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MODELING OF INDICATORS OF ECONOMIC EFFICIENCY OF SECTORAL LAND USE

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Abstract

This article provides an in-depth analysis of the calculation of gross domestic product (GDP) by the production method which is based on gross value added by type of economic activity. The dynamics of indicators that determine the directions of state economic policy is studied. Multi-vector use of GDP, creates a basis for financial support from the IMF, the Maastricht convergence criteria, the forecast of public defense spending.
Assessing the contribution of each type of economic activity and each institutional sector of the economy to the creation of GDP, the study identified the following types of economic activity: agriculture; forestry; industry; construction; trade, transport; IT field; financial and insurance activities; scientific and technical, administrative activities; public administration, defense, education, health care and social services; other services (taxes, arts, entertainment and recreation). An important stage of the study was to find the relationships between economic indicators of profitability (average GDP per unit area) and the use of land resources, considering the institutional sectors of the economy. The analysis shows the level of dependence of the income of a particular sector of the economy on the area of land use involved in the formation of national economic benefits. Dependences of profitability of economic sectors on land resource potential are revealed. It is established that to ensure high economic indicators (GDP indicators), it is necessary to develop economic sectors that have a significant impact on the formation of national wealth.

Key words: *economic efficiency, GDP, land use, nature management.*

INTRODUCTION

The increase in the intensity of nature management in the context of the spread of economic benefits, negatively affecting the state of biodiversity, so over the past 400 global populations in the wild has decreased by 60%. According to research presented at the World Economic Forum (WEF, Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and Economy, New Nature Economy project, Geneva, 2020), more than half of the world's aggregate GDP (gross domestic product) depends on nature. The problem of the use of natural resources and the level of dependence of global and national economies on the intensity of nature use is acute in the context of climate change. Trends in losses and irreversible transformations of natural resource potential are most pronounced in countries whose economies are actively developing.
Global economic trends indicate that about one third of the GDP of India (33%), Indonesia (32%) and the African region (24%) is generated in industries that actively use natural resources (WEF, Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and Economy, New Nature Economy project, Geneva, 2020). The world's largest economies are characterized by the highest absolute amounts of GDP that depend on the natural sector, namely: China ($ 2.7 trillion), the EU ($ 2.4 trillion) and the United States ($ 2.1 trillion), i.e., even a relatively small share of their economy has a significant impact. In the formation of total value added in different industries there is an imbalance in intensity and dependence on nature (Figure 1). As can be seen from the diagram, the dependence of gross value added (GVA) in the first eight sectors of production is significant, the following industries are characterized by an average level of dependence. According to a study conducted by the World Economic Forum, about 44 trillion. US dollars in the structure of world GDP depends on natural capital assets, and therefore are potentially at risk. In general, the dependence of the global economy on natural resources in

terms of industries shows that the efficiency of production in some industries is strongly influenced by environmental dependence, their share in GDP is 15% (13 trillion US dollars). Partially dependent industries produce about 37% of world GDP (31 trillion US dollars). The most nature-intensive sectors of production form about 8 trillion. USD gross value added: construction - 4 trillion. dollars, agriculture - 2.5 trillion. USD and food industry - 1.4 trillion. US dollars. The peculiarity of nature use of these sectors of production is both the direct extraction of resources from the environment and the provision of ecosystem services (soil protection, conservation of water resources, etc.). Features of nature-intensive sectors of production suffer losses from the loss of ecosystem functions and its ability to recover.

Summing up, we can say that the formation of absolute economic indicators (GDP, GVA) in the structure of production is characterized by heterogeneity. Sectoral nature dependence is a deterrent to economic growth in the regions.

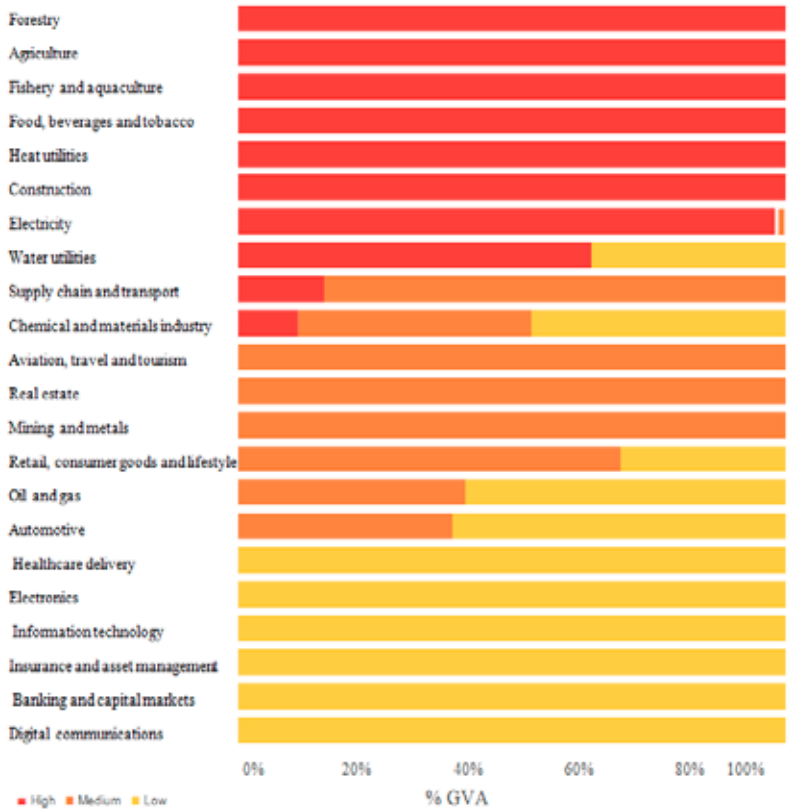

Figure 1. Sectorial nature and value added, % (WEF, Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and Economy, New Nature Economy project, Geneva, 2020)

MATERIALS AND METHODS

The study set the task of substantiating the dependence of financial and economic indicators on the efficiency of land use potential in the structure of land use in Europe.

