Ecologization and problems of modern civilization

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Abstract. The development of the productive forces of individual regions of Russia at the present stage determines the relevance of problems associated not only with obtaining the maximum return from the employed economic potential in its full extent, but also with the prospects for the integrated and rational use of mineral, raw materials and fuel and energy resources, and the use of new management methods, improving the mechanism of organization and production management. At the same time, the pace of development of the latter is still low, and the comprehensiveness of the use of mineral raw materials is still insufficient. In such a situation, it is necessary to justify the most effective ways of developing sectors of the mineral raw materials complex, the products of which are used both in the corresponding processing industries and for the expansion and modernization of the economy. It should be noted that greening the economy through the transition from technogenic to sustainable development will provide the opportunity for significant savings and release of a large volume of raw materials, and will also reduce environmental pollution and the amount of waste while increasing the final results. For example, combining several processes in the production of gasoline in one distillation column can help save raw materials and improve the environmental friendliness of oil refining due to reduced waste. Despite the identified reserves of various types of minerals, ultimately, they are limited, as a result of which the most rational way to ensure the progressive sustainable development of society is resource conservation.

1 Introduction

The problem of rational use of mineral raw materials, fuel and energy resources facing the country's economy occupies a special place. One of the ways of effective development of the real sector of the economy should be the structural restructuring of existing industries and the creation of new ones based on the integrated use of raw materials, taking into account the introduction of innovative processes.

Industries associated with the extraction, processing and transportation of oil and gas represent a dangerous source of possible environmental complications.

The combustion of this fuel is the main cause of atmospheric pollution with greenhouse gases, primarily carbon dioxide, shielding the earth's thermal radiation and thereby

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contributing to climate warming, as well as sulfur and nitrogen compounds that cause acid rain. CO2 is a global pollutant and is considered responsible for global warming and therefore climate change. Energy consumption accounts for 85% of CO2 emissions, making it a critical internal driver of climate change.

There is another aspect of the problem of environmental protection - the preservation of non-renewable natural resources for future generations.

The situation is different with energy resources. For 40 years, the dominant energy carrier - cheap, efficient and technologically advanced, on which the modern economy is based, has been oil. But gradually it will disappear from the economic arena, and with it, as many economists believe, the era of cheap and abundant energy will end. According to the latest data, oil reserves on Earth will last for about 40 years, and natural gas – for 60 years. However, there are large reserves of coal, which are approximately 3 times larger than oil and gas reserves combined. Coal accounts for approximately 80% of all energy resources, but is environmentally "dirtier" and an insufficiently efficient energy carrier [1].

Nevertheless, there is no successor to oil that has its advantages (abundance of reserves, ease of production and low cost), and the prospect of its appearance in the foreseeable future is still unclear.

An important problem of the coexistence of man and nature is also the accumulation of waste and toxic products from agriculture, industry and cities.

2 Literature review

Problem Research of forming sustainable economic systems has developed since the adoption of the Declaration on Environment and Development in 1992 in Rio de Janeiro (Brazil).

Significant contributions to the genesis and evolution of theoretical and methodological approaches to determining the ecologization of the country were made by D. Meadows, M. Mesarovic, E. Pestel, J. Tinbergen, M. Todaro, G.H. Bruntland, A. Gore, K. Annan, N. Desai and many other scientists.

Problems of development of countries specializing in the extraction and export of minerals and other natural resources were studied by A. Gelb, T. Gilfason, K. Matsuyama, J. Sachs, E. Warner, M. Alekseev, R. Conrad, R. Solow, D. Hartwick, H. Hotteling, M. Fardmanesh et al.

The works of A.A. Golub, I.P. Glazyrina, K.V. Papenova, R.A. Perelet, A.Y. Reteyum, E.B. Strukova, D. Ursula are devoted to these problems. The works of T.Kh. Alikhanova, S.N.Bobylev, A.Kh.Karasaeva, V.M.Lelevkina, A.V.Pozdnyakova, S.F. Solovyova and others are devoted to the study of methodological approaches to assessing the sustainability of regional ecosystems and the development of a system of indicators.

Despite the depth and unconditional significance of these developments in general for domestic economic science and the theory of sustainable development, the current pace of development of the world economy, accompanied by the depletion of natural resources and the increase in social and environmental threats, impose new demands on the development of economic systems and necessitate a holistic theoretical and methodological justification ensuring sustainability at the national, regional and sectoral levels and exploring ways to integrated solutions to socio-ecological-economic problems.

3 Methods

A global problem at the present stage is the deterioration of the environmental situation caused by human activities associated with huge amounts of emissions of toxic substances, the harmful effects of which are associated with a synergistic effect. Almost all

technological processes and installations of production facilities of the oil and gas complex pose a danger to the air basin and the environment, failure to comply with tightness requirements during production processes can also cause harmful emissions.

We are talking about taking into account the state of the environment and environmental benefits in the structure of social reproduction, the preservation and reproduction of which are considered part of the concept of sustainable development. The quality of the environment is closely related to the quality of life, represented as a set of comfortable conditions to ensure the functioning of society [2].

