УДК 338 : 338.012 : 338.054.23 : 338.58 : 338.14
JEL E01, L72, O11, O44, O47

М.І. Бублик
Національний університет "Львівська політехніка"

ЗАСТОСУВАННЯ ЛОГІСТИЧНИХ СИСТЕМ НА НАЦІОНАЛЬНОМУ РІВНІ ДЛЯ ЗНИЖЕННЯ ТЕХНОГЕННИХ ЗБИТКІВ

Актуалізовано доцільність застосування логістичних систем на національному рівні з метою зменшення деструктивного впливу господарської діяльності людини на довкілля й суспільство. Визначено склад і структуру за видами економічної діяльності основних показників техногенного навантаження. Проаналізовано світовий досвід створення національних логістичних систем та їх використання для зниження техногенних збитків. Показано, що сучасна національна логістична система є вагомим чинником впровадження політики зеленої економіки.

Ключові слова: техногенні збитки, національне господарство, види економічної діяльності, національна логістична система, техногенне навантаження, політика зеленої економіки.

LOGISTIC SYSTEMS AT THE NATIONAL LEVEL FOR REDUCING TECHNOGENIC LOSSES

The article scrutinises the specification of logistics systems at the national level in order to reduce the destructive impact of human activities on the environment and society. The composition and structure of the key indicators of technogenic load have been determined by economic activities. International experience of the establishing national logistics systems and their use to reduce man-made damage have been analyzed. It is shown that the current national logistics system is an important factor in the implementation of green economy policies.

Key words: technogenic losses, the national economy, economic activities, the national logistics system, technogenic impacts, policy green economy.

Problem formulation. With the rapid technological progress effective management of the national economy requires solving management problems of rational nature, finding effective environmental measures and methods to determine their cost-effectiveness at the macro level. Solving these problems involves not only reducing environmental impact but also create a favorable environment for cleaner production, the introduction of green economy policies and formation of logistics systems at the national level. The national economy of Ukraine requires ways of building a single economic mechanism, aimed at the development of the complex's low-waste and non-waste technology, high-tech economic activities.

However, at the present stage of its development, the national economy of Ukraine is characterized by poor environmental conditions and poor quality of life. Of particular relevance is the problem of the

formation of effective logistics systems at the national level in terms of pollution growth, deteriorating health, increased mortality, etc., described with the concept of man-made damage to the national economy.

Analysis of current research outputs and publications. The theoretical aspects of logistics systems in managing the national economy studied in scientific writings of many domestic and foreign scholars. Particularly remarkable is the heritage of outstanding scientists [1-5], including: Vasyltsiv N.M., Krykavskyy E.V., Larina R.R., Svyrydko S.V., Plahuta G.A. et al. The industry also damages the economy and the relationship between man and nature work, many scientists and researchers from around the world, including the significant contribution made by Ukrainian scientists Amosha A., Balatskiy O., B. Burkyns'kyi, J. Vytvytsky, V. Geets, B. Danilishin, S. Doroguntsov, S. Illyashenko, A. Zagorodniy, B. Kislyi, O. Kuzmin, L. Melnyk, E. Mishenina, I. Nyedin, V.A. Soloviev, Yu. Stadnitskii, V. Trehobchuk, A. Telizhenko, Yu. Tunytsya, A. Fedoryscheva, L. Fedulova, S. Kharichkov, Ye. Khlobystov, M. Hvesyk, V. Shevchuk et al. Recently, there has been formed Lviv economic research under the guidance of prof. Kuzmin O.Ye, whose achievements are related to the development of effective ways to reduce man-made damage to the national economy and state regulation [6-8].

Past studies indicate that in Ukraine there is no work being done to set up national logistics systems to establish green economy, despite the fact that in many countries there is a positive experience.

Article objectives. The theoretical foundations and applied problems of logistical systems in the national economy leads to the formulation of the following purposes: 1) substantiate the theoretical base of green logistics systems in the national economy; 2) investigate the composition and structure of economic activity of key indicators anthropogenic stress; 3) analyze the global experience of national logistics systems and their use to reduce man-made damage.

