

Volodymyr V. Boiko<sup>1</sup>

## ENVIRONMENTAL SAFETY OF UKRAINE AND ITS REGIONS: THE ECONOMIC DIMENSION

*This paper analyzes the impact of environmental safety on regional economic development. The ways to improve the economic mechanism of environmental policy are determined.*

*Keywords: city; environmental safety; economic development; economic instruments of environmental policy.*

Володимир В. Бойко

## ЕКОЛОГІЧНА БЕЗПЕКА УКРАЇНИ ТА ЇЇ РЕГІОНІВ: ЕКОНОМІЧНИЙ ВИМІР

*У статті проаналізовано вплив екологічної безпеки на економічний розвиток регіонів. Визначено шляхи гармонізації взаємодії у системі «природа – суспільство».*

*Ключові слова: місто; екологічна безпека; економічний розвиток; економічні інструменти екологічної політики.*

*Рис. 4. Табл. 3. Літ. 11.*

Владимир В. Бойко

## ЭКОЛОГИЧЕСКАЯ БЕЗОПАСНОСТЬ УКРАИНЫ И ЕЕ РЕГИОНОВ: ЭКОНОМИЧЕСКИЙ АСПЕКТ

*В статье проанализировано влияние экологической безопасности на экономическое развитие регионов. Определены пути гармонизации взаимодействия в системе «природа – общество».*

*Ключевые слова: город; экологическая безопасность; экономическое развитие; экономические инструменты экологической политики.*

**Problem statement.** Ecologically destructive processes that are dangerous to the population natural resources as well as economic progress in general are increasingly developing in Ukraine. Studies have shown that regional disparities in the level of environmental safety are of large scale. In a number of Ukraine's regions human impact on the environment is becoming threatening and is close to the limits of environmental sustainability of their ecosystems. This means that the relationship between society and the nature is characterized by discrepancies with scientific and technological pace, the development of productive forces, speed of production and social processes and environmental self-recovery capabilities. The crisis of environmental phenomena absorbing Ukraine today is determined primarily by the low level of environmental safety. The reason for this is the low dissemination of innovative technologies and modernization processes, especially in the regions which are the "engine" of the economy, and also due to the lack of progressive environmental legislation. According to the Ministry of Ecology and Natural Resources of Ukraine losses due to environment deterioration are about 10–15% of GDP (Khvesyuk and Stepanenko, 2014). Annually, according to the WHO, because of unsatisfactory state of the environment for every 100 thousand residents 315 persons die, and about 67 people die of air pollution. To overcome these problems it is necessary to ensure the harmonization of relations in the system "human – nature" and thus of particular

---

<sup>1</sup> Institute of Environmental Economics and Sustainable Development of the National Academy of Sciences of Ukraine, Kyiv, Ukraine.

significance is the research to disclose the mutual impact of environmental safety on economic and social development of the state and to develop ways to ensure environmentally sustainable development.

**Recent publications analysis.** Many Ukrainian and foreign scientists have been engaged in the research of environmental safety in relation to economic growth and modernization of economic instruments of environmental protection. Among them in particular are: B. Danylyshyn, A. Stepanenko and O. Ralchuk (2007); Z. Gerasymchuk and O. Oleksyuk (2007) etc.

**The main purpose of this study** is to show the impact of environmental safety on regional economic development and to identify the ways to improve the economic mechanism of environmental policy.

**Key research findings.** In the Institute of Environmental Economics and Sustainable Development of NAS of Ukraine within the scientific work of the department subject "Environmental and natural-technogenic safety of Ukraine in the regional dimension" research has been carried out on measuring the environmental safety of Ukraine's regions.

The system of indicators in 6 categories was developed for this study. Each category included a number of indicators on the state of air, water, land and forest resources, mineral resources and waste areas. The block "air" included 18 indicators, the block "water resources" – 30, the block "land" – 10, the block "forest" – 12, the block "minerals" – 7, the block "wastes" – 18. Altogether there are 95 indicators.

