1	1.0
Lithuania	56.8	1.8	0.3	11.5	7.9	17.1	3.6	4.1	9.2	1.2
Luxembourg	74.4	0.1	0.0	4.2	10.1	10.9	25.4	9.3	13.2	1.3
Malta	14.9	0.1	0.0	1.5	1.6	2.0	2.9	2.6	2.7	1.4
Netherlands	926.5	16.5	0.2	136.2	123.2	185.3	107.5	139.0	201.0	17.6
Germany	3869.3	27.3	3.6	885.2	664.8	610.7	347.9	432.9	757.6	139.2
Poland	606.7	14.5	1.9	149.3	81.9	151.1	51.0	56.4	92.8	7.9
Portugal	234.9	4.3	1.1	40.6	42.7	52.8	20.9	18.1	48.1	6.1
Romania	253.1	8.4	2.2	54.9	40.7	49.9	25.8	22.5	41.8	6.8
Slovakia	106.2	2.0	0.6	24.0	18.5	22.3	8.1	9.9	17.7	3.2
Slovenia	53.7	0.9	0.3	14.3	7.4	10.3	4.5	5.2	9.7	1.2
Hungary	157.7	6.2	0.3	38.2	24.4	27.1	14.5	15.3	27.4	4.3
Finland	275.5	2.9	4.8	53.2	58.9	40.2	25.9	25.1	56.7	7.7
France	2643.6	43.6	3.9	349.0	491.7	433.5	251.1	375.4	618.6	76.7
Croatia	57.2	2.0	0.2	11.1	9.1	11.4	6.7	4.6	10.0	2.0
C. Republic	247.8	3.8	1.4	71.1	38.7	43.1	25.5	17.3	41.6	5.2
Sweden	547.8	5.2	3.6	93.7	87.1	90.9	70.7	62.5	118.3	15.9
Ukraine	155.2	14.0	0.6	27.9	14.4	32.3	7.8	7.3	22.0	23.9
EU	15442.8	255.2	30.9	2987.0	2634.1	2761.1	1534.7	1718.2	3058.3	463.2

Source (WEF, 2020)

Using the data in Table 1, we established correlational dependences between GDP indicators and sectoral types of economic activity. As a result of substantiating the dependencies, a correlation-regression matrix of the influence of the components of the economy on the value of GDP was obtained (Table 2).

Table 2

Matrix of dependence of GDP indicators on economic sectors

Variable	Y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
Y	1									
x_1	0.79	1								
x_2	0.59	0.45	1							
x_3	0.97	0.68	0.54	1						
x_4	0.99	0.81	0.61	0.95	1					
x_5	0.99	0.84	0.58	0.95	0.99	1				
x_6	0.99	0.77	0.57	0.96	0.98	0.97	1			
x_7	0.98	0.77	0.58	0.92	0.98	0.97	0.98	1		
x_8	0.99	0.80	0.60	0.93	0.99	0.98	0.98	0.99	1	
x_9	0.98	0.79	0.56	0.96	0.98	0.97	0.95	0.94	0.96	1

Source: author's calculations

The coefficients of determination determined during the study indicate the strength of the relationship between the result Y and variables X1-9. Thus, relatively low dependencies were found between forestry, nature protection (r = 0.59) and rural and fishing activities (r = 0.79). The coefficients of determination are R2 = 0.64 and R2 = 0.34, respectively. This result indicates that these industries do not affect the indicators of the gross domestic product in the European Economic Area, and therefore the economic well-being of the population. In turn, the high correlation coefficient, and therefore the impact on economic indicators, is typical for the cultural and entertainment and fiscal spheres (r = 0.98, R2 = 0.98), the system of education, defense, social sphere, health care and public administration (r = 0.99, R2 = 0.98), administrative and research and technical work (r = 0.98, R2 = 0.96), insurance, financial and information spheres of the economy (r = 0.99, R2 = 0.97), trade and logistics industry (r = 0.99, R2 = 0.98), construction (r = 0.99, R2 = 0.99) and industrial manufacturing (r = 0.97, R2 = 0.93). The conducted analysis proves that all sectors of the economy have a high economic effect, except for forestry, environmental protection, and agricultural activities. Taking into account that the spatial basis of any activity is land resources, we will establish patterns and mutual influences of the land use system and economic sectors of European countries. Within the framework of the study, we carried out the typification of land uses taking into account the peculiarities of economic activity on the basis of data and formed the types of land uses (Ukrstat, 2023; Kryvoviaz, E. et al., 2020). Thus, within the framework of the conducted research, the following groups of land use were identified: food-producing - agricultural and water management lands; ecologically stabilizing (nature-preserving) – nature reserves, forest, dry, swampy, abandoned and unused territories; social and infrastructural - includes residential buildings, public areas, areas earmarked for development and real estate transactions; production - trade - economy-forming - territories under industrial facilities, warehouse and treatment facilities, facilities of transport, logistics and trade enterprises, financial, insurance, IT institutions, scientific and technical, administrative, managerial, defense, educational, medical and social , tax, cultural and artistic, entertainment, recreational and other services.

