Proceedings

SEMIT2022.REFCONF.COM

ANKARA YILDIRIM BEYAZIT ÜNİVERSİTESİ
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INTERNATIONAL CONFERENCE ON SCIENCE, ENGINEERING MANAGEMENT AND INFORMATION TECHNOLOGY

September 8-9, 2022, ANKARA, TURKEY

SEMIT 2022-SEP

www.semit.refconf.com

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Important: *This book consists of all papers of SEMIT 2022-Feb. excluding the papers published by Springer. Those papers will be published in a booklet by Springer.*

Internatioanl Conference on Science, Engineering Management and Information Technology (SEMIT 2022)

September 08 - 09, 2022 – Ankara, Turkey

Available online at "semit.refconf.com"

Methodical Approaches to Assessing the Regional Transport Potential of Ukraine: Modern Realities and Development Guidelines

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Abstract

The article's purpose is to justify methodological approaches to the assessment of the regional transport potential of Ukraine by modern realities and the determination of development guidelines. The author's approaches to defining the concept of "transport potential" are grouped. To evaluate the transport potential of the regions of Ukraine, it is proposed to use the assessment of the resource provision of the transport system and the results of their activity of the transport system by group indicators (resource provision; natural and geographical characteristics). The evaluation of the regions by the level of development of the transport potential showed that the Dnipropetrovsk region was in the first place, the Kharkiv region was in the second place, and the Lviv region was in the third place. It was determined that the lowest level of development of transport potential is in the Chernivtsi region. It has been proven that methodical approaches and determined rating assessments of the transport potential of the regions of Ukraine make it possible to structure the resources of the national transport system by individual regions in the context of infrastructural support of the national production sphere.

Keywords: transport potential, methodical approaches, resource provision, natural and geographical characteristics, rating of production results.

1. Introduction.

The unjustified Russian invasion of Ukraine has damaged transport infrastructure, caused major transport disruptions and led to a massive flow of refugees into the EU and neighbouring countries. Designed to undermine Russia's economic and financial ability to sustain its war effort, the sanctions have also impacted on transport in the EU, leading to traffic shortages, supply chain bottlenecks and the need to bypass traditional routes, thereby lengthening journey times and increasing costs.

In the current conditions of the war in Ukraine, it is important to maximize the use of transport potential to ensure the socio-economic development of each region and the country as a whole. The ability of domestic transport to provide transportation of goods and passengers across the country's territory and beyond is of particular importance. The collection and systematization of information regarding the potential opportunities for the transport system of Ukraine's regions are necessary for stabilizing the transportation system in emergency situations. When active hostilities are taking place on the territory of some regions, it is essential to skillfully use the transport potential of other regions to meet the needs of the entire state. While still in a state of war, the government of Ukraine is already actively working on recovery plans based on the active use of transport potential. That is why the issue of developing methodical approaches to assessing the transport potential of Ukraine's regions is becoming more relevant. The rational use of the transport potential of the country's regions is the key to ensuring the population's livelihood, the adequate flow of business processes, and the economic activity of the regions.

The results of previous studies show considerable attention to assessing transport potential at the regional level [2-3]. However, most of them are based on expert assessment, which partially reduces objectivity. In our opinion, to assess the transport potential of the regions of Ukraine, it is advisable to use indicators confirmed by official state statistics bodies. This will avoid the subjectivity of the assessment and ensure the possibility of using such approaches in

conditions of uncertainty and constant changes. The formation of methodological approaches to the rating assessment of regions is devoted to the work of famous scientists [4-7]. Thus, it is possible to assert the absence of uniform methodological approaches to assessing the transport potential of the country's regions, which proves the relevance of the tasks we have set within the framework of the outlined topic.

To justify methodological approaches to assessing the transport potential of the regions of Ukraine, we will first analyze the theoretical aspects of the interpretation of the categories related to the transport potential (Table 1).