These results provide the opportunity to ascertain that the environment in the regions of Ukraine is heterogeneous. The average ecological safety coefficient for each region (Table 1) clearly demonstrates that the lowest levels of environmental safety are observed in industrialized regions: Donetsk, Dnipropetrovsk and Luhansk. In these regions a significant part of Ukrainian mining and steel industries is concentrated. Air, water and land resources in these regions are especially influenced by the human; there is also a tense situation concerning wastes. In turn, the most environmentally safe regions are in Western Ukraine with moderate industrial development and Kherson region. The level of GRP per capita in these areas is low. Based on this we can assume that there is some correlation between GRP and environmental safety of the region. It manifests itself in the trend: the higher the level of GRP per capita is, the lower is the level of environmental safety and vice versa. However, some regions do not fit into this trend (Figure 1). The most striking example is Kyiv which now serves as a center of financial resources accumulation – a significant proportion of GRP is created outside the immediate boundaries of the city. The major share of GRP is formed by the tertiary sector of the economy.

It should be noted that in highly developed countries there is also the relationship between economic development and environmental safety, but in these countries it takes the form: "the higher is economic growth, the more stable is the environmental situation", and it is the opposite for Ukraine. This is explained by the fact that the main forming factor of Ukraine's GDP is harmful and outdated production facilities that can further only increase the harmful impact on the environment. This means that in Ukraine the economy does not tend to increase significantly, and therefore does not create any preconditions to reduce pressure on the environment, except the actual decline in industrial production. However, as a rule, economic growth in

Ukraine is caused not by qualitative changes in the economy, but by raising production, thus leading to increased pollution, especially in urban areas. This means that Ukraine has not passed the way in which environmental pollution would fall together with economic growth (the theory in which if income increases by 1%, the demand for clean environment will increase by more than 1% (McConnell, 1995). Thus, the more developed the economy becomes, the smaller its influence on nature is, since consumers having sufficient financial resources will be able to buy environmentally friendly goods and services, and producers, using energy-saving technologies, will be able to establish treatment facilities contributing to the reduction of human impacts on the environment. The researchers of the phenomenon "Kuznets environmental curve" focus their attention on this area of investigation.

Table 1. Environmental Safety of Ukraine and its regions in 2012

Region		Environmental Safety Level Coefficient	GDP, mln UAH	GRP per capita
1	Sevastopol	0.0023	9891	25872
2	Transcarpathian region	0.0041	21404	17088
3	Rivne region	0.0044	21795	18860
5	Ternopil region	0.0045	17957	16644
4	Volyn region	0.0045	20005	19249
6	Chernihiv region	0.0051	23934	22096
7	Chernivtsi region	0.0054	13166	14529
8	Khmelnyskyi region	0.0056	26237	19920
9	Kharkiv region	0.0058	82223	29972
10	Kyiv	0.006	275685	97429
11	Zaporizhzhia region	0.0065	54828	30656
12	Autonomous Republic Crimea	0.0066	44536	22675
13	Sumy region	0.0069	24933	21722
14	Kirovohrad region	0.0071	22056	22082
15	Vinnitsia region	0.0075	33024	20253
16	Mykolaiv region	0.0076	29205	24838
17	Ivano-Frankivsk region	0.0081	32286	23379
19	Cherkasy region	0.0085	31265	24558
18	Poltava region	0.0085	56580	38424
20	Zhytomyr region	0.0086	24849	19551
21	Kyiv region	0.0091	69663	40483
22	Kherson region	0.0108	19357	17910
23	Odesa region	0.0125	64743	27070
24	Lviv region	0.0128	61962	24387
25	Luhansk region	0.0176	58767	25950
26	Dnipropetrovsk region	0.0277	147970	44650
27	Donetsk region	0.029	170775	38907
	<b>Ukraine's average</b>	<b>0.0124</b>	<b>54040</b>	<b>27746</b>

Calculations are made within the scientific work under the departmental topic «Environmental and natural-technogenic safety of Ukraine in the regional dimension».

