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# DEVELOPMENT OF COMPREHENSIVE QUANTITATIVE INDICATOR OF ENVIRONMENTAL STABILITY OF THE ECONOMY OF KAZAKHSTAN

*The need for a comprehensive qualitative assessment of such an imperative (natural) resource in the economy as an ecological environment and the impact of its state on the overall economic efficiency of the national economy is shown. The interconnection between the socio-economic development of society and the quality of the imperative resource is shown; shows the dependence of the effectiveness of the use of imperative resource on its quality, which deteriorates as a result of human activities and excessive environmental load; a number of methodological recommendations for improving the economic mechanism for protecting imperative resources was proposed.*

***Key words:*** *imperative resource, environment, ecological factors, ecological load, green economy, sustainable economy.*

*Жұмыста экономикадағы императивті (табиғи) ресурс ретіндегі экологиялық ортаның ұлттық экономиканың жалпы экономикалық тиімділігіне әсерін кешенді сапалы бағалау қажеттілігі көрсетілген. Қоғамның әлеуметтік-экономикалық дамуы мен императивті ресурстың сапасы арасындағы қатынасы көрсетілген; императивті ресурстың адамның қызметі мен экологиялық жүктің шамадан тыс төмендеуі нәтижесінде нашарлайтын оның сапасына қолданылу тиімділігіне тәуелділігін көрсетеді;императивті ресурстарды қорғаудың экономикалық механизмін жетілдіру бойынша бірқатар әдістемелік ұсыныстар берілген.*

***Түйін сөздер:*** *императивті ресурс, қоршаған орта, экологиялық факторлар, экологиялық жүктеме, жасыл экономика, тұрақты экономика.*

*Показана необходимость комплексной качественной оценки такого императивного (природного) ресурса в экономике, как экологическая среда и влияние ее состояния на общую экономическую эффективность национальной экономики. Показана взаимосвязь между социально-экономическим развитием общества и качеством императивного ресурса, зависимость эффективности использования императивного ресурса от его качества, которое ухудшается вследствие антропогенной деятельности человека и чрезмерной экологической нагрузки; предложен ряд методических рекомендаций по совершенствованию экономического механизма охраны императивных ресурсов.*

***Ключевые слова:*** *императивный ресурс, окружающая среда, экологические факторы, экологическая нагрузка, зеленая экономика, устойчивая экономика.*

Problems of violation and destruction of ecological balance today become problems not only of the material well-being of mankind, spiritual and physical health of society, but also the very existence of human. From the point of view of the effective use of natural resources, humanity faces the need to resolve a wide range of problems in the formation of a qualitatively different relationship between nature and society. It can be said that at present humanity is in a peculiar point of bifurcation: evolution or degradation.

For many centuries man has invaded (and continues to invade) natural processes, and this leads to the destruction of many species of plants and animals from the biocenosis system. Extensive use of resources and pollution of nature took the nature of a planetary disas-

ter. The modern reproduction cycle of society is largely wrested from the fabric of natural reproduction processes. So, for example, mankind synthesizes the rarest elements in huge quantities and saturates them with the surface of the planet, new chemical compounds that change the chemical composition of the biosphere are produced, and radioactive elements that are scattered in nature in local volumes, the person concentrates and creates radiation sources that are absent in the natural environment .

Currently, environmental factors play an increasingly important role in limiting the direction of development of society.

The objective necessity of preserving the conditions that determine the vitality and vital activity of man, puts forward a number of imperatives to ensure its sustainable development.

A set of primary factors of the most important factors, phenomena and processes that ensure the existence of life on earth while objectively restricting human activity and requiring them and taking into account in all spheres of its life activity to achieve co-evolution of nature and society, are imperative resources[1]. They are based on four basic factors: land, water, air, solar energy; all of them are a global limiting factor in the direction of development of society.

Correctly understood and correctly expressed requirements of imperative resources will allow to avoid excessive costs of a society and, ultimately, not only to provide resource efficiency, but also to save a civilization and ensure its sustainable development.

In the composition of imperative resources there are: natural processes and phenomena; ecological and sanitary-hygienic conditions and factors.

The objective existence of imperative resources and their role in providing resource efficiency necessitate:

– the fullest possible detection of them;

– determining the requirements and conditions they put forward for human activities;

– accounting for the requirements of imperative resources in the implementation of all types of activities.

The environment, that is, its biophysical and chemical components, acts as the most important imperative resource - the most important factor ensuring the quality of life and influencing the level of social and economic development.