It is worth noting that land resources are an integral part of natural resources and an important factor in economic growth on a par with capital, labor, and scientific and technological progress.

The study was based on data collection, based on documents available on the digital platform Scopus and other scientific databases. Thus, the study studied and analyzed the work in which the issues of managing growth and change of economic indicators (Vera Ferreira et al., 2022), modeling of GDP (Paolo Andreini et al., 2021), the problem of land use-resource potential (Chumachenko et al., 2021; Kryvoviaz et al., 2020). In the Scopus database, he searched for research papers on the keywords "land use", "gross domestic product", "economic efficiency", "sectoral production", as a mechanism for determining scientific products have already been published.

The sample was conducted from a list of documents published for the period from 2015 to October 2021. The result of this work was the verification of documents filtered by years, authors, affiliation, field of knowledge, journal documents, source and keywords. systematic analysis and study of selected articles.

The author's calculation of economic indicators was carried out in the research and their dependence was established on the basis of open data. Microsoft Office Excel software was used for the calculation. The methodology of the State Statistics Service of Ukraine was used to calculate GDP, which involves the use of one of the methods - production, which will be used as a basis for further research (Metodolohichni poiasnennia).

The essence of the method is to determine gross value added (GVA) by type of economic activity as the difference between the value of output at basic prices and the cost of material costs and services consumed in the process.

The amount of GVA of economic activities is equal to the GVA of the economy:

$$B.1g = \sum_{i=1}^{19} (P.1_i - P.2_i) \quad (1)$$

where:

- B.1g - Airborne forces of the national economy as a whole at basic prices;
- $P.1_i$ - issue of the i-th type of economic activity in basic prices;
- $P.2_i$ - intermediate consumption of the i-th type of economic activity.

GDP for the economy as a whole in market prices is defined as the sum of gross value added of all economic activities in all institutional sectors of the economy in basic prices and taxes, except for subsidies on products:

$$B.1*g = B.1g + D.21 - D.31 \quad (2)$$

where:

- B.1*g - GDP at market prices;
- D.21 - product taxes;
- D.31 - subsidies on products.

This method is important in analyzing the results of the economy. It allows us to characterize the contribution of each type of economic activity and each institutional sector of the economy to GDP. According to the methodology of the State Statistics Service of Ukraine, gross value added is calculated as the difference between output and intermediate consumption (Metodyka rozrakhunku valovoho vnutrishn'oho produktu za vyrobnychym metodom i za dokhodamy). It contains the primary income generated by the participants in production.

In the analysis of the study data was used multifactorial correlation - in the study of the dependence of GDP on the components of the economy and investigated the relationships between economic profitability and use of land resources, taking into account institutional sectors of the economy. Such an analysis estimates the strength of the relationship between the variables studied, and a multivariate statistical model is selected using multiple regression analysis to describe the relationship between the factors. In the study, a model of the influence of many factors on the performance variable described by the linear model was built:

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + ... + \alpha_m X_m + U \quad (3)$$

where:

- y - dependent variable;

- xi - independent variables (factors);
- ai - estimates of unknown parameters to be evaluated;
- u - random variable (error).

Also, the research methods were used, namely: grouping - in the formation of land use, taking into account the types of economic activity and institutional sectors of the economy and the formation of their respective types; synthesis - when the dependence of economic indicators on the use of land resources; component analysis - when establishing links between types of land use and their contribution to changes in economic indicators.

RESULTS AND DISCUSSIONS

Today, the measure of high living standards of the population of the country (region) and an indicator of economic prosperity is the indicator of gross domestic product (GDP). Derivative indicators, such as GDP per capita (per capita) in US dollars, are widely used to compare living standards and monitor economic convergence or disagreement within the European Union (EU) and other countries. The development of specific components of GDP and related indicators - economic production, imports, exports, domestic consumption, investment, redistribution of income and savings, contributes to the assessment of economic activity and EU policy.

The global economic crisis of 2009 led to a recession in the EU and other countries (USA, UK, Japan), only China's economy has been steadily growing (Figure 2). The next decline in GDP in the EU was recorded at 6.1% due to the spread of COVID-19.

The economic downturn in the Eurozone is in fact in line with the trend in the EU: the reductions recorded in 2009, 2012 and 2020 were 4.5%, 0.9% and 6.5% respectively. Thus, in the period 2005-2020, real GDP growth in the Eurozone (overall growth of 9.2%) was slightly weaker than in the EU as a whole (12.6%).

Within the EU, GDP growth can be described as heterogeneous (Table 1) (National accounts and GDP).