The cluster analysis of regions by the indicators of 6 categories mentioned above in relation to GRP per capita has shown that Ukraine's regions can be divided into 6 clusters. Thus, Donetsk region is very difficult to be attributed to any of the clusters. The K-analysis has confirmed this assumption. However, we still include it into the 6th cluster, as we consider inappropriate to form a separate cluster for one region only.

It should be noted that international studies have shown that the level of environmental sustainability of Ukraine is constantly decreasing. In terms of EPI (Environmental Performance Index, 2014) Ukraine is on the 95th place out of 178

countries covered by the survey and in recent years the trend was steadily negative. This is the lowest place among the neighboring countries. Slovakia is 21st, Hungary – 28th, Poland – 30th, Belarus – 32th, Russia – 73rd, Moldova – 74th and Romania – 86th. Other studies have confirmed (Siemens, 2010; UN, 2013) that Ukraine has significant environmental problems.

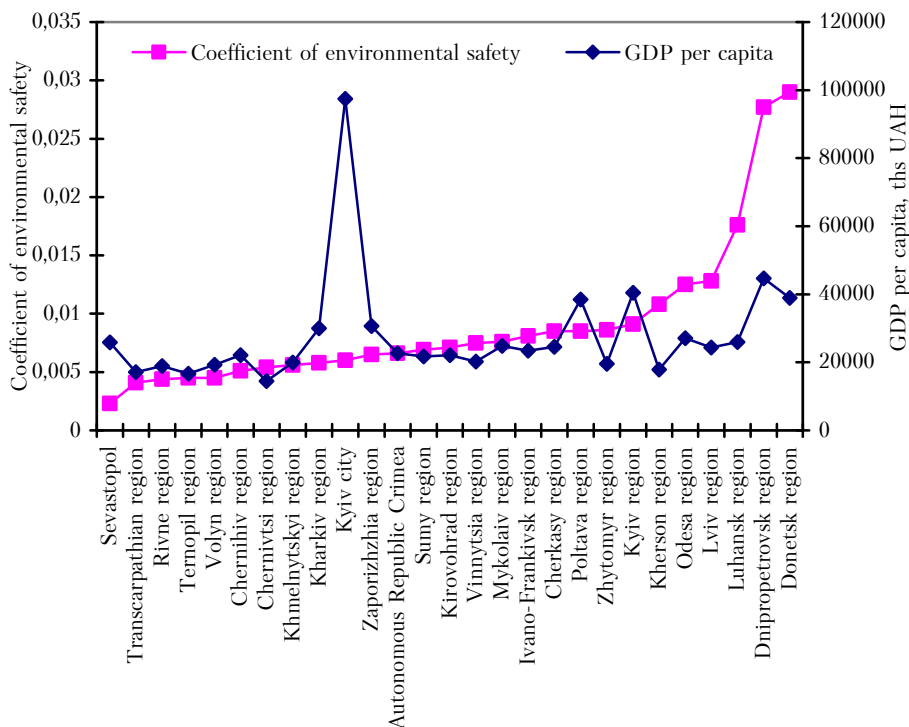


Figure 1. Correlation between the level of GRP per capita and environmental safety in the regions of Ukraine, 2012, compiled by the author

Table 2. Clustering regions of Ukraine by their of environmental safety in conjunction with GRP per capita, compiled by the author

# of cluster	Regions	Average Safety Coefficient	GRP per capita, UAH
1	Volyn, Sevastopol, Rivne, Zaporizhzhia, Kharkiv, Kyiv (city)	0.0067	37006.3
2	Autonomous Republic Crimea, Ternopil, Vinnytsia, Kirovohrad, Zaporizhzhia, Sumy, Cherkasy, Zhytomyr	0.0086	21069.3
3	Mykolaiv, Chernivtsi, Khmelnytskyi	0.0112	19762.3
4	Transcarpathian, Ivano-Frankivsk, Kyiv, Chernihiv region, Odesa, Poltava	0.0118	28090.0
5	Lviv, Kherson	0.0148	21148.5
6	Donetsk, Dnipropetrovsk, Luhansk	0.0343	40821.3

Complex ecological situation in Ukraine entails serious consequences for the country, because economics and ecology have strong mutual influence. Ukraine's economy is characterized by high consumption of natural resources, energy con-

sumption and ineffective use of secondary raw materials. Intensive and energy inefficient economy of Ukraine together with very outdated logistics determine high values of emissions into the atmosphere, the accumulation of wastes, water pollution and land depletion. Compared to the EU, Ukraine has significantly higher rates of fuel and energy resources per unit of GRP, emissions into the air, waste etc.