Presentation of main materials. The source of the formation of man-made damage to the national economy are manufacturing, transport and the provision of certain types of services related to the collection and waste storage and more. The consequences of human activities are the loss of non-renewable natural resources, significant degradation of renewable resources, storage of hazardous waste and the resulting decline in the quality of human resources, including their loss. The problem of optimization of material, financial and time resources flows is becoming of greate logistics values. The problem is aiming to find an efficient logistic system which would allow carrying out a complete and objective management of resource flow on condition that the man-made stress and its impact on the environment and society will be eliminated.

Database for the study of man-made damage is the statistical study of the impact of human activities on the environment, collected by the relevant departments (State Statistics Committee of Ukraine, the Ministry of Environment and Natural Resources, etc.). The system of indicators includes indicators describing the results of economic activities (GDP, GNP, etc.), the source of man-made damage (emissions, effluents and wastes), natural resources (renewable and non-renewable) and the quality of human resources (morbidity and mortality, etc.) and others.

Table 1 shows the values of the distribution of real GDP dynamics by the branches of economic activities (BEA) for the period of 2003-2012. According to statistical sources [9–11] there have been calculated absolute GDP growth, GDP growth rates, GDP increase rates and associated average indexes which reflect the development of the BEA in Ukrainian national economy.

The calculations in the Table 1 shows that chain indices: absolute GDP growth, GDP growth rates, GDP increase rates used to study the dynamics of GDP, with a positive trend for almost all BEA, except for the values in 2009 and average annual growth rate of GDP for each of the BEA are between 115 % to 121 % and between 15 % and 21 % respectively at market prices.

Let us complet the composition and structure of GDP by economic evaluation of technogenic (man-made) stress by economic activity. In Ukraine there are collecting quantitative data on emissions of sulfur dioxide, nitrogen oxides, carbon dioxide and other pollutants into the air business entities (stationary sources) and from road, rail, aviation, water transport and production equipment (mobile sources) and volume of pollutants in the sea and rivers to return waters.

Table 1

Distribution of real GDP dynamics by BEA for the period of 2003-2012

Years	Agriculture, hunting and forestry				Mining				Manufacturing			
	GDP	Absolute growth, P_1-U_0	Growth rate, P_1/P_0	Increase rate, $(P_1-U_0) / U_0$	GDP	Absolute growth, P_1-U_0	Growth rate, P_1/P_0	Increase rate, $(P_1-U_0) /U_0$	GDP	Absolute growth, P_1-U_0	Growth rate, P_1/P_0	Increase rate, $(P_1-U_0) / U_0$
2003	66119	0	1	0	26484	0	1	0	235,289	0	1	0
2004	85668	19549	1.295664	0.29566388	31766	5282	1.199441	0.19944117	325,820	90531	1.384765	0.38476512
2005	94801	9133	1.10 6609	0.10660924	41149	9383	1.295379	0.29537871	399,039	73219	1.224722	0.22472224
2006	98410	3609	1.038069	0.03806922	46125	4976	1.120926	0.12092639	456,729	57690	1.144572	0.14457234
2007	113149	14739	1.149771	0.14977136	57563	11438	1.247978	0.24797832	588,203	131,474	1.28786	0.28785998
2008	156,072	42923	1.379349	0.37934935	91551	33988	1.590449	0.59044873	751,615	163,412	1.277816	0.27781565
2009	157,867	1795	1.011501	0.0115011	78492	-13,059	0.857358	0.14264181	628,232	-123383	0.835843	0.16415718
2010	194,132	36265	1.229719	0.22971869	117804	39312	1.500841	0.50084085	812,068	183,836	1.292624	0.29262438
2011	260,081	65949	1.339712	0.33971215	154,932	37128	1.315168	0.31516757	977,456	165,388	1.203663	0.20366275
2012	268,373	8292	1.031882	0.03188238	147,856	-7076	0.954328	0.04567165	982,102	4646	1.004753	0.00475316
average		20225	1.15	0.11		12137	1.19	0.22		74681	1.15	0.15
Years	Electricity, gas and water				Construction				Trade; repair of motor vehicles, household appliances, etc.			
2003	30360	0	1	0	25811	0	1	0	54897	0	1	0
2004	31961	1601	1.05 2734	0.0527339	37667	11856	1.459339	0.45933904	71490	16593	1.302257	0.302257
2005	36739	4778	1.149495	0.1494947	45972	8305	1.220485	0.22048477	99662	28172	1.394069	0.394069
2006	47318	10579	1.28795	0.2879501	64152	18180	1.395458	0.3954581	122,365	22703	1.2278	0.2278
2007	60898	13580	1.286994	0.2869944	94307	30155	1.470055	0.47005549	173,149	50784	1.415021	0.415021
2008	77688	16790	1.275707	0.2757069	117,362	23055	1.244468	0.24446754	240,111	66962	1.386731	0.386731
2009	85749	8061	1.103761	0.1037612	77631	-39,731	0.661466	0.33853377	239,327	-784	0.996735	0.003265
2010	103,317	17568	1.204877	0.204877	98904	21273	1.274027	0.27402713	293,540	54213	1.226523	0.226523
2011	135,032	31715	1.306968	0.3069679	124,855	25951	1.262386	0.26238575	362,117	68577	1.233621	0.233621
2012	144,639	9607	1.071146	0.0711461	132,187	7332	1.058724	0.05872412	376,417	14300	1.03949	0.03949
average		11428	1.17	0.16		10638	1.18	0.27		32152	1.21	0.15