After the economic downturn of 2009, with the exception of Poland, growth was recorded in 2010-2011. With the onset of the COVID 19 pandemic in 2020, the growing dynamics of the EU economies has changed dramatically. Overall, the average annual growth of EU GDP over the last 15 years is 0.8%. The largest decline in production was experienced by the economies of Portugal to 7.6%, Malta - 7.8%, France - 7.9%, Croatia - 8.0%, Greece - 8.2%, Italy - 8.9% and Spain - 10.8%. The analysis shows that the Polish economy had a positive dynamic (by 2020 the average growth rate was 3.6%), Ireland maintained economic growth even during the crisis (average annual growth of 4.2% between 2005 and 2020). The negative rate of change in 2020 was the first since 2009 for Belgium, Bulgaria, Denmark, Germany, Estonia, France, Lithuania, Malta, Austria and Slovakia.

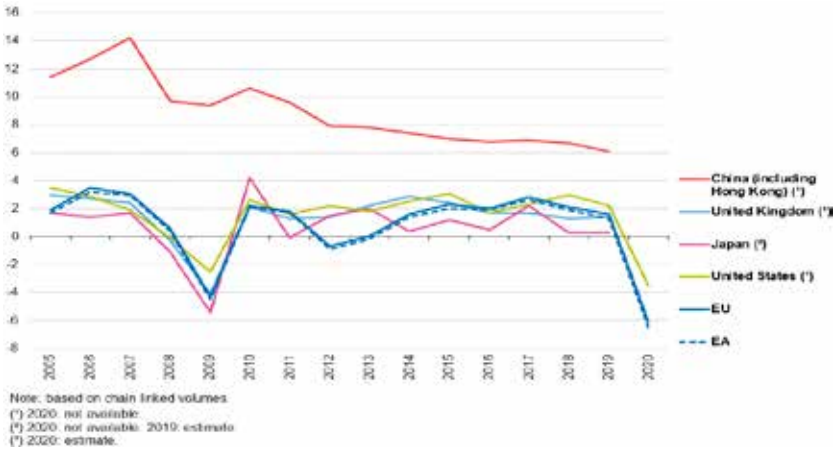

Figure 2. Rate of change in GDP, 2005-2020 (% compared to the previous year) (Eurostat)

Table 1. GDP dynamics, % to previous year
(GDP and main components - output, expenditure and income)

Countries	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2005-2020**
Austria	1.8	2.9	0.7	0.0	0.7	1.0	2.0	2.4	2.6	1.4	-6.3	0.9
Belgium	2.9	1.7	0.7	0.5	1.6	2.0	1.3	1.6	1.8	1.8	*-6.3*	*0.9*
Bulgaria	0.6	2.4	0.4	0.3	1.9	4.0	3.8	3.5	3.1	3.7	-4.2	2.3
Greece	-5.5	-10.1	-7.1	-2.7	0.7	-0.4	-0.5	1.3	*1.6*	*1.9*	*-8.2*	*-1.8*
Denmark	1.9	1.3	0.2	0.9	1.6	2.3	3.2	2.8	2.2	2.8	-2.7	1.0
Estonia	2.7	7.4	3.1	1.3	3.0	1.8	3.2	5.5	4.4	5.0	-2.9	2.0
Ireland	1.8	0.6	0.1	1.2	8.6	25.2	2.0	9.1	8.5	5.6	3.4	4.2
Spain	0.2	-0.8	-3.0	-1.4	1.4	3.8	3.0	3.0	*2.4*	*2.0*	*-10.8*	*0.2*
Italy	1.7	0.7	-3.0	-1.8	0.0	0.8	1.3	1.7	0.9	*0.3*	*-8.9*	*-0.7*
Cyprus	2.0	0.4	-3.4	-6.6	-1.8	3.2	6.4	5.2	5.2	*3.1*	*-5.1*	*1.3*
Latvia	-4.4	6.5	4.3	2.3	1.1	4.0	2.4	3.3	4.0	2.0	-3.6	1.6
Lithuania	1.7	6.0	3.8	3.6	3.5	2.0	2.5	4.3	3.9	4.3	-0.9	2.6
Luxembourg	4.9	2.5	-0.4	3.7	4.3	4.3	4.6	1.8	3.1	2.3	-1.3	2.5
Malta	5.5	0.5	4.1	5.5	7.6	9.6	3.8	8.6	5.2	5.5	-7.8	3.8
Netherlands	1.3	1.6	-1.0	-0.1	1.4	2.0	2.2	2.9	2.4	*1.7*	*-3.7*	*1.1*
Germany	4.2	3.9	0.4	0.4	2.2	1.5	2.2	2.6	1.3	0.6	*-4.8*	*1.1*
Poland	3.7	4.8	1.3	1.1	3.4	4.2	3.1	4.8	5.4	4.7	*-2.7*	*3.6*
Portugal	1.7	-1.7	-4.1	-0.9	0.8	1.8	2.0	3.5	2.8	*2.5*	*-7.6*	*0.1*
Romania	-3.9	1.9	2.0	3.8	3.6	3.0	4.7	7.3	4.5	*4.1*	*-3.9*	*3.0*
Slovakia	5.9	2.8	1.9	0.7	2.6	4.8	2.1	3.0	3.7	2.5	-4.8	2.9
Slovenia	1.3	0.9	-2.6	-1.0	2.8	2.2	3.2	4.8	4.4	3.2	-5.5	1.4
Hungary	1.1	1.9	-1.4	1.9	4.2	3.8	2.1	4.3	5.4	*4.6*	*-5.0*	*1.4*
Finland	3.2	2.5	-1.4	-0.9	-0.4	0.5	2.8	3.2	1.3	1.3	-2.8	0.7
France	1.9	2.2	0.3	0.6	1.0	1.1	1.1	2.3	1.9	*1.8*	*-7.9*	*0.5*
Croatia	-1.3	-0.2	-2.4	-0.4	-0.3	2.4	3.5	3.4	2.8	*2.9*	*-8.0*	*0.4*
Czech Republic	2.4	1.8	-0.8	0.0	2.3	5.4	2.5	5.2	3.2	2.3	-5.6	1.9
Sweden	6.0	3.2	-0.6	1.2	2.7	4.5	2.1	2.6	2.0	2.0	-2.8	1.7
EU 27_2020	**2.2**	**1.8**	**-0.7**	**0.0**	**1.6**	**2.3**	**2.0**	**2.8**	**2.1**	**1.6**	**-6.1**	**0.8**