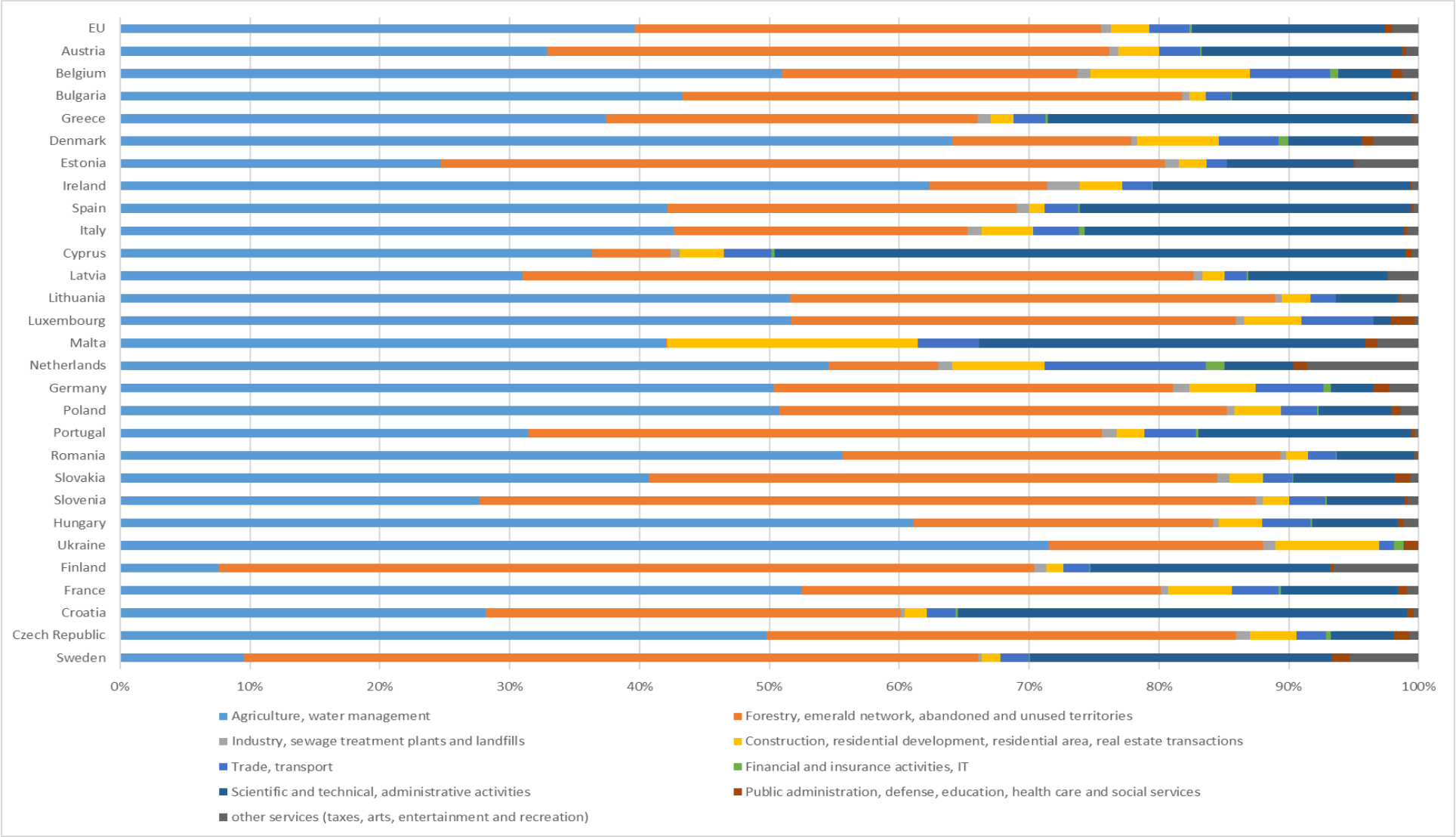
Analysis of the diagram shows that the area of food-producing land uses in the EU is 39.6% of the total (Fig. 5). Not a significant share of such land in Finland (7.6%), Sweden (9.5%), Estonia (24.7%). Denmark (64.1%), Ireland (62.3%), Hungary (61.1%), Romania (55.6%) have a rather high share in the land use system. In the structure of land use in Ukraine, food-producing lands make up more than 70%.