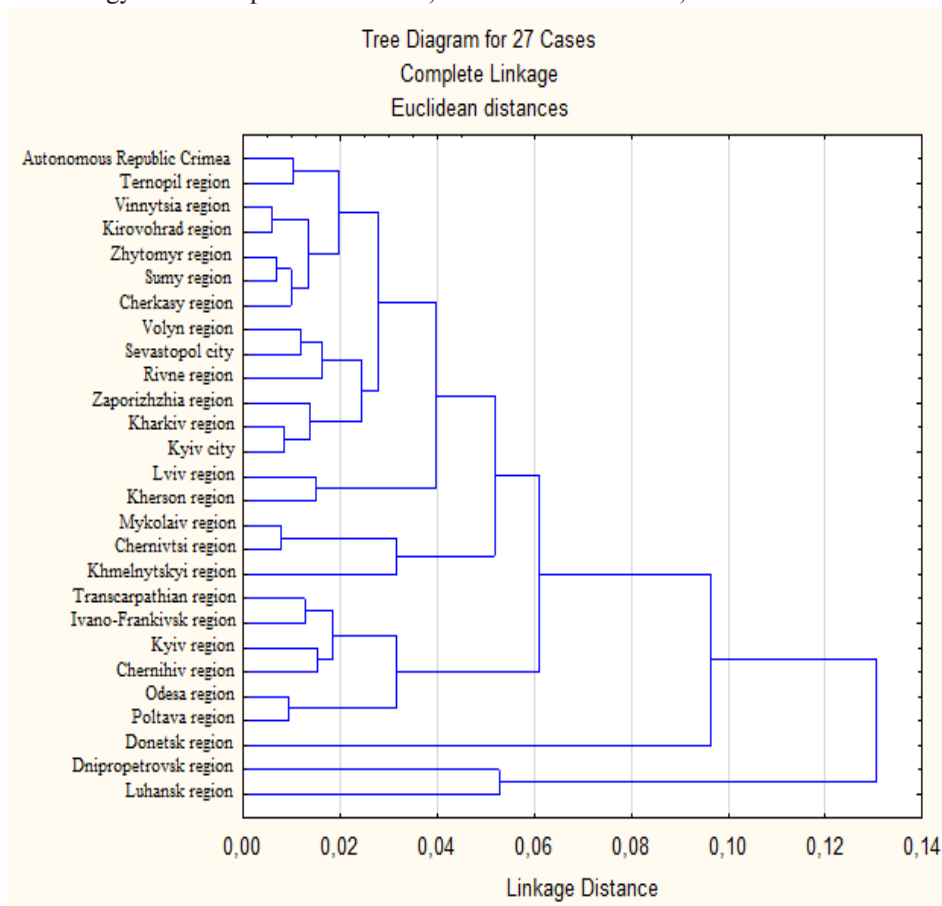


Figure 2. Clustering of Ukraine's regions by their environmental safety in correlation with GRP per capita, calculated by the author

The generalized data (Table 2) shows that Ukraine's economy is one of the most energy intensive. Per each 1000 USD of GDP Ukraine spends twice more energy than Russia and Bulgaria, more than 3 times than Czech Republic and almost 9 times more than Japan. There is a clear correlation between GDP per capita and energy efficiency. Countries with high GDP per capita are characterized by significant energy efficiency, while in the countries with relatively low GDP per capita the situation is the opposite.