When estimating the level of well-being of the population of a country or region, GDP per capita is often used. Taking into account that the EU population as of 2020 was 447 million, the average GDP per capita for the EU (at current prices) was 29.7 thousand euros. The relative situation of individual EU countries is shown in Figure 3. Based on this indicator, the highest value among EU member states was recorded for Luxembourg, where GDP per capita was about 3.7 times higher than the EU average. The high level of GDP per capita in US dollars is typical for Ireland (81.6), Denmark (60.2), Sweden (52.6). The lowest rates are in Bulgaria (9.8), Romania (12.9). Thus, we see that gross domestic product (GDP), being the main generalizing indicator of economic development, reflects the total volume of production of goods and services for a given period. This indicator characterizes the economic activity in the country and determines its place in the world rankings.

As of 2020, the euro area accounted for 80.5% of EU GDP (compared to 84.8% in 2005). Thus, the share of the four largest economies of the EU member states: Germany, France, Italy and Spain, was slightly less than three-fifths (59.7%) of EU GDP. The German economy accounts for 22.4% (2020) of EU GDP in the year, down slightly from 22.5% compared to 2005.

The shares of the other largest Member States fell more sharply between 2005 and 2020, falling by 2.5% in Italy, 1.2% in Spain and 0.95 in France (Figure 3).

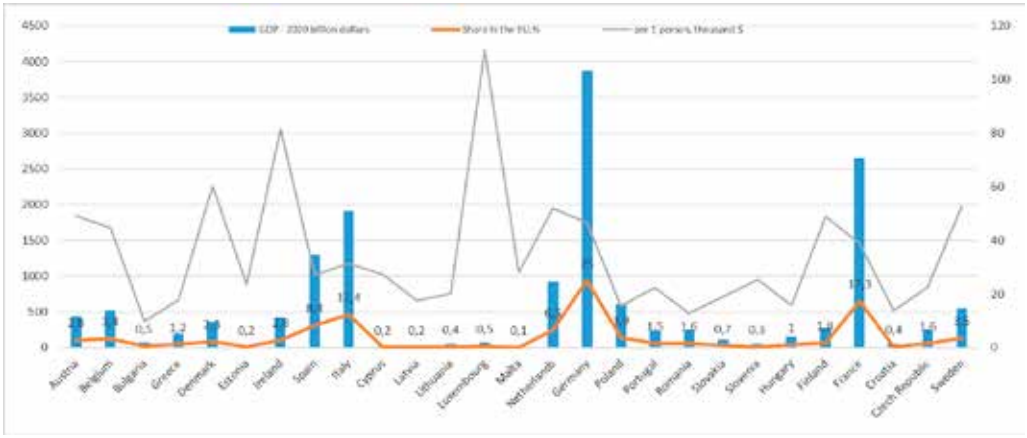

Figure 3. Structure of EU GDP, billion dollars USA (GDP and main components - output, expenditure and income).

Next, it is planned to study the indicators of GDP, their dependence, identify ties and establish their strength, taking into account the sectors of production.

In the study we identified the following types of economic activity: agriculture; forestry; industry; construction; trade, transport; IT field; financial and insurance activities; scientific and technical, administrative activities; public administration, defense, education, health care and social services; other services (taxes, arts, entertainment and recreation). The data are shown in Table 2.

Thus, we performed a correlation-regression analysis of the data (see Table 2) and established the corresponding correlation dependencies. The result is a correlation-regression matrix of indicators of GDP dependence on sectoral components of the economy (Table 3).

In the structure of EU GDP, the share of agriculture and water management has a Pearson correlation coefficient of r = 0.79 (respectively, the coefficient of determination R^2 = 0.64), which indicates a relatively weak direct relationship between the variables Y and X1 (see Table 3). The study shows that in most EU countries the share of agriculture and water in GDP is not significant. Carrying out a correlation-regression analysis of indicators of forestry and nature protection complex, it was found that the dependence of national GDP on this industry has a Pearson coefficient r = 0.59 (coefficient of determination R^2 = 0.34), which proves the absence of any significant effects on industry. most European countries. Correlation - regression analysis of economic indicators of industry r = 0.97 (coefficient of determination R^2 = 0.93); construction r = 0.99 (coefficient of determination R^2 = 0.99); trade, transport r = 0.99 (coefficient of determination R^2 = 0.98); IT sphere; financial and insurance activities r = 0.99 (coefficient of determination R^2 = 0.97); scientific and technical, administrative activities r = 0.98 (coefficient of determination R^2 = 0.96); public administration, defense, education, health care, social services r = 0.99 (coefficient of determination R^2 = 0.98) and fiscal system, cultural and entertainment industry r = 0.98 (coefficient of determination R^2 = 0.98) have a high correlation coefficient, which indicates a close direct relationship of indicators and their linear dependence. Evaluating the results of the analysis, we can conclude that the GDP of the EU does not depend on agriculture, forestry and water, and the economy is formed by all other sectors of the economy.