In the analysis of the problem of environmental quality, it is of fundamental importance that a person acts in relation to the natural environment in two ways: on the one hand, as a biological being with his utilitarian applied interests, and on the other, as a social individual capable of nature-forming activity. Differences between these qualities form relationships with the surrounding nature, differing in the purposes, functions, scales of manifestation.

Some aspects of the quality of the environment are reflected in particular terms “water quality”, “air quality”, “soil quality”, etc. These terms, widely used in assessing the state of natural complexes, are filled with practical content, but they do not exhaust all the specifics of the concept of “quality of the environment”.

The quality of the environment is not limited to the sum of water quality indicators, air quality, soil, landscape, etc., since in its separate expression each indicator has its own functional limitations.

The content of the concept of "quality of the environment" should be considered in development, taking into account the fact that it was ultimately formed as a result of generalization of particular or less generalized concepts reflecting the state of individual elements of an integrated system.

Comprehensive assessment of the environment on various, irreducible grounds, initially contains a practical inferiority, because in principle it is not able to overcome the barrier of a different quality of biocenosis.

In connection with the fact that when assessing the quality of the environment, the principal irreducibility of various characteristics to a single denominator is noted, it can be concluded that the quality of the environment is a functional poly-aspect characteristic of subject-object (socionatural) relations in their practical application.

It is possible to speak about the ecologization of the economy if the following pattern is observed: a positive growth rate of GDP per capita with a stable rate of decreasing the environmental load, which requires research into the dynamics of the state of the environment and the environmental load caused by emissions from stationary and mobile sources of pollution, industrial and household waste, etc.

In the context of a green economy, the indicator of the ecological load and the ecological state of the environment should testify to the improvement of the ecological condition of the territory as a whole and to the reduction of the load on the environment with the growth of the economy.

In calculating the criterion of environmental load, you can include indicators:

– index of water pollution (IWP);

– the volume of untreated sewage per capita ($S_{uv}$), m3 / person;

– the share of untreated sewage in the total volume ($S_{uvs}$),%;

– Index of atmospheric pollution (IAP);

– volume of emissions per capita (E), tons / person;

– the share of organized sources of emissions in the total number of stationary ($S_{os/ss}$),%;

– volume of over limit emissions (P), tons;

– fraction of substances emitted into the atmosphere from the total amount of substances formed ($S_{e/fs}$),%;

– the share of disposed substances with respect to those captured and rendered harmless at treatment facilities ($S_{ds/ds}$),%;

– share of hazardous waste ($S_{h/w}$);

– amount of hazardous waste per capita (HW), kg / person;

– the proportion of recycled waste in total ($S_{rw}$),%;

– the amount of non-utilized waste per capita (NW), kg / person.

The composition of indicators can be reviewed and optimized. These ecological indicators can be divided into three groups, characterizing the ecological state of the aquatic environment, atmosphere and soil.

However, without calculating the integrated single quantitative indicator of the ecological state and the load on humans and the natural environment, it is impossible to infer the direction of the change as a whole different component indicators vary in different directions, both in the direction of deterioration and in the direction of improvement.

The proposed formula for calculating the criterion is as follows:

$$EL = \frac{IWP * S_{uv} * S_{urs} * IAP * E * P * S_{e/fs} * S_{w/n} * HW * NW}{S_{os/ss} s_{ds/ds} S_{rw}}$$

The numerator included indicators, the decrease in the value of which positively affects the environment and human health, and, as a result, strengthening the environmental security of the country, region and city. In the denominator - those indicators, the increase of which means the easing of environmental tension and environmental stress. The lower the value of the indicator, the lower the environmental load and the safer living in the area. Calculation and study of this indicator in the dynamics will make it possible to comprehensively evaluate the effectiveness of ongoing activities and implemented programs in the field of environmental protection. Calculation and study of this indicator within the territories will allow to compare the territories by the ecological load. Table 1 shows the calculation of the Ecological Load Index (EL) in the Republic of Kazakhstan.