Ecologically stabilizing territories of the EU make up about 36%. Significant areas of this type of land use are located in Estonia (55.8%), Sweden (56.6%), Slovenia (59.8%) and Finland (62.7%), the smallest indicators in the structure of land use in Denmark (13,8%), Ireland (9.1%), the Netherlands (8.4%), Cyprus (6%) and Malta (0.1%). The territory of Ukraine has a given 16.5% of such lands in its structure.

In the EU land use structure, only 3% of the territory is under social infrastructure facilities. This type of land use is closely related to population displacement, so it can indicate the level of urbanization. The lowest share of such land uses is in Sweden (1.4%), Finland (1.3%), Bulgaria (1.2), high level of urbanism is characterized by land use in the Netherlands (7.3%), Belgium (12.3%), Malta (19.3%). In the land use structure of Ukraine, such lands are 8%.

Territories in the structure of which were allocated production - trade - economic types of land use have a rather complex structure. One of the components is land under industrial facilities, which in the EU make up 0.8% of the total area. The lowest share of land is in Denmark (0.4%), Romania (0.4%), Croatia (0.3%), Malta (0.1%), and significant areas in the Netherlands (1.1%), Estonia (1.1%), Germany (1.2%), Jordan (2.4%). In the land use structure of Ukraine, such lands make up about 0.9%. The share of land under transport, logistics and trade facilities in the EU is 3.0%. Fairly high indicators in Germany (5.3%), Belgium (6.2%), the Netherlands (12.4%), the lowest in Bulgaria (1.9%), Latvia (1.7%) and Estonia (1.1%). The national indicator is 1.1%. Low land security (0.21% for the EU) is characterized by insurance, financial activities and the field of information technologies. The most such lands are in Germany (0.57%), Belgium (0.63%), Denmark (0.73%) and the Netherlands (1.4%), and the least in Luxembourg (0.004%), Slovakia (0.03%)., Lithuania (0.05%). In the land use structure of Ukraine, the share of such lands is quite high and amounts to 0.74%. Land use under objects of administrative and scientific and technical activity in the EU land use structure is quite high, which is justified by the high level of stimulation of the development of scientific and technical potential and the development of territorial administration. The highest indicators are in Sweden (23.2%), Italy (24.5%), Spain (25.5%), Greece (28.02%), Croatia (34.6%), Cyprus (48.5%). The smallest share among European countries is in Belgium (4.14%), Germany (3.28%), Luxembourg (1.35%), Ukraine (0.02%). Land use of education, health care, public administration, defense, social sphere in the EU land use structure is 0.59%, in Ukraine this figure is 1.06%. Land use with objects of recreational economy, fiscal services and objects of cultural and mass events in the structure of land use in the EU is 2.02%, in Ukraine this indicator is only 0.07%. The above analysis of the structure of land use in European countries in terms of sectors of the economy makes it possible to determine the contribution of each sector to the formation of the gross domestic product.

As part of the study, we will find a connection between the use of land resources and the average GDP per unit area, taking into account the above sectors of the economy of European countries. The research data are given in Table 3.



Source: author's compiling

Fig. 5. **Land use by economic sectors of European countries, %**

Table 3

Profitability of land resources used by sectors of the economy, thousand US dollars / ha