In other words, the correspondence of the living environment to the needs of society is characterized by the average life expectancy, the state of health of the population, and the level (frequency) of human morbidity. Environmental factors mainly manifest themselves indirectly through socio-economic factors (economic well-being and others); demographic factors (life expectancy, etc.).

Currently, economic growth is directly proportional to the output of production and consumption waste. If the mass of natural resources used by society per year is taken as P, the total mass of production and consumption waste is M, the mass of capital accumulation is K, then in general terms, with certain tolerances, the balance of material and physical flows for a year can be represented as P^M+K (unit of mass of substances).

The development of an effective environmental management system should be based on the creation of multi-purpose production programs that optimally combine economic and environmental goals [3].

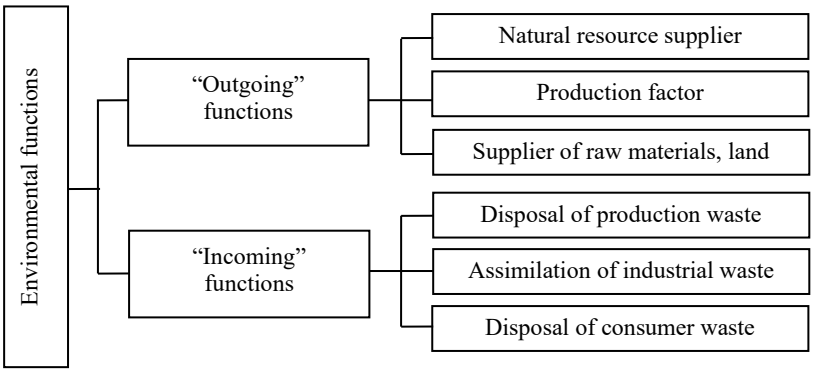
The interaction of the “society-nature” system makes it possible to identify in its structure the material and energy exchange processes between them, which are realized during production and consumption; production relations, which together form the internal social form of their interaction.

The limited capabilities of the environment, as well as the depletion of natural resources with the continuous development of a technogenic economy, contribute to the emergence of global environmental problems that lead to the degradation of human civilization. (Figure 1).

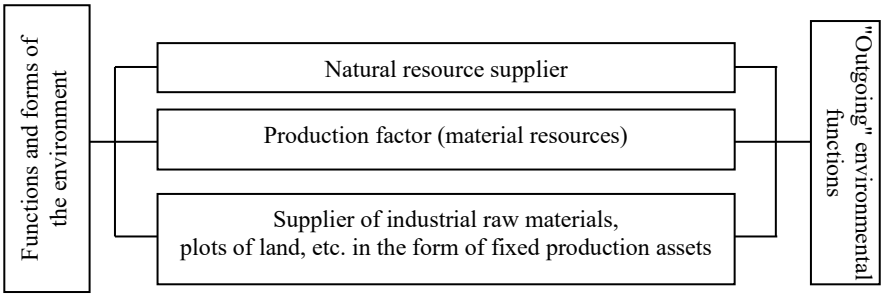
As follows from Figure 1, these environmental functions are part of the process of creating labor results in production. The introduction of prices for the right to use it would lead to the transformation of natural resources into an object of goods/money relationships. From the analysis and assessment of economic growth it follows that they do not sufficiently reflect environmental factors. Today, the level of economic development depends on the choice of goods and services produced, as well as on the environmental potential of its quality.

The social form of production relations reflects the material connections between society and nature and is an important factor in their organization. The study of the laws of interaction of a given system consists in establishing the relationship between the laws of nature and economic laws and the patterns of this interaction. The interaction between society and nature is based on solving problems regarding the object of management and the organizational structure of management.

activities have contributed to the development of anomalous phenomena today.



a) Classical theory of production and enterprise production costs



b) Neoclassical theory of production and production costs of an enterprise

Fig. 1. Environmental functions.

Incorrectly chosen guidelines in the relationship between society and nature, formal administrative approaches to environmental

One of the main causes of global environmental problems is the problem of the growth of the planet's population, i.e. the increase in the needs of humanity implies a quantitative increase in the growth of material goods, which leads to an increase in anthropogenic load, expressed in the form of an increase in emissions, industrial waste and wastewater, which affects the deterioration of the ecological state of the environment and increases contradictions in the "society-nature" system.

In the current situation, it is necessary to reconsider the mechanism for forming environmental policy in modern conditions and the criteria for assessing the economic development of individual regions and states [4].

The object of management at the enterprise level is considered to be its environmental activities, which remain so at the regional level and above, but are not limited to it. (Figure 2).