***Table 1 –*** Calculation of the Ecological Load Index (EL) in the Republic of Kazakhstan

| Indicator | Year | | | | |
|---|---|---|---|---|---|
| | 2013 | 2014 | 2015 | 2016 | 2017 (prognosis) |
| IWP | 1,91 | 1,819 | 1,9 | 1,9 | 1,9 |
| $S_{uv}$ | 12,6 | 10,3 | 9,2 | 9,9 | 9,88 |
| $S_{uvs}$ | 0,034 | 0,031 | 0,027 | 0,0285 | 0,02642 |
| IAP | 5,39 | 5,21 | 5,35 | 5,35 | 5,35 |
| E | 0,136 | 0,142 | 0,142 | 0,14 | 0,1394 |
| $S_{os/ss}$ | 0,6578 | 0,676 | 0,6555 | 0,6506 | 0,6518 |
| P | 0,68 | 0,66 | 0,54 | 0,5 | 0,497 |
| $S_{e/fs}$ | 0,0793 | 0,0772 | 0,0714 | 0,0682 | 0,0648 |
| $S_{ds/ds}$ | 0,2488 | 0,2469 | 0,283 | 0,2857 | 0,2553 |
| $S_{h/w}$ | 0,332 | 0,991 | 0,99 | 0,989 | 0,9874 |
| HW | 18,5715 | 25,40789 | 21,1985 | 23,16956 | 23,594 |
| $S_{rw}$ | 0,299 | 0,162 | 0,388 | 0,3277 | 0,3316 |
| NW | 39,2731 | 21,4973 | 13,114 | 15,75274 | 17,058 |
| EL | 160,05 | 438,29 | 52,86 | 81,14 | 85,79 |

The indicator of ecological load takes into account the trends of all indicators and allows estimating the direction of the change in the ecological state as a whole. The proposed formula is a basic option. It can be further refined and optimized. Figure 1 shows the dynamics of this indicator for Kazakhstan. If the economy of Kazakhstan was sustainable from an ecological point of view, the schedule would monotonously decrease. Thus, the environmental burden on the environment and human beings in Kazakhstan in 2014 relative to 2013 increased, in 2015 compared to 2014 - decreased, in 2016 - again increased, and the forecast for 2017 - increased load.

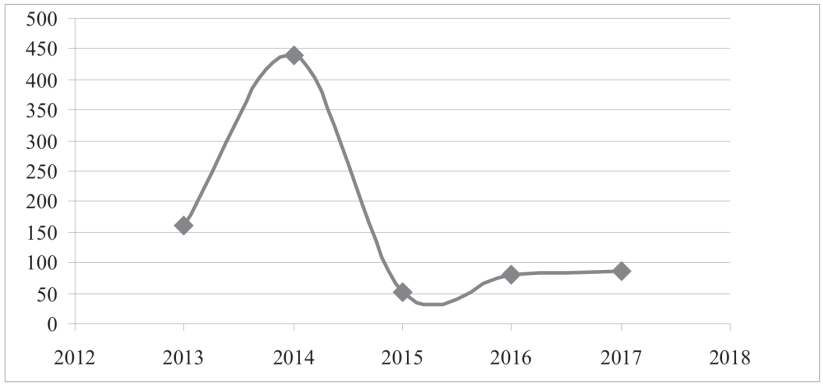


***Figure 1*** – Dynamics of the integrated indicator of environmental load for

Kazakhstan for the period from 2013 to 2016 year and its forecast for 2017

During the period under review, there is no stable growth trend for this indicator, which indicates the insufficient effectiveness of environmental protection measures. One of the main mechanisms for protecting the environment from the harmful effects of production and consumption processes is the economic mechanism, which is aimed at economic stimulation, which includes two main aspects: payments for pollution of the environment (for emissions); economic assessment and compensation for environmental damage.

A comparative analysis of approaches to calculating payments and assessing the damages of Kazakhstan and Russia showed that not all possible situations of excessive pollution of the environment have been considered in the Kazakh methodology, a wide range of factors and increasing coefficients to the payment rates that would allow for the formation of a more efficient economic mechanism from the point of view view of stimulating a reduction in the burden on the environment. The proposed coefficients, which should be taken into account in calculating payments and assessing damages in the RK:

– coefficient taking into account the state of the atmosphere in the regions of Kazakhstan (average wind speed, average air humidity, average rainfall) - for emissions;

– a coefficient that takes into account the population over which the pollution spreads - for emissions;

– factor that takes into account the ecological factor (state of water bodies) along the river basins of Kazakhstan - for discharges;

– coefficient that takes into account the ecological state of the soil in the regions of Kazakhstan - for the placed production and consumption waste;

– a factor that takes into account the location of waste and the sanction, the organization of the location of their location - for the placement of production and consumption waste;

– coefficient taking into account the level of occurrence of groundwater, the mechanical composition of the soil - to accommodate production and consumption wastes;

– increasing factor for excess pollution to the normative pollution rate;

– coefficient taking into account natural and climatic conditions depending on the season;

– coefficient taking into account the ecological state of the water source;

– a coefficient that takes into account the intensity of the negative impact of harmful pollutants on the water body and should depend on the multiplicity of the actual concentration

of the pollutant when discharged at the wastewater outlet over its background concentration in the water of the water body;

– coefficient that takes into account the area of the contaminated site;

– coefficient taking into account the depth of soil contamination;

– coefficient, taking into account the category and purpose of the polluted land;

– a coefficient that takes into account the nature of the territory over which pollution is spread;

– a coefficient that takes into account the population that experiences an excess of pollutant exposure;

– coefficient that takes into account the acceleration of depreciation of fixed assets;

– a coefficient that takes into account the state of the atmosphere in a given region;

– a coefficient that takes into account the nature of the dispersion of impurities in the atmosphere.