In addition, as compared to European countries as of each 1 USD of GDP Ukraine emits sulfur dioxide 24 times more, ammonia – 23 times more and nitrogen oxides – 8 times more. Water pollution is 11 times more than in developed countries.

Table 3. Dynamics of energy efficiency and economy of some countries of the world (kg. conv. pal. (oil equivalent) / 1000 USD of GDP)

Year / Country	2005	2006	2007	2008	2009	2010	2011	2012
<b>Ukraine</b>	<b>1579.0</b>	<b>1276.0</b>	<b>948.7</b>	<b>732.8</b>	<b>957.1</b>	<b>886.2</b>	<b>768.6</b>	<b>710.7</b>
<b>The USA</b>	179.5	168.3	163.8	157.6	153.0	152.5	145.8	136.0
<b>Russia</b>	848.0	682.5	523.3	411.5	529.8	442.0	366.7	344.5
<b>Germany</b>	119.7	117.0	97.6	90.2	93.3	97.6	84.7	91.0
<b>Great Britain</b>	98.3	90.8	76.4	81.2	94.0	93.5	80.9	82.2
<b>France</b>	123.1	115.8	99.7	91.4	93.5	98.7	88.0	94.0
<b>Italy</b>	103.6	98.5	85.5	78.2	79.6	84.3	77.2	80.7
<b>Poland</b>	300.1	222.5	225.0	181.7	213.7	211.8	193.5	199.3
<b>Czech Republic</b>	348.3	310.8	252.0	197.4	212.0	219.2	198.2	213.3
<b>Romania</b>	401.3	330.9	219.8	188.4	206.9	208.1	193.8	198.3
<b>Bulgaria</b>	678.3	602.2	460.6	376.3	350.0	372.9	356.7	351.2
<b>Japan</b>	116.2	121.7	120.9	107.4	94.9	92.2	81.5	80.2

Calculated by the author according to (BP, 2014; The World Bank, 2014; CIA, 2014).

Ukraine's economy suffers from significant losses due to natural and anthropogenic emergencies. They cause considerable damages to the economy and population of the country. Environmental emergencies are expanding, not only of facility character, but also of local and regional influences. Thus, the volume of damages caused by them largely depends on their nature. According to the State Service of Emergencies of Ukraine, in 2013 the Crimea sustained the largest losses of 192500 ths UAH. Overall, in 2013 material damages of different character from EE were equal to 352255 ths UAH. It should be noted that in recent years in Ukraine there is a reduction trend in terms of the EE number and the number of deaths from them.

The relation between economy and ecology is confirmed by the decoupling effect – the phenomenon of divergence between economic growth and the reduction of environmental influence, which in the context of providing sustainable eco-safe economic development in recent years attracts more and more attention of scholars and international organizations. Decoupling is defined as the strategic basis for the development of green economy as the one that "leads to improvement of human welfare and social justice, and at the same time significantly reduces environmental risks and resource consumption". One kind of manifestation of the decoupling phenomenon is "decoupling of influence", which is considered as an increase in eco-efficiency and provides an increase in output (GDP increase) while reducing the negative impact on the environment. According to the scenarios, 3 relationships between economic growth and environmental load can be identified and will be expressed in terms of decoupling factor ( $F$ ). If  $F < 0$  – environmental burden exceeds economic growth; if  $F = 0$  – the situation has ambiguous character; if  $F > 0$  – economic growth occurs simultaneously with a decrease in the burden on the environment or under no changes of the load level on the environment – the absolute decoupling (Fischer-Kowalski, 2011).

The study on general decoupling trends in Ukraine shows how economic growth component increases the burden on the environment (Figure 3).

The index had a positive value (except 2003 and 2010), so it makes sense to ask about presence of only relative decoupling. The above analysis gives grounds to state that in Ukraine there is an irrational system of the environmental management of socioeconomic development, as it is repeatedly emphasized. Thus, there is an appar-

ent need for a balanced state policy aimed at ensuring the sustainable development of its economic and environmental components, and thus to achieve the effect of decoupling it is necessary to focus both on the extent of the usage of resources associated with economic activities, and the impact on the environment. Achieving decoupling will require a number of changes at all levels. This includes changes in public policy, in corporate behavior, and also changes in consumption patterns.