The next step of our study will be to determine the impact of the land use system on the sectoral components of the EU economies. To this end, we formed (grouped) land use, taking into account the types of economic activity and institutional sectors of the economy. Sources of data on the structure of land use in the EU and Ukraine were official sources: Eurostat (Land use overview by NUTS 2 regions. Eurostat.), State Geocadastre (Vidkryti dani. Derzhavna sluzhba Ukrainy z pytan heodezii, kartohrafii ta kadastru, 2021) and the State Statistics Service

of Ukraine (Ekonomichna statystyka, 2021). Given the structure of land use of EU countries, the typification of land use was carried out taking into account the types of economic activity and institutional sectors of the economy and the corresponding types of land use were formed (Figure 4).

Table 2. Economic and static model of EU and Ukraine GDP for 2020, million USD (GDP and main components - output, expenditure and income)

	GDP, million US dollars									
	Total	Agriculture + fisheries	Forestry	Industry	Construction + real estate transactions	Trade, transport	Financial and insurance activities, IT	Scientific and technical, administrative activities	Public administration, defense, education, health and social services	other services (taxes, arts, entertainment and recreation)
	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9
Austria	435651,92	4458,03	1205,44	92793,86	79724,30	88001,69	35723,46	40951,28	81031,26	11762,60
Belgium	523365,32	4091,78	95,14	83738,45	81121,62	92635,66	58616,92	80074,89	114617,01	8373,85
Bulgaria	70345,88	2413,75	329,74	15265,06	10622,23	13365,72	9989,11	4783,52	12029,15	1547,61
Greece	192362,80	8981,59	59,47	27315,52	36933,66	44435,81	16927,93	9233,41	42896,90	5578,52
Denmark	361962,60	5368,43	417,19	64726,58	60387,37	68342,59	36883,30	38329,71	77382,61	10124,83
Estonia	31513,72	403,65	289,65	5861,55	4916,14	6523,34	4254,35	2993,80	5451,87	819,36
Ireland	425146,96	4226,90	24,57	166657,61	38263,23	38688,37	93532,33	37838,08	43364,99	2550,88
Spain	1302470,85	44449,64	1091,29	212090,66	245921,07	257631,60	107997,08	114502,93	266739,78	52046,79
Italy	1915850,20	40016,25	2132,46	373590,79	356348,14	379338,34	172426,52	183921,62	337189,64	70886,46
Cyprus	24175,56	505,18	2,50	1909,87	4182,37	5415,33	3674,69	2610,96	4883,46	991,20
Latvia	34027,44	815,62	647,56	5138,14	6737,43	7894,37	2858,30	2858,30	6124,94	952,77
Lithuania	56815,56	1765,32	334,76	11522,04	7946,23	17141,16	3632,56	4086,63	9194,93	1191,93
Luxembour	74405,88	104,89	43,92	4166,73	10119,20	10863,26	25372,41	9300,74	13169,84	1264,90
Malta	14875,84	74,38	0,00	1532,21	1621,47	2037,99	2856,16	2603,27	2722,28	1428,08
Netherland	926461,84	16487,19	189,13	136189,89	123219,42	185292,37	107469,57	138969,28	201042,22	17602,77
Germany	3869252,19	27303,25	3619,84	885173,58	664846,53	610731,11	347884,81	432923,32	757615,81	139153,92
Poland	606718,28	14478,99	1902,41	149252,70	81906,97	151072,85	50964,34	56424,80	92827,90	7887,34
Portugal	234860,56	4311,67	1090,13	40630,88	42744,62	52843,63	20902,59	18084,26	48146,41	6106,37
Romania	253072,56	8426,27	2202,78	54916,75	40744,68	49855,29	25813,40	22523,46	41756,97	6832,96
Slovakia	106203,80	1962,91	585,98	24002,06	18479,46	22302,80	8071,49	9876,95	17736,03	3186,11
Slovenia	53704,52	903,99	331,21	14339,11	7357,52	10311,27	4457,48	5155,63	9666,81	1181,50
Hungary	157673,00	6157,98	306,61	38156,87	24439,32	27119,76	14505,92	15294,28	27435,10	4257,17
Finland	275461,72	2866,55	4846,37	53164,11	58948,81	40217,41	25893,40	25067,02	56745,11	7712,93
France	2643578,52	43639,28	3945,13	348952,36	491705,60	433546,88	251139,96	375388,15	618597,37	76663,78
Croatia	57168,28	1991,51	238,05	11090,65	9089,76	11433,66	6688,69	4630,63	10004,45	2000,89
Czech Repu	247845,60	3815,21	1389,55	71131,69	38663,91	43125,13	25528,10	17349,19	41638,06	5204,76
Sweden	547823,92	5169,50	3595,69	93677,89	87104,00	90938,77	70669,29	62451,93	118329,97	15886,89
Ukraine	155180,67	14028,33	574,17	27932,52	14431,80	32277,58	7759,03	7293,49	22035,66	23882,31
EU	***15162324,07***	***264760,00***	***30285,30***	***2922126,24***	***2568802,56***	***2705382,03***	***1506769,72***	***1684570,27***	***2999345,29***	***475316,88***