Continue the same. Table

Years	Transport and communications				Education				Health and social assistance			
	GDP	Absolute growth, P_1-U_0	Growth rate, P_1/P_0	Increase rate, (P_1-U_0) / U_0	GDP	Absolute growth, P_1-U_0	Growth rate, P_1/P_0	Increase rate, (P_1-U_0) / U_0	GDP	Absolute growth, P_1-U_0	Growth rate, P_1/P_0	Increase rate, (P_1-U_0) / U_0
2003	59995	0	1	0	18640	0	1	0	14958	0	1	0
2004	75233	15238	1.253988	0.253988	22086	3446	1,184 871	0.184871	18470	3512	1.234791	0.234791
2005	91219	15986	1.212487	0.212487	29388	7302	1.330617	0.330617	22855	4385	1.237412	0.237412
2006	107,638	16419	1.179995	0.179995	36161	6773	1.230468	0.230468	28305	5450	1.23846	0.23846
2007	135074	27436	1.254891	0.254891	46083	9922	1.274384	0.274384	35947	7642	1.269988	0.269988
2008	172314	37240	1.275701	0.275701	62186	16103	1.349435	0.349435	45902	9955	1.276935	0.276935
2009	182,914	10600	1.061516	0.061516	70705	8519	1.136992	0.136992	54100	8198	1.178598	0.178598
2010	209,444	26530	1.145041	0.145041	83917	13212	1.186861	0.186861	64327	10227	1.189039	0.189039
2011	258,843	49399	1.235858	0.235858	90914	6997	1.08338	0.08338	70300	5973	1.092854	0.092854
2012	263,036	4193	1.016199	0.016199	106,481	15567	1.171228	0.171228	81207	10907	1.155149	0.155149
average		20304	1.16	0.14		8784	1.19	0.20		6625	1.18	0.20