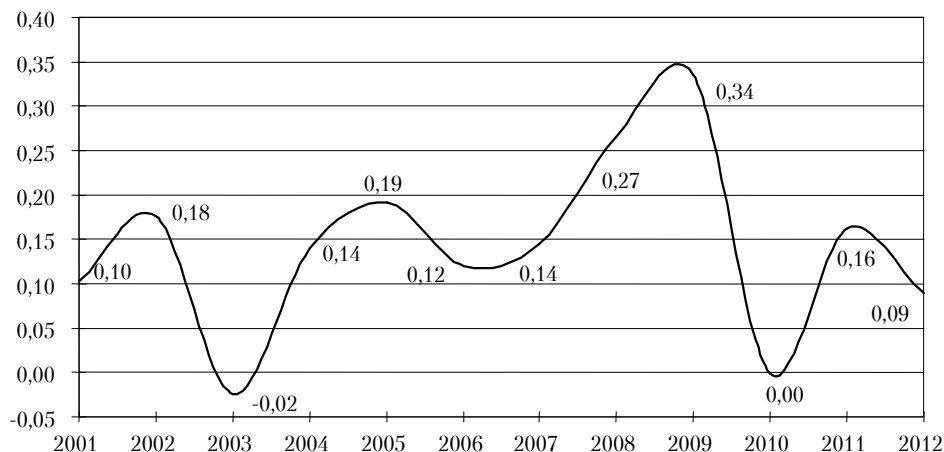


Figure 3. Dynamics of decoupling in Ukraine, 2001 to 2012, compiled by the author

One of the basic postulates of the sustainable development concept in Ukraine is increasing the environmental safety of the regions due to increasing level of their economic development, in particular, due to the spread of advanced technologies and secondary resources usage. Thus, the sector of recycling and the reuse of wastes are becoming a profitable sector. For example, there is economization of wastes based on new organizational and economic mechanisms and state assistance. Within these trends in developed countries qualitative changes are launched in economy and in society. (Khvesyuk and Stepanenko, 2014).

Such trends can be achieved by eliminating environmental threats for sustainable development in accordance with purposeful and effective search for alternative sources of energy conservation; by developing and using resource-saving, environmentally friendly, non-waste technologies; by taking extensive measures to reuse materials in economic exchange; by promoting the development of comprehensive ecological business; by creating a comprehensive system of environmental education for all population groups; by providing economic responsibility in the form of fines and other payments for violations. This can be achieved by modernizing the economic mechanism of ensuring environmental safety and environmental management.

Today it can be claimed that environmental aspects have not received a wide representation in sectoral policies. The introduction of new environmentally friendly technologies and the spread of best practice in this regard is very slow in Ukraine. Low energy prices retaining for a long time, and high levels of equipment deprecia-



tion led to the fact that Ukraine holds the world's 6th largest in terms of gas consumption manufacturing 3–4 times exceeding the performance of European countries. But soon the situation must change fundamentally, as the crisis in relations with Russia – a major supplier of natural gas to Ukraine urges to begin the process of reducing the energy dependence of Ukraine and to diversify energy supply sources. This should be promoted by a balanced integration of environmental policies into sectoral policies with mandatory environmental component when developing strategies, plans and programs of Ukraine and its regions, the introduction of environmental management at enterprises, the "greening" of all economic activities.

The primary task of today's environmental policy in Ukraine must be solving the problems that caused environmental pollution. On the basis of the existing legislation short-term and long-term plans should be developed to improve the environment and conservation measures. It has to become a part of economic and investment policies and the basis for establishing priorities.

The basis of this policy should be economic tools ensuring environmental safety and environmental management. The main economic instruments of environmental management and environmental safety are presented in Figure 4.