Table 3. Correlation-regression matrix of GDP dependence indicators

	y	x1	x2	x3	x4	x5	x6	x7	x8	x9
y	1.00									
x1	0.79	1.00								
x2	0.59	0.45	1.00							
x3	0.97	0.68	0.54	1.00						
x4	0.99	0.81	0.61	0.95	1.00					
x5	0.99	0.84	0.58	0.95	0.99	1.00				
x6	0.99	0.77	0.57	0.96	0.98	0.97	1.00			
x7	0.98	0.77	0.58	0.92	0.98	0.97	0.98	1.00		
x8	0.99	0.80	0.60	0.93	0.99	0.98	0.98	0.99	1.00	
x9	0.98	0.79	0.56	0.96	0.98	0.97	0.95	0.94	0.96	1.00

The relative indicators of the selected types of land use of the EU and Ukraine are shown in Figure 4, which shows that the share of food-forming lands of the EU is 39.6% of the area (Denmark - 64.1%, Ireland - 62.3%, Hungary - 61.1%, Romania - 55.6%) and the lowest rates (Finland - 7.6%, Sweden - 9.5%, Estonia - 24.7%, Slovenia - 27.6%). In Ukraine, this figure is 71.5%. The average rate of EU eco-stabilizing areas is 35.9%. The largest shares are characterized by land use in Finland (62.7%), Slovenia (59.8%), Sweden (56.6%), Estonia (55.8%), Latvia (51.7%), the smallest in Malta (0.1 %), Cyprus (6%), the Netherlands (8.4%), Ireland (9.1%), Denmark (13.8%). For Ukraine, this figure is 16.5%.

The share of land in EU social infrastructure is 3%. The largest areas of residential land, public areas, plots for real estate and real estate transactions in the land use structure of Malta (19.3%), Belgium (12.3%), the Netherlands (7.3%), the smallest in Spain (1, 2%), Bulgaria (1.2%), Finland (1.3%), Sweden (1.4%). In Ukraine, this figure is 8.0%. As these lands are closely connected with the processes of urbanization, in our opinion, they quite clearly characterize the level of urbanization of the country.

The complex of production - trade - economic forming territories is characterized by diversity and complexity of internal ties. Thus, the territories occupied by industrial facilities and other accompanying territories in the EU are 0.8% (Ireland - 2.5%, Germany - 1.2%, Portugal, Estonia, the Netherlands - 1.1% and Malta - 0.1%, Sweden, Croatia - 0.3%, Romania, Denmark - 0.4%).

In Ukraine, the share of such lands is - 09%, which indicates a relatively high level of industrial load on the territory. The EU average share of land involved in transport, logistics and trade is 3.0%. The highest rates were recorded in the Netherlands (12.4%), Belgium (6.2%), Luxembourg (5.5%), Germany (5.3%), Malta (4.7%), and Denmark (4.6%). %) and the smallest: Estonia (1.1%), Latvia (1.7%), Lithuania, Bulgaria (1.9%). Ukraine has the lowest rate of 1.1%, which can be considered insufficient compared to highly developed European countries. The lowest share of land supply has financial, insurance and IT activities 0.21% in the EU. However, in countries such as the Netherlands (1.4%), Denmark (0.73%), Belgium (0.63%), Germany (0.57%) it is relatively high, and the lowest in Luxembourg (0.004%), Malta, Slovakia (0.03%), Estonia (0.04%), Lithuania (0.05%).

In Ukraine, the share of such land use is 0.74%, which is quite high among European countries (higher only in the Netherlands). Land use related to scientific, technical and administrative activities in some European countries have a significant share in the land use system, which can be explained by the high level of development of territorial administration and stimulating the development of scientific and technical potential of countries. Thus, the highest rates were found in Cyprus (48.5%), Croatia (34.6%), Malta (29.8%), Greece (28.02%), Spain (25.5%), Italy and Sweden, respectively 24.5% and 2 3.2%. The smallest share of the studied type of land use is in Ukraine (0.02%), Luxembourg (1.35%), Germany (3.28%), Belgium (4.14%). The largest amounts of land in Luxembourg (1.89%), Sweden (1.36%), Germany and the Czech Republic (1.18%) were transferred to public administration, defense, education, health care and social services. the lowest rates are in Latvia (0.05%), Ireland (0.1%), Estonia (0.13%), the figure in Ukraine is 1.06%, which is almost twice as high as the EU average (0.59%).

After conducting research on land use in the field of entertainment and recreation, cultural events, fiscal services, etc., it was found that the share of total land use is the Netherlands (8.57%), Finland (6.59%), Sweden (5.33) %), Estonia (4.87%), Denmark (3.49%), the least in Romania (0.17%), Bulgaria (0.25%), Luxembourg (0.27%). In Ukraine, this figure is 0.07%, which is 2 orders of magnitude lower than the European average (2.02%).

Indicators of the use of land and resource potential of the territories of countries in certain sectors of the economy, allow us to analyze the contribution of each of them to the overall growth of economic indicators of the country (Kryvoviaz et al., 2020). We took as a basis the indicator of gross domestic product.