Table 1. Theoretical approaches to defining the "transport potential" category

Authors	Definition
Chernikov, S.V. Belova and E.B. Figurnov. [8]	"potential is a set of resources necessary for the functioning and development of a certain system".
Abalkin L.I. [9]	"potential is a generalized, collective characteristic of resources, which is considered in the context of place and time."
Alkema V.G. [10]	"transport potential of the country - quantitative and qualitative properties and resources of the country's transport system, as well as its ability to increase the level of efficiency of operation and ensure the appropriate level of transport service to consumers, taking into account the interests state and the whole society".
Syzdykbaeva B., Raimbekov Zh., Zhumataeva B. [11]	"The transport and logistics potential of the region is a set of indicators or factors characterizing the strength, sources, opportunities, means and other reserves that can be used in economic activity"

Thus, in simple words, it is possible to formulate that the transport potential covers all possibilities in the form of various resources (material, human, investment, etc.) that can be used to carry out the transportation of anyone or anything, that is, to obtain the results of the production of the transport system. The transport system is a component of the infrastructural support of the national production sphere.

2. Discussion.

To assess the transport potential of Ukraine's regions, each region must determine the assessment of the resource provision of the transport system and the evaluation of the results of the transport system by the groups of indicators listed in Table 2.

To carry out a regional assessment of the transport potential, it is essential to add natural and geographical characteristics to the totality of resource provision because each region is characterized by a different area, the presence or absence of borders with other states, and access to the sea, which significantly affects the capabilities of the transport system of the region itself. The natural and geographical resources of different regions of the same country differ, which explains the need to consider this group of indicators in the regional assessment.

Table 2 Characteristics of groups of hands for building dynamic models and forecasting the components of the national transport potential in the system of socio-economic development

	Group of indicators	Component indicators of the group
Resource supp	Material resources	- Initial (revalued) cost of fixed assets by type of economic activity "Transport, warehousing, postal and courier activities", UAH million (RZ_1);

		- The cost of new fixed assets received during the year, by type of economic activity "Transport, warehousing, postal and courier activities", million hryvnias (RZ_2).
	Human resources	- The average number of full-time employees of enterprises of the economic activity "Transport, warehousing, postal and courier activities", is thousands of people (RZ_3).
	Investment resources	- Capital investments by type of economic activity "Transport, warehousing, postal and courier activities" (RZ_4).
Natural and geographical characteristics (PG)		- Area of the region, thousand hectares (PG_1) - Proximity to the capital, km (PG_2) - Common border with other states (number of neighboring states), (PG_3) - Exit to the sea, (PG_4)
Production results (RV)		- Volume of sold products (goods, services) of enterprises by type of economic activity "Transport, warehousing, postal and courier activities", UAH million (RV).

Source: grouping proposed by the authors

The calculation of the integral indicator of the assessment of the level of the transport potential of the country's regions is carried out based on the summation of the rank values adjusted for the weighting coefficients for each group of indicators from the above list, namely:

$$I= k1*R(P3)+ k2* R(PG)+ k3*R(PB) \quad (1)$$

Where are the weighting factors k1=0.3; k2=0.1; k3=0.6;

It is possible to assume that each constituent indicator plays an equal role in the rating assessment of the transport potential of the regions. However, we believe that the production results play the most important role in the assessment of the transport potential because, given the availability of the same resources in different regions, it is possible to achieve different results due to the skillful use of the available resources and the synergistic effect of their combination.

Therefore, the distribution of weight coefficients between resource provision (including natural and geographical resources) and production results should correspond to a ratio of 40 to 60. That is, 40% in the assessment of the transport potential corresponds to the available resources of the transport system, and 60% to the production results assessed based on the experience of using the available resources of the region's transport system. If resource support is divided into two groups: 1) material, human, and investment resources (RZ); 2) natural and geographical resources (NG), then we allocate 20% to the first group and 20% to the second. Thus, k3=0.6, and (k1+ k2)=0.4.

Based on the final integral indicator's numerical value, each region's place (serial number, rating) is determined from the point of view of the level of its transport potential. We will determine the ratings of the resource provision of the transport system based on two groups of indicators: 1) material, human, and investment resources; 2) natural and geographical resources. To assess the level of transport potential of the regions of Ukraine, we will use statistical data for 2021 (table 3).