The main ones by BEA are presented in Table 2. However, quantitative data on emissions, discharges and waste, the amount of disease and population dynamics do not allow us to estimate the impact of the destructive nature of production on the environment and population. To do this, let's examine the structure of ecological payments and investments in environmental protection by BEA in 2012 (Table 3). The studies of quantitative indicators of emissions, effluents, waste, their composition and structure showed that the most dangerous type of economic activity is the supply of electricity, gas, steam and conditioned air. Basic indicators of anthropogenic load of BEA are maximum and exceed the mining and processing industries (environmental tax is 952,046.3 thousand ₴, 287,693.6 thousand ₴ and 530,288.5 thousand ₴ respectively). In Table 3 there are no data on the following BEA: Information and Telecommunications, Professional, Scientific and Technical Activities, Activities in Administrative and Support Services, Arts, Sports, Entertainment and Recreation. As we can be seen from data at Table 2, BEA do not create the influence on the environment and society like as emissions, effluents and wastes. However, this is not entirely true, any BEA, related information and telecommunications, can not exist without the production and supply of electric power, mining and manufacturing industries and so on.

Table 2

Output of goods and services and the volume of anthropogenic load on BEA in 2012

Branches of economic activity	Output of goods and services, million ₴	Technological loads			
		The volume of emissions		The volume of discharges polluted waters, million cubic meters	Volumes of waste, tons
		Contaminant substances, tons	Carbon dioxide, tons		
Agriculture, forestry and fishing	269,983	82	918.6	71	10199.6
Mining and quarrying development	153,036	882.4	4296.8	295	335754.4
Manufacturing	974,924	1272.5	81908	560	76054.8
Electricity, gas, steam and air conditioned	144,578	1882.7	105752.9	21	9813.2
Water supply; sewerage, waste management (HCS)	24070			538	429.5
Construction	184751	20.7	613.2	6	
Wholesale and retail trade; repair of motor vehicles and motorcycles	399,249				
Transportation, storage, postal and courier activities	222,425	164.3	3886.5	3	
Arrangement of temporary and catering	24993				
Information and Telecommunications	90269				
Financial and insurance activities	100096				
Real estate	126209				
Professional, scientific and technical activities	88024				
Activities in Administrative and Support Services	34563				
Public administration and defense; compulsory social security	89101				
Education	106702				
Health care and social assistance	80542				
Arts, sports, entertainment and recreation	18283				
Provision of other services / Other BEA	18855	30.7	799.1	27	10505.9
Total (at basic prices)	3,150,653.0	4335.3	198,175.1	1521.0	442,757.4

Source: Constructed and calculated by the author according to the State Statistics Committee of Ukraine [9–11]

Table 3

The structure of environmental fees and costs of conservation activities at national BEA households in 2012

Economic activity	Environmental payments		Environmental protection		
	Environmental tax	Fines	Total capitalization. invest.	including the cost of major repairs	operating costs
	Thousand ₴	Thousand ₴	Thousand ₴	Thousand ₴	Thousand ₴
Agriculture, forestry and fishing	26509	410.1	50275.7	2041.7	297853.6
Mining and quarrying development	287693.6	2347.7	693193.6	143498.9	3701479.1
Manufacturing	530288.5	13145.4	2036948.4	320785.6	4560684.4
Electricity, gas, steam and air conditioned	952046.3	1191.6	563124.3	69353.1	3045012.5
Water supply; sewerage, waste management (HCS)	32896.8	539.1	2020884.6	5858.8	1195366.2
Construction	8232.5	146.1	11927.8	870.1	42017.5
Wholesale and retail trade; repair of motor vehicles and motorcycles	50887.5	506.9	3082.9	1323.1	62167.9
Transportation, storage, postal and courier activities	28856.7	1137.3	865652.5	28440.2	532326.5
Arrangement of temporary and catering	0	0	168.7	168.7	194.1
Financial and insurance activities	219.8	0	0	0	0.2
Real estate	5354.6	146.1	104093.3	18008.8	284580.9
Public administration and defense; compulsory social security	3328.6	80.1	233061.6	44178.5	58747.2
Education	1578.9	28.2	347.3		3511.2
Health care and social assistance	2715.2	3.4	475	15.5	17842.5
Arts, sports, entertainment and recreation	33275.6	551.5	2026985.4	6288.3	1318236.7
Total (at basic prices)	1,963,883.6	20233.5	8,610,221.1	640,831.3	15,120,020.5

Source: Constructed and calculated by the author according to the State Statistics Committee of Ukraine [9–11]

At the state level, we see that we are dealing with material, resource, information flows, which should be regulated by the state based on the achievements of logistics knowledge. The experience of Europe, the Far and Middle East shows that it leads to success.