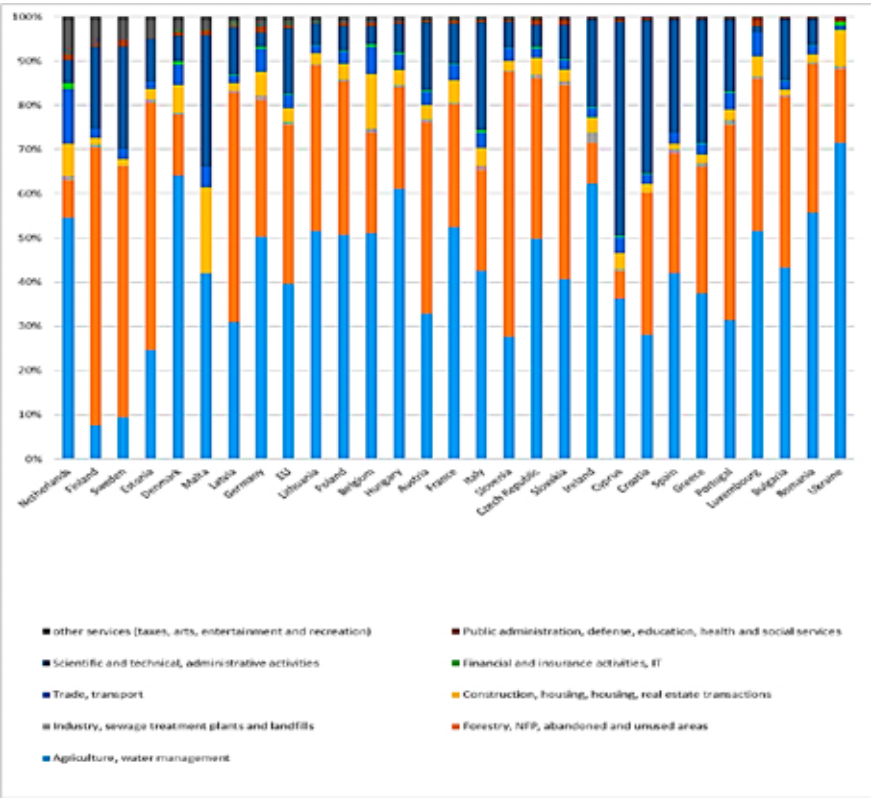

Figure 4. Typification of land use taking into account the institutional sectors of the economy, % (author's development)

The next step of the study involves finding relationships between economic indicators of profitability (average GDP per unit area) and the use of land resources, taking into account the institutional sectors of the economy. The data are shown in table 4.

The result of the correlation analysis is the matrix (Table 5) of the profitability of economic sectors from the land resource potential of the EU and Ukraine. The analysis shows how much the income of a particular sector of the economy depends on the area of land use involved in the formation of economic benefits. Thus, the analysis shows that variables with r = 0.7 and more have a relatively strong dependence of the amount of land involved in the industry and the profitability of the industry in the formation of overall GDP. The variable x5 r = 0.96 has the highest correlation coefficient, which is responsible for the transport, logistics and trade component of GDP and indicates a very strong impact of land use on the industry. The values of variable x2 (r = 0.75) in forestry land use, x3 (r = 0.79) in industrial lands, x8 (r = 0.78) in lands under public administration, defense, education, health care are characterized by a high degree of dependence. I, etc., x9 (r = 0.76) cultural, entertainment and recreational land use.

Land use in the agricultural and water sectors x1 (r = 0.69) has a slightly weaker correlation, which indicates a slightly lower impact of this type of land use on economic GDP. The study found that land for housing (x4, r = 0.62), financial, insurance, IT (x6, r = 0.49) and scientific, technical and administrative (x7, r = 0.57) sectors have weak correlations with the effective sign of the profitability of the sector from the use of land resources, which can be regarded as a weak dependence of income in the national, on the areas involved in the production or provision of services by the industry.

Table 4. Profitability indicators of land resource potential of economic sectors, thousand US dollars/ha