Country	Agriculture, water management	Forestry, emerald network, abandoned and unused territories	Industry, sewage treatment plants and landfills	Construction, residential development, residential area, real estate transactions	Trade, transport	Financial and insurance activities, IT	Scientific and technical, administrative activities	Public administration, defense, education, health care and social services	other services (taxes, arts, entertainment and recreation)
Austria	1.6	0.3	1636.6	298.3	338.3	2686.0	31.6	3294.0	145.2
Belgium	2.6	0.1	2810.0	215.2	489.9	3021.5	630.0	4898.2	208.3
Bulgaria	0.5	0.1	228.2	77.6	62.3	1135.1	3.1	369.0	56.5
Greece	1.8	0.0	216.1	158.8	135.7	829.8	2.5	1600.6	120.2
Denmark	2.0	0.7	3424.7	223.0	343.4	1182.2	158.0	1984.2	67.6
Estonia	0.4	0.1	121.1	51.6	90.1	2659.0	6.8	924.0	3.7
Ireland	1.0	0.0	946.9	167.3	245.2	21751.7	27.2	6472.4	68.8
Spain	2.1	0.1	437.9	404.7	199.5	3068.1	9.0	2796.0	260.6
Italy	3.1	0.3	1147.7	295.9	356.5	1369.6	24.8	3681.1	265.5
Cyprus	1.5	0.0	289.4	132.4	160.2	1597.7	5.8	1017.4	202.3
Latvia	0.4	0.2	117.6	60.5	71.2	519.7	4.1	1914.0	6.3
Lithuania	0.5	0.1	362.3	54.4	137.1	1100.8	13.1	884.1	12.8
Luxembourg	0.8	0.5	2422.5	896.3	754.4	2537240.5	2649.8	2687.7	1807.0
Malta	5.6	148.8	51073.7	266.3	1358.7	285616.1	276.6	9074.3	1428.1
Netherlands	8.1	0.6	3413.3	463.1	399.0	2050.9	703.3	4821.2	55.0
Germany	1.5	0.3	1988.7	363.9	324.7	1719.6	369.1	1790.6	169.7
Poland	0.9	0.2	825.1	73.7	175.1	1068.4	32.4	432.2	17.7
Portugal	1.5	0.3	407.1	218.6	149.7	1236.8	12.4	1965.2	226.2
Romania	0.6	0.3	527.0	100.9	97.3	1253.1	15.9	877.2	170.8
Slovakia	1.0	0.3	506.4	146.3	198.4	4747.9	25.7	313.4	97.1
Slovenia	1.6	0.3	1303.6	180.0	181.2	1832.3	42.7	1972.8	67.1
Hungary	1.1	0.1	902.1	79.7	78.2	993.6	24.8	696.3	40.0
Finland	1.1	0.2	166.0	129.9	59.1	1056.9	4.0	636.9	3.5
France	1.5	0.3	1148.6	181.7	223.3	1889.7	76.1	1632.2	153.0
Croatia	1.3	0.1	606.0	96.3	90.0	704.1	2.4	357.3	87.0
C. Republic	1.0	0.5	869.6	137.1	237.0	959.7	44.8	448.7	93.4
Sweden	1.2	0.1	756.7	138.2	91.1	2317.0	6.0	194.9	6.7
EU	1.7	5.7	2913.1	207.8	261.0	106874.4	192.7	2138.4	216.3
Ukraine	0.3	0.1	51.7	3.0	47.1	17.4	561.0	34.6	570.0

Author's compiling

As part of the study, the dependence of profitability of institutional sectors of the economy on sectoral land use was established (Table 4). The correlation matrix establishes the dependence of gross domestic income indicators on land use areas.

Table 4

Matrix of influence of land use on economic indicators

Variable	Y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
x_1	1									
x_2	0.47	1								
x_3	0.52	1.00	1							
x_4	0.38	0.08	0.13	1						
x_5	0.58	0.81	0.85	0.56	1					
x_6	0.05	0.08	0.10	0.78	0.46	1				
x_7	0.13	0.03	0.08	0.81	0.48	0.92	1			
x_8	0.67	0.65	0.69	0.40	0.79	0.13	0.20	1		
x_9	0.20	0.57	0.59	0.66	0.78	0.81	0.77	0.45	1	
Y	0.69	0.75	0.79	0.62	0.96	0.49	0.57	0.78	0.76	1