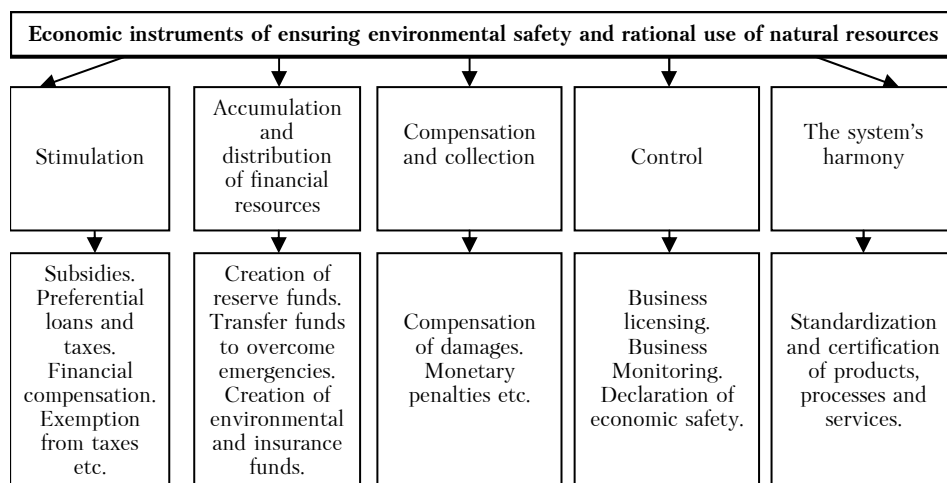


Figure 4. Economic instruments of ensuring environmental safety and rational use of natural resources, compiled by the author

Economic mechanisms are of primary importance in the implementation of national environmental policy. In the regulation of the Verkhovna Rada of Ukraine "On main directions of the state policy of Ukraine in the field of environment, natural resources and environmental safety" the importance of economic mechanism of nature use as the main component of the mechanism for implementing national environmental policy is emphasized. However, in the Law of Ukraine "On Fundamentals (strategy) of the State Environmental Policy of Ukraine till 2020" it is emphasized that ensuring sustainable financing of environmental activities, improvement of economic instruments are the basic premises for the implementation of environmental policy in Ukraine. Economic mechanisms of environmental policy, nature and environmental safety are the mechanisms of environmental control, which on the one



hand, act as motivation tools of nature users to a smaller impact on the environment and on the other hand, – the sources of environmental funds establishment. Important functional components of economic environmental control systems are the systems of state budget and off-budget financing of measures. The analysis of the Strategy of the State Environmental Policy of Ukraine, the Law of Ukraine "On Fundamentals (strategy) of the State Environmental Policy of Ukraine till 2020", indicates a lack of a thorough model. Instead, this block contains a list of activities, even very limited and with some duplication, rather than the expected strong economic platform for environmental policy based on sustainable development. In the above law it is stated that developed and implemented at the beginning of independence of our country economic instruments and mechanisms for financing environmental activities need further development in the context of globalization. Taking this into account, as well as weak capacity of current management decisions on the implementation of economic and socio-environmental national interests, the development of scientifically grounded proposals and recommendations aimed at building truly effective, constructive economic block implementation of environmental policy, is significantly updated.

Realizing the strategic objectives of improving the economic efficiency of the implementation mechanism within national environmental policy and increasing funding of environmental activities requires solving a number of issues, among which it is worth mentioning: improvement of environmental and economic performance for both producers and consumers; improvement of the legal framework for state support of environmental protection, expansion of market mechanisms use in this area and creation of a financial mechanism to attract private capital; ensuring stable funding and expanding financial resources for environmental measures, increasing the optimal share of expenditures on environmental protection in GDP; expanding the financial basis and cofinancing measures by combining different sources of financing for improving the use of funds on environmental purposes etc.