Table 3. Indicators of resource provision (material, human, and investment resources) for assessing the transport potential of the regions of Ukraine

	MP_1, million UAH	MP_2, million UAH	LR_1, thousand persons	IR_1, million hryvnias
Ukraine	**10819289**	**462940**	**614,3**	***685291,7***
Autonomous Republic of Crimea*	-	-	-	-
Vinnytsia	357036,5	12962,3	22,6	18502,9
Volynsk	205566,5	5092,3	9,5	12335,3
Dnipropetrovsk	1060290,3	66200,4	55,5	78808,5
Donetsk	562603,0	37498,1	34,4	35635,2
Zhytomyr	227205,1	7407,0	11,2	12335,3
Zakarpattia	162289,3	4166,5	11,6	6852,9
Zaporizhzhia	421952,3	28702,3	21,5	21244,0
Ivano-Frankivsk	238024,4	9721,7	11,9	8223,5
Kyivska	595060,9	22684,1	32,6	43858,7
Kirovohradsk	194747,2	6018,2	16,3	8908,8
Luhansk	108192,9	3240,6	5,3	4111,8
Lviv	584241,6	18980,5	40,9	32208,7
Mykolayivska	248843,6	9721,7	16,8	13020,5
Odesa	540964,5	12962,3	64,5	28782,3
Poltava	508506,6	26850,5	25,0	34264,6
Rivne	183927,9	6944,1	11,7	7538,2
Sumy	205566,5	6944,1	16,3	9594,1
Ternopilsk	151470,0	3703,5	9,3	9594,1
Kharkivska	670795,9	30554,0	45,3	27411,7
Khersonsk	173108,6	5092,3	10,5	9594,1
Khmelnytska	227205,1	7407,0	10,8	14391,1
Cherkassy	281301,5	15277,0	14,8	12335,3
Chernivtsi	108192,9	2314,7	5,6	4797,0
Chernihivska	216385,8	5555,3	10,3	10964,7

*-data temporarily unavailable

Source: data from the State Statistics Service of Ukraine [12]

The ranking of indicators of resource provision (material, human and investment resources) for assessing the transport potential of the regions of Ukraine is carried out according to the growth of numerical values (Table 4). The smallest value will correspond to a rank of 1, and the largest value will correspond to 24.

Table 4. Ranking values of indicators of resource provision (material, human and investment resources) for assessing the transport potential of the regions of Ukraine

	$R(RZ_1)$	$R(RZ_2)$	$R(RZ_3)$	$R(RZ_4)$	$\sum R(RZi)$	Rating Regions (RV)
Autonomous Republic of Crimea*	-	-	-	-	-	-
Vinnytsia	16	15	17	16	64	9

Volynsk	8	5	4	11	28	19
Dnipropetrovsk	24	24	23	24	95	1
Donetsk	20	23	20	22	85	2
Zhytomyr	11	11	8	11	41	14
Zakarpattia	4	4	9	3	20	21
Zaporizhzhia	17	21	16	17	71	8
Ivano-Frankivsk	13	13	11	5	42	13
Kyivska	22	19	19	23	83	4
Kirovohradsk	7	8	13	6	34	16
Luhansk	1	2	1	1	5	24
Lviv	21	18	21	20	80	5
Mykolayivska	14	13	15	14	56	10
Odesa	19	15	24	19	77	6
Poltava	18	20	18	21	77	6
Rivne	6	9	10	4	29	18
Sumy	8	9	13	7	37	15
Ternopilsk	3	3	3	7	16	22
Kharkivska	23	22	22	18	85	2
Khersonsk	5	5	6	7	23	20
Khmelnytska	11	11	7	15	44	12
Cherkassy	15	17	12	11	55	11
Chernivtsi	1	1	2	2	6	23
Chernihivska	10	7	5	10	32	17

Thus, according to the level of resource provision (material, human and investment resources) in the system of determining the transport potential of the regions of Ukraine, the first position with the highest rating is occupied by Dnipropetrovsk, followed by Kharkiv and Donetsk regions. Luhansk Oblast ranks last in terms of resource provision.

The natural and geographical features of the transport system of the regions of Ukraine can be assessed on the basis of indicators characterizing the area of each region, proximity to the capital of Ukraine, the presence or absence of borders with neighboring states and access to the sea (Table 5). The presence of borders with other countries in the region will be evaluated by a numerical value that corresponds to the number of neighboring countries. We will evaluate the presence of access to the sea in the region as 1, and the absence as 0.