	Agriculture	Forestry	Industry	Construction, housing	Trade, transport	Financial and insurance activities, IT	Scientific and technical, administrative activities	Public administration, defense, education, health and social services	other services (taxes, arts, entertainment and recreation)	Yield is average, thousand dollars / ha
	x1	x2	x3	x4	x5	x6	x7	x8	x9	Y
Austria	1,62	0,33	1636,58	298,26	338,34	2685,97	31,60	3293,95	145,22	51,94
Belgium	2,62	0,14	2810,02	215,23	489,88	3021,49	629,97	4898,16	208,30	170,67
Bulgaria	0,50	0,08	228,18	77,65	62,34	1135,13	3,11	368,99	56,48	6,34
Greece	1,82	0,02	216,10	158,79	135,72	829,80	2,50	1600,63	120,23	14,61
Denmark	1,95	0,71	3424,69	223,00	343,43	1182,16	158,00	1984,17	67,59	84,32
Estonia	0,36	0,11	121,08	51,64	90,10	2658,97	6,78	924,05	3,71	6,95
Ireland	0,97	0,04	946,92	167,31	245,17	21751,70	27,23	6472,39	68,76	60,78
Spain	2,11	0,08	437,93	404,74	199,45	3068,10	8,99	2796,01	260,62	26,13
Italy	3,11	0,31	1147,74	295,90	356,52	1369,55	24,81	3681,11	265,49	63,42
Cyprus	1,50	0,04	289,37	132,35	160,22	1597,69	5,81	1017,39	202,29	26,13
Latvia	0,41	0,19	117,58	60,48	71,25	519,69	4,11	1914,04	6,30	5,27
Lithuania	0,52	0,14	362,33	54,43	137,13	1100,78	13,10	884,13	12,80	8,70
Luxembourg	0,78	0,49	2422,52	896,30	754,39	2537240,51	2649,78	2687,72	1807,00	286,73
Malta	5,59	100,00	51073,72	266,25	1358,66	285616,13	276,65	9074,26	1428,08	470,75
Netherlands	8,08	0,60	3413,28	463,06	398,99	2050,95	703,25	4821,16	54,97	247,86
Germany	1,52	0,33	1988,71	363,90	324,72	1719,65	369,07	1790,63	169,66	108,21
Poland	0,91	0,18	825,06	73,66	175,14	1068,43	32,40	432,16	17,73	19,45
Portugal	1,54	0,28	407,12	218,64	149,74	1236,84	12,39	1965,16	226,16	26,36
Romania	0,64	0,27	527,03	100,90	97,34	1253,08	15,89	877,25	170,82	10,62
Slovakia	0,98	0,27	506,37	146,31	198,42	4747,93	25,70	313,36	97,14	21,66
Slovenia	1,61	0,27	1303,56	169,96	181,22	1832,27	42,75	1972,82	67,13	26,49
Hungary	1,08	0,14	902,05	79,71	78,22	993,56	24,84	696,32	39,97	16,95
Finland	1,11	0,23	166,03	129,93	59,10	1056,87	4,02	636,87	3,46	8,14
France	1,51	0,26	1148,63	181,74	223,27	1889,69	76,14	1632,18	152,99	48,15
Croatia	1,25	0,13	606,05	96,28	89,96	704,07	2,37	357,30	87,00	10,10
Czech Repu	0,97	0,49	869,58	137,06	236,95	959,70	44,83	448,69	93,44	31,42
Sweden	1,22	0,14	756,69	138,17	91,07	2317,03	6,01	194,88	6,66	12,24
Ukraine	0,33	0,06	51,75	2,97	47,09	17,38	561,04	34,59	569,98	2,57
EU	**1,71**	**3,94**	**2913,14**	**207,47**	**260,99**	**106874,36**	**192,67**	**2138,36**	**216,30**	**69,27**

Author's development

Table 5. Matrix of dependence of profitability of economic sectors on land resource potential

	x1	*x2*	*x3*	*x4*	*x5*	*x6*	*x7*	*x8*	*x9*	*Y*
x1	1									
x2	0,47	1								
x3	0.52	1.00	1							
x4	0.38	0.08	0.13	1						
x5	0.58	0.81	0.85	0.56	1					
x6	-0.05	0.08	0.10	0.78	0.46	1				
x7	0.13	0.03	0.08	0.81	0.48	0.92	1			
x8	0.67	0.65	0.69	0.40	0.79	0.13	0.20	1		
x9	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

Further research shows that land involved in finance, insurance and IT is the most profitable per hectare. Thus, the European leaders are Luxembourg - 2537240.51 thousand US dollars per hectare; Malta - 285,616.13 thousand US dollars per hectare, Ireland - 21,751.70 thousand US dollars per hectare. The smallest share of these activities is in: Greece - 829.80 thousand US dollars per hectare, Croatia - 704.07 thousand US dollars per hectare and Latvia - 519.69 thousand US dollars per hectare.

The EU average is 106,874.36 thousand US dollars per hectare. The figure in Ukraine is 17.4 thousand dollars.

The lowest weight in the formation of GDP are lands involved in agriculture and water. However, the most efficient agricultural land is used in: the Netherlands - 8.08 thousand US dollars per hectare, Italy - 3.11 thousand US dollars per hectare, Belgium - 2.62 thousand US dollars per hectare and Spain - 2.11 thousand dollars USA per ha.

The lowest share in the national income structure of the agricultural sector is in: Bulgaria - 0.50, Latvia - 0.41 and Estonia - 0.36 thousand US dollars per hectare. The indicator in Ukraine is 0.33, which indicates low economic efficiency of land use.

Lands under financial, insurance and IT institutions are used most economically (EU - 106874.36 UAH / ha).

Sectors sch as industry (EU - 2913.1 thousand dollars), public administration (EU - 2138.4 thousand dollars) are characterized by high economic effect per unit area.

We can consider low-efficiency: agricultural and water land use (EU - 1.71 thousand dollars), forest areas and NPF (EU - 3.94 thousand dollars).

CONCLUSIONS

In general, we can say that the lower the indicator "r", the lower the dependence of income on land used or used in production (land resource potential). To ensure high economic indicators (GDP indicators), it is necessary to develop sectors of the economy that have a significant impact (share) in the formation of national wealth. Preferring economic growth, it is necessary to ensure the support and development of environmental security and relevant areas (forest, nature reserves and other areas), food security as a basis for well-being and national prosperity (agricultural and fishery areas and lands), social and infrastructure facilities. projects and territories, etc.

During the study, it was found that the growth of economic efficiency from the use of land resources is proportional to the distance from food-forming (agricultural and water lands) and ecologically stabilizing (nature reserves, forests, dry, wetlands, neglected and unused areas) and approaching economic formative sectors of production, such as social and infrastructural (residential buildings, public areas, areas for development and real estate transactions) and production - trade - economic (areas under industrial facilities, warehouses and sewage treatment plants, facilities of transport, logistics and trade enterprises, financial, insurance, IT institutions, scientific and technical, administrative, administrative, defense, educational, medical and social, tax, cultural - artistic, entertainment, recreational and other services).

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