To accomplish the above objectives it is necessary to: reform the current framework of regulating natural resources payments by sources, including the system of issuing permits; optimize the tax system of forest, water, and land usage and financial support of natural economic systems with regard to their resource-specific character; improve the regulatory framework of payments for natural resources consumption based on objective rent assessments of resource sources and differentiation of relevant payments by quality and spatial characteristics and the mechanisms of rental income regulation; apply the result-oriented approaches to solving the problems of natural economic systems with regard to their specific nature; elimination of structural imbalances in regulations and amounts of payments between different categories of natural resources; create a system of incentives to attract domestic and foreign investments into environmental protection by creating a system of preferential refinancing of commercial banks in case of soft loans for investment projects on development and implementation of high-tech equipment and other innovative products, expansion of concessional lending for technical and technological measures related to safety; select performance indicators that would best describe the environmental condition and give an opportunity to assess the activities by their impact on the environment etc.

This will help stabilize and improve the environment in Ukraine by integrating the environmental policy into socioeconomic development to ensure an adequate environment, ecologically safe for life and health, as well as the introduction of ecologically balanced system of wildlife management and natural ecosystems conservation.

**Conclusions.** The study has shown that the ecological situation in Ukraine's regions is heterogeneous and depends largely on the structure of the economic complex. The lowest levels of environmental safety are observed in industrialized areas of Prydniprovya and Donbas, and the highest – with lower industrial development, especially in Western Ukraine. Thus, it is possible to trace the dependence according to which regions with higher GRP per capita GRP have significant environmental problems. This can be explained by outdated production technologies, lack of economic modernization and of harmonization of current legislation with European standards. There is an inverse situation in highly developed countries of Europe where the environmental safety level fits the economic development level. In Ukraine, only Kyiv has a clear similar trend to that of Europe.

To improve the ecological safety in Ukraine's regions and to ensure the country's sustainable development radical changes are necessary in the economic sector aimed at cleaner production systems and modernization of legislation. Therefore, this area of research requires further development, especially in the context of current and future economic reforms in the country. This can be achieved through systematic convergence of environmental legislation of Ukraine to the one of the European Union, in particular taking as one of the main purposes the permanent adherence to standards, norms, limits and processes specified in the EU Directives, including 2008/50 EU. This will not only significantly reduce the harmful impact on the environment, but also significantly rationalize the natural resources use.

#### **References:**

- Герасимчук З.В., Олексюк О.М.* Екологічна безпека регіону: діагностика і механізм забезпечення. – Луцьк: Надстир'я, 2007. – 280 с.
- Данилишин Б.М., Степаненко А.В., Ральчук О.М.* Безпека регіонів України і стратегія її гарантування: Монографія: У 2 т. / НАН України; Рада по вивченню продуктивних сил України; М.Д. Богдан (ред.) – К.: Наукова думка, 2008. – Т. 1: Природно-техногенна (екологічна) безпека. – 391 с.
- Хвесик М.А., Степаненко А.В.* Екологічна криза в Україні: соціально-економічні наслідки та шляхи їх подолання // Економіка України. – 2014. – №1. – С. 74–86.
- Environmental Performance Index. Full Report and Analysis // Environmental Performance Index, 2014 // [epi.yale.edu](http://epi.yale.edu).
- European Green City Index // Siemens, 2009 // [www.siemens.com](http://www.siemens.com).
- Fischer-Kowalski, M.* (2011). Decoupling natural resource use and environmental impacts from economic growth. A Report of the Working Group on Decoupling to the International Resource Panel. In: M. Fischer-Kowalski, M. Swilling, E.U. von Weizsacker, Y. Ren etc. United Nations Environment Programme, 2011. 174 p.
- GDP (current US\$) // The World Bank, 2014 // [data.worldbank.org](http://data.worldbank.org).
- McConnell, K.E.* (1995). Income and the demand for environmental quality. *Environment and Development Economics*, 2: 383–400.
- State of the World's Cities 2012/2013. Prosperity of Cities // UN-HABITAT, 2013 // [mirror.unhabitat.org](http://mirror.unhabitat.org).
- Statistical Review of World Energy 2014 // BP plc, 2014 // [www.bp.com](http://www.bp.com).
- The World Factbook // Central Intelligence Agency, 2014 // [www.cia.gov](http://www.cia.gov).

Стаття надійшла до редакції 30.09.2014.