Table 5. Natural and geographical characteristics for assessing the transport potential of the regions of Ukraine

Regions of Ukraine	PG_1	PG_2	PG_3	Access to the sea (PG_4)
Vinnytsia	2649,2	267,5	1	
Volynsk	2014,4	435,6	2	
Dnipropetrovsk	3192,3	474,5	0	
Donetsk	2651,7	720,3	1	
Zhytomyr	2982,7	140,3	1	
Zakarpattia	1275,3	771,9	4	
Zaporizhzhia	2718,3	516	0	1 (Sea of Azov)
Ivano-Frankivsk	1392,7	549,6	1	
Kyivska	2812,1	0	1	
Kirovohradsk	2458,8	299,1	0	
Luhansk	2668,3	822,8	1	
Lviv	2183,1	538,8	1	
Mykolayivska	2458,5	482,9	0	1 (Black Sea)
Odesa	3331,4	478,3	2	1 (Black Sea)
Poltava	2875,0	342,5	0	
Rivne	2005,1	327,2	1	
Sumy	2383,2	225,5	1	
Ternopilsk	1382,4	419,3	0	
Kharkivska	3141,8	483,4	1	
Khersonsk	2846,1	549,4	0	2 (Black Sea, Sea of Azov)
Khmelnytska	2062,9	323,7	0	
Cherkassy	2091,6	189,2	0	
Chernivtsi	809,6	512,7	2	
Chernihivska	3190,3	788,2	2	

We will rank the regions by area and proximity to the capital in ascending order (Table 6), and as ranks for the characteristics of the presence of borders with other states and the presence of access to the sea, we will take the same numerical values as defined in the previous table.

Table 6. The rank of indicators of natural and geographical characteristics for assessing the transport potential of the regions of Ukraine

Regions of Ukraine	$R(PR_1)$	$R(PR_2)$	$R(PR_3)$	$R(PR_4)$	R (g)	Rating of regions (PR)
Vinnytsia	13	5	1		19	15

Volynsk	6	11	2		19	15
Dnipropetrovsk	23	12	0		35	7
Donetsk	14	21	1		36	6
Zhytomyr	20	2	1		23	14
Zakarpattia	2	22	4		28	9
Zaporizhzhia	16	17	0	1	34	8
Ivano-Frankivsk	4	20	1		25	13
Kyivska	17	1	1		19	15
Kirovohradsk	12	6	0		18	19
Luhansk	15	24	1		40	2
Lviv	9	18	1		28	9
Mykolayivska	11	14	0	1	26	12
Odesa	24	13	2	1	40	2
Poltava	19	9	0		28	9
Rivne	5	8	1		14	21
Sumy	10	4	1		15	20
Ternopilsk	3	10	0		13	23
Kharkivska	21	15	1		37	5
Khersonsk	18	19	0	2	39	4
Khmelnytska	7	7	0		14	21
Cherkassy	8	3	0		11	24
Chernivtsi	1	16	2		19	15
Chernihivska	22	23	2		47	1

Thus, according to the natural and geographical resource provision of the regions of Ukraine in the transport potential assessment system, the highest ranking positions belong to the Chernihiv, Odesa and Luhansk regions. The Cherkasy region was at the bottom of the rating.

The next component of assessing the transport potential of the regions of Ukraine is the characteristics of the production results of the transport system of the regions. It was possible to include a larger number of indicators in this group, but we will limit ourselves to one - the most generalizing indicator of the volume of sold products (goods, services) of enterprises by type of economic activity "Transport, warehousing, postal and courier activities" and determine the corresponding ranks (table. 7).

Table 7. Performance indicators of the transport system and their ranking values in the transport potential assessment system of the regions of Ukraine

	RV, UAH million	R(RV)	Rating of regions (RV)

Ukraine	**11844231**		
Autonomous Republic of Crimea*	-		-
Vinnytsia	390859,6	16	9
Volynsk	225040,4	8	16
Dnipropetrovsk	1160734,6	24	1
Donetsk	615900,0	20	5
Zhytomyr	248728,9	11	13
Zakarpattia	177663,5	4	21
Zaporizhzhia	461925,0	17	8
Ivano-Frankivsk	260573,1	13	12
Kyivska	651432,7	22	3
Kirovohradsk	213196,2	7	18
Luhansk	118442,3	1	23
Lviv	639588,5	21	4
Mykolayivska	272417,3	14	11
Odesa	592211,6	19	6
Poltava	556678,9	18	7
Rivne	201351,9	6	19
Sumy	225040,4	8	16
Ternopilsk	165819,2	3	22
Kharkivska	734342,3	23	2
Khersonsk	189507,7	5	20
Khmelnytska	248728,9	11	13
Cherkassy	307950,0	15	10
Chernivtsi	118442,3	1	23
Chernihivska	236884,6	10	15

Thus, according to the effectiveness of functioning in the transport potential assessment system of the regions of Ukraine, the highest ranking positions are assigned to the Dnipropetrovsk, Kharkiv and Kyiv regions. Chernivtsi and Luhansk regions were at the bottom of the ranking of the efficiency of the transport system of the region.