These coefficients should be used more often as raising factors. Another drawback of the methodology for calculating payments in the RK for emissions to the environment is the fixing of a limited number of substances in the tax code, for which pollution charges are levied, in fact, enterprises throw out a significantly wider list of pollutants.

Also, the proposed coefficients need to strengthen the indirect approach of the economic assessment of environmental damage, which is based on the assessment of damage by multiplying excess pollution by the specific damage from 1 ton of excess. These coefficients should be included in the calculation of specific damage from 1 ton of excess of a specific pollutant.

In addition, the Kazakh method of economic damage assessment does not consider and does not approve the assessment of damages arising in the following cases:

1) pollution of water bodies with organic and inorganic substances, pesticides as a result of accidents;

2) pollution of water bodies by discharges of domestic wastewater from ships and other floating objects and structures;

3) pollution of water bodies with garbage, production and consumption wastes, including from floating facilities and stationary facilities;

4) pollution of water bodies with suspended solids during exploration and production of mineral resources, carrying out dredging, blasting, drilling and other works related to changes in the bottom and shores of water bodies;

5) damage to water bodies in case of their partial or complete depletion as a result of water abstraction with violation of water use conditions;

6) damage to the animal and plant life.

Economic assessment of damages in these areas should be fixed in uniform guidelines, be clear, concise. Russia's experience in this matter can be used as a basis for developing formulas, methods and approaches.

The analysis of the official data of the Russian Federation and the Republic of Kazakhstan on the directions of the ecological state of the aquatic environment, atmosphere and soil shows that there is no clear trend towards increasing the ecologization of the economies of our countries.

The ecological state of surface water sources largely depends on the volume of waste water and the specific gravity of untreated sewage. Thus, in the Russian Federation, despite

the fact that the discharge of contaminated sewage in the last 10 years has decreased by almost 20%, nevertheless it is more than 15 billion $m^3$ [3]. The maximum load from pollution is experienced by the basins of the Ob', Volga and Amur rivers, which account for more than 70% of all cases of high and extremely high pollution [2].

In the Republic of Kazakhstan, the share of untreated sewage over the past 10 years has increased and there is no stable tendency to improve the ecological status of any water source. Of the 11 main surface water sources in Kazakhstan, only two (Irtysh and Ural rivers) in the water pollution index can be classified as "clean". Thus, it can be said that the measures taken to protect water sources are insufficient.

As is known, the complex indicator of the state of atmospheric air is the atmospheric pollution index (IAP). Of the 22 major cities in Kazakhstan, only one city (Kokshetau) can be classified as clean according to the IAP indicator in terms of atmospheric air. In Russia, the level of atmospheric air pollution in cities is also high. Regular monitoring of air quality is carried out by Roshydromet in 223 Russian cities, and in 138 of them the degree of air pollution is estimated as very high and high, and only 18% of cities have a low level [2].

In Russia, more than twice in the past 10 years, the annual volume of production and consumption was increased and amounted to more than 5 billion tons in 2012. At the same time, the volume of hazardous wastes amounted to 114 million tons, or 2.3% of the total amount of waste [3]. Although in Kazakhstan the total amount of waste annually decreases, but more than 90% of the total volume of production and consumption wastes are classified as hazardous. As a positive moment, it should be noted that in our countries the volume of household waste per capita, according to official statistics, is much less than in many European countries, for example, in Switzerland, Germany, France [4].

In the intercountry comparison of data on current environmental expenditures, Russia in this indicator is on a par with many European countries, where costs are 0.7-0.8% of GDP and in Kazakhstan this figure is only 0.1% [4].

The effectiveness of using such a resource as the quality of the environment is difficult to assess. Different subjects (population, government, business) evaluate it from different points of view. The population is interested in indicators related to health and safety. For government bodies, budgetary investments in environmental protection measures are often the determining ones, and for business the effectiveness of the investments made is expressed, first of all, through the improvement of financial indicators, increase in profit.

Both in Russia and in Kazakhstan, at the state level, a number of important programs have been adopted in recent years aimed at improving the resource efficiency of the economies of both countries. They outline the main directions for increasing the energy and resource efficiency of the economy with the expectation of a multiplicative effect on reducing the burden on the environment, increasing its quality and value as an important resource.

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