For example, in Japan formed a national logistics system which manages and completely transforms recycled materials. This logistics system is called Junkan-Gata Society, which means "environmentally viable society", as described by Hashimoto in [12].

A characteristic feature of Junkan-Gata Society is the promotion of research and management of material flows and information about material flows in Japan. The concept Junkan-Gata Society laid not the ordinary cycle of the material in the national economy, but material cycles in the socio-economic system, aimed at protecting the cycles that exist in nature and society [13]. Disclosure of informational and material flows are directed to monitor the effectiveness of government policies and environmental protection and to support improving the resource efficiency.

The most famous industry project of the green national logistics system is the organization of production in the Danish industrial town of Kalundborg [14], which is based on the use of by-products of interaction between the commensurate branches. In a survey conducted by the Agency for the U.S. Environmental Protection Agency [14] found that the interaction potential by-products not well understood and may be greater than we imagine. Example, in the United States for two years studied of the industrialized region North Carolina, which includes Raleigh, Durham and Chapel Hill to identify potential by-products i partnerships. From the list of 343 objects were drawn programs to prevent pollution by using

the Geoinformational systems (GIS). GIS was used for comparison of different needs for resources and exsisting by-products that can be utilized. As a result of this work there were found potentially partner for 49 different products, for example: acetone, carbon, desiccant, hydrochloric acid, methanol, packaging, plastic bags, sawdust, sodium hydroxide, wood ash, sawdust, etc. For some by-products there were also develop and install certain technologies for their involvement in the processes of production, such as: copper, electricity, floppy disks, fiberglass, paint, plastic, etc.

There are many such examples around the world. Therefore, analysis of known research results, we propose to develop and shape the national logistics system that would improve the effectiveness of all resources and information flows in the national economy and reduced technogenical losses and as a result organize effective and efficient environmental management environmental performance.

Green Economy Policy, which is just being introduced in Ukraine, can reduce technogenic impact on environment and society in several times. We believe that the introduction of the state's regulation of man-caused losses logistics approach allows making effective management decisions regarding resource and information flows management in the planning of the national economy, modernize its economic activities and reconstruction of industrial facilities that represent a potential threat of man-made society. The proposed idea of using national logistics systems contribute to the usage, implementation of different production technologies, assessing levels of their waste production, that will enhance the protection of people and the environment from the destructive impact of human activities.

The proposed concept of national logistic systems of green economy enriches the theory of economic losses at both the level of business units and generally at the level of national economy. Obtained results will improve state regulation of the phenomenon; provide appropriate allocations for their eradication and compensation.

Conclusions and further research prospects.

1. In order to to develop the appropriate theoretical base of green logistic systems in the national economy the need for application of logistical approaches to the level of the national economy has been substantiated. Today, Ukraine's national economy is in a state of emergency to build a single economic mechanism with a developed set of high-tech economic activities and low-waste technologies.

2. The studies of quantitative indicators of emissions, effluents, waste, their composition and structure showed that the most dangerous type of economic activity is the supply of electricity, gas, steam and conditioned air. Basic indicators of anthropogenic load of BEA are maximum and exceed the mining and processing industries (environmental tax is 952,046.3 thousand ₴, 287,693.6 thousand ₴ and 530,288.5 thousand ₴ respectively). The consequences of human agreecultural activities lie in the loss of non-renewable natural resources, significant degradation of renewable resources, storage of hazardous waste and as a result, decline in the quality of human resources (including their loss).

3. The theoretical base of green logistic systems in the national economy of Ukraine was justified in the paper as a result of the analysis of global experience using national logistic systems to reduce the man-made losses. Consequently, the problem of constructing green logistic systems in the national economy demands further work and studies.

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