We calculate the integral indicator of the level of transport potential of the regions of Ukraine by summing the rank values for each component (Table 8).

Table 8. Ranking values of individual components and rating of regions of Ukraine by the level of development of transport potential

Regions of Ukraine	R(RZ)	R(PG)	R(RV)	I	Rating of regions
Vinnytsia	64	19	16	26,2	9
Volynsk	28	19	8	14,2	19
Dnipropetrovsk	95	35	24	40,4	1
Donetsk	85	36	20	36,2	3
Zhytomyr	41	23	11	19,4	14
Zakarpattia	20	28	4	12	21
Zaporizhzhia	71	34	17	31,2	8
Ivano-Frankivsk	42	25	13	21,2	13
Kyivska	83	19	22	33,6	6
Kirovohradsk	34	18	7	14,6	18
Luhansk	5	40	1	9,6	22
Lviv	80	28	21	34,2	5
Mykolayivska	56	26	14	24,8	10
Odesa	77	40	19	34,8	4
Poltava	77	28	18	31,8	7
Rivne	29	14	6	12,2	20
Sumy	37	15	8	15,2	17
Ternopilsk	16	13	3	7,6	23
Kharkivska	85	37	23	38,2	2
Khersonsk	23	39	5	15,4	16
Khmelnytska	44	14	11	18,2	15
Cherkassy	55	11	15	22,2	11
Chernivtsi	6	19	1	5,6	24
Chernihivska	32	47	10	21,8	12

Thus, in terms of the level of development of the transport potential of the region, the Dnipropetrovsk region was in first place (Fig. 4), which corresponds to the integral indicator of the assessment of the transport potential I=40.4. Kharkiv region is in second place (I=38.2), and Lviv region is in third place (I=34.2). The lowest level of transport potential development in Chernivtsi region (I=5.6).

Dnipropetrovsk region leads the ranking of regions of Ukraine in terms of the development of transport potential because this region has preserved all the signs of industrialization and the key industries are the industries, the development of which is parallelly accompanied and strengthened by the development of the transport system. Thus, after ranking the regions of Ukraine, it is possible to generalize that those regions

with developed industries have a strong transport potential. Transport and industrial possibilities complement each other's opportunities for socio-economic development in Ukraine's regions. In addition, it is necessary to note the critical role of the transport system in the development of absolutely all types of economic activity and the well-being of the population.

3. Conclusion.

The transport system is a component of the infrastructural support of the national production sphere. Therefore, it is impossible to overestimate its role in the socio-economic development of individual territories and the country. The question of using the transport potential of the regions of Ukraine takes on particular importance in the context of building plans and programs for post-war reconstruction, which has actualized the need to justify methodological approaches to the assessment of the transport potential of the regions. The proposed methodical approaches are based on the determination of the transport potential of the region through all the possibilities of the given region, which include various resources (material, human, investment), including natural and geographical, used for transportation, that is, for obtaining the results of the production of the transport system. The rating assessment of the transport potential of the regions is carried out based on the rating of the regions according to separate groups of indicators:

- Resource provision (material, human, and investment resources).
- Natural and geographical characteristics (area of the region, proximity to the capital of Ukraine, presence or absence of borders with neighboring states and access to the sea).
- Production results (volume of sold products (goods, services) of transport system enterprises).

Separate groups of indicators in the rating assessment of the transport potential of the regions are proposed to be combined, taking into account their weighting factors, which are determined based on the distribution of the level of importance between the resulting indicators and resource provision in the field of functioning of the transport system of the region. The proposed methodical approaches and determined rating assessments of the transport potential of the regions of Ukraine make it possible to structure the resources of the national transport system by individual regions in the context of infrastructural support of the national production sphere.

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