Source: Author's calculations

Analysing the results of correlation-regression relationships of GDP and the sectoral land use system, we can say that with r equal to 0.7 and more, the indicators have a relatively strong dependence. Thus, land use under trade and transport and logistics facilities significantly affects GDP, as indicated by the correlation coefficient r = 0.96 with variable x_5. A fairly high level of influence on GDP indicators is demonstrated by the forestry type of land use r = 0.75 with the variable x_2, the industrial type of land use r = 0.79 with the variable x_3, land under health care, education, defense and the public sector r = 0.78 with the variable x_8, recreational and cultural and entertainment type of land use r = 0.76 with variable x_9. Food-producing territories have r = 0.69 with variable x_1, which indicates a lower level of dependence of GDP on the sector. Other types of land use (residential, r = 0.62 with variable x_4; financial, insurance, IT, r = 0.49 with changes x_6; administrative and scientific and technical, r = 0.57 with variable x_7) have weak connections with a productive sign of the economic sector from the use of land resources. That is, there is a weak dependence of income as part of the total, on the areas used in the production or provision of services by the industry. Calculations carried out as part of the study show that the land used in the financial, insurance and IT sectors has the highest profitability per hectare (Luxembourg - 2537240.51 thousand dollars; Malta - 285616.13 thousand dollars), for Ukraine this indicator is 17.4 thousand of dollars per hectare. Agricultural lands have the lowest economic weight. However, the most efficient hectare of agricultural land is used in: the Netherlands - 8.08 thousand dollars, Italy - 3.11 thousand dollars. The agricultural sector has a low impact on GDP formation in: Latvia - 0.41, Estonia - 0.36 thousand dollars. For Ukraine, this indicator is 0.33 thousand US dollars, which proves the low economic efficiency of the agricultural sector. In the structure of land use in the EU countries, it is most profitable to use land under financial, insurance and IT institutions (106,874.36 UAH/ha), industry (2,913,1 thousand dollars) and public administration (2,138,4 thousand dollars). Low efficiency is noted for the food-forming type of land use (1.71 thousand dollars) and the ecologically stabilizing (nature-preserving) type (3.94 thousand dollars).

Conclusions, proposals, recommendations

Summarizing the research findings, the authors have noted the following.

1) With a decrease in the "r" indicator, the dependence of GDP on land resources is lost. Formation of national wealth (GDP) is advisable to support those sectors of the economy that significantly affect its growth. At the same time, one should not limit oneself to economic growth, because the quality of

society's life lies not only in the plane of economic benefits. Developing a system of nature-preserving land uses ensures acceptable ecological conditions and the provision of ecosystem functions of territories.

2) Investments in the system of agricultural land use form a stable and high-quality food base of society and contribute to the extension of life. The development of social infrastructure facilities provides development and new communication opportunities to society, which generally raises the level of living in society to a high level.

3) The growth of economic efficiency from the use of land resources is proportional to the distance from the centre of the model (primary - food security) to the top (the economy of the forming sectors of production).

Bibliography

1. Eurostat. (2022). Online data codes: naida_10_gdp and nama_10_gdp. Retrieved from: https://ec.europa.eu/eurostat/databrowser/product/view/NAMA_10_GDP
2. Frolenkova, N., Rokochinskiy, A., Mazhayskiy, Yu., Volk, L., Prykhodko, N., Tykhenko, R., Openko, I. (2022). Specific features of environmental risk management in environmental projects. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. Vol. 22, Issue 2, p. 325-333.
3. Kryvoviaz, E., Openko, I., Tykhenko, R., Shevchenko, O., Tykhenko, O., Tsvyakh, O., Chumachenko, O. (2020). Recovery of losses for inappropriate use of land. Scientific Papers. Series E. Land Reclamation, Earth Observation & Surveying, Environmental Engineering, Volume 9, pp. 175–182. Retrieved: http://landreclamationjournal.usamv.ro/pdf/2020/Art26.pdf
4. Shevchenko, O., Openko, I., Tykhenko, R., Tsvyakh, O., Zhuk, O., Kryvoviaz, E., … Volk, P. (2021). Assessment of economic losses caused by degradation processes of agricultural land use. Scientific Papers. Series E. Land Reclamation, Earth Observation & Surveying, Environmental Engineering, Volume 10, pp. 102–109.
5. State Service of Ukraine for geodesy, cartography and cadastre. (2022). Open data. Retrieved from: https://land.gov.ua/index.php/open-data
6. Tykhenko, R., Tykhenko, O., Openko, I., Shevchenko, O., Bavrovska, N., Zhuk, O., Stepchuk, Ya. (2021). The assessment of impact ecological stability of territory on the organization of rational land use of agricultural enterprises. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 21(2), pp. 685–692.
7. Ukrstat. (2022). Methodological regulations for calculating the gross domestic product. Retrieved from: http://www.ukrstat.gov.ua/metod_polog/ metod_doc/2018/ 187/mp_VVP.pdf
8. Ukrstat. (2023). Methodological explanations. Retrieved from: http://ukrstat.gov.ua/operativ/ operativ2005/ vvp/metod_nr.htm
9. Ukrstat. (2023). Methodology for calculating gross domestic product by production method and income. Retrieved from: http://www.ukrstat.gov.ua/metod_ polog/metod_doc/2004
10. WEF, Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and Economy, (2020). New Nature Economy project. Retrieved from: https://www3.weforum.org/docs/WEF_New_Nature_Economy_Report_2020.pdf.https://www3.weforum.org/docs/WEF_New_Nature_Economy_Report_2020.pdf