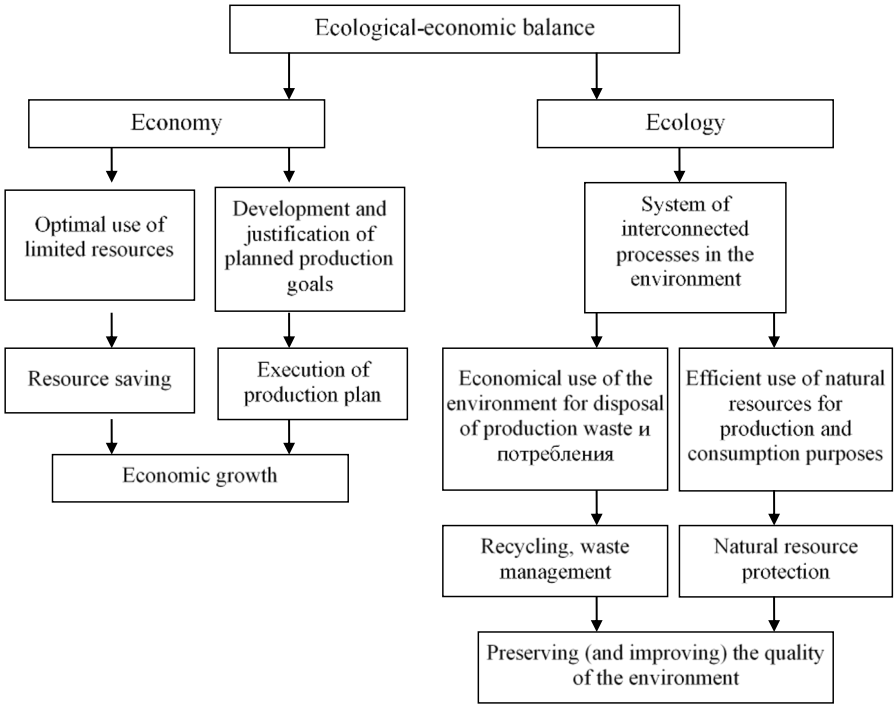


Fig. 2. Ecological balance model.

It should be noted that the main indicator of economic development is the gross national product, which until recently was a universal means of measuring the levels of economic development of countries around the world on a comparable basis. The shortcomings of GNP have begun to manifest themselves seriously at the present time. That is, speaking about the wear and tear of machinery and equipment, this indicator completely misses the problem of wear and tear of "natural capital", which in a certain part is non-renewable or partially renewable capital. In this regard, humanity can move from a technogenic type of development to a sustainable environmental one if there are certain restrictions in the use of natural resources by states and their regions are taken into account.

Currently, as a result of economic development, crisis situations have arisen in the relationship between man and nature. It turned out that the era of rapid industrial development led to disruptions in many natural systems due to the continuous saturation of the natural environment with waste gases, solid waste and sewage.

Solving environmental problems today requires efforts involving and activating all resources, both economic and scientific. Many environmental problems necessitate the justification of environmental priorities and principles of environmental protection planning [5].

Changes in the composition of the earth's atmosphere are occurring rapidly due to an increase in dust and gaseous emissions. Currently, more than 300 substances and compounds enter the atmosphere in the form of sulfur dioxide, carbon dioxide, carbon monoxide, nitrogen oxide and dust of various chemical compositions.

According to forecasts provided by the International Corporation for Scientific Research and Technology, the annual volume of residual products of production and consumption in the world has increased over 30 years for CO, C02, SO2, from 19,7 to 0,97 and for organic agricultural and household waste from 14,1 up to 37,4 billion tons. At the same time, official

sources contain data that indicate the danger and consequences of production waste on humans (Table 1).

Table 1. Characteristics of the air basin at various concentrations of pollutants.

Main air pollutants	Hazard Class	Condition of the air basin at lead concentration, mg/m		
		Causes concern	Dangerous	Extremely dangerous
Inorganic dust	IV	0.15	0.75	0.75
Sulphur dioxide	III	0.05	0.2	0.38
Nitric oxide	II	0.085	0.255	0.765
Hydrocarbons	IV	1.5	7.5	37.5
Lead	I	0.0007	0.00125	0.00224
Hydrogen sulfide	II	0.008	0.024	0.072
Sulfuric acid	II	0.1	0.3	0.9
Mercury	I	0.0003	0.00054	0.00096

Existing statistics indicate that the incidence of many diseases is significantly higher in contaminated areas.

The quality of the environment is closely related to the quality of life, represented as a set of comfortable conditions to ensure the functioning of society. In other words, the correspondence of the living environment to the needs of society is characterized by the average life expectancy, the state of health of the population, and the level (frequency) of human morbidity. Environmental factors mainly manifest themselves indirectly: through socio-economic factors (economic well-being and others); demographic factors (life expectancy, etc.).

The interaction of the “society-nature” system makes it possible to identify in its structure the material and energy exchange processes between them, which are realized during production and consumption; production relations, which together form the internal social form of their interaction [6].

As a social form of production relations, it reflects the material connections between society and nature and is an important factor in their organization. The study of the laws of interaction of a given system consists in establishing the relationship between the laws of nature and economic laws and the patterns of this interaction.

Thus, in the current situation, it is necessary to reconsider the mechanism for forming environmental policy in modern conditions and the criteria for assessing the economic development of certain regions and states.

The use of economic instruments and mechanisms should contribute to the internalization of environmental externalities.

Environmental payments and fines, which go in full to local budgets and are practically not used for their intended purpose, could be targeted for:

– assessing the assimilation potential of regional ecosystems (determine the actual state of the environment, acceptable levels of pollution);

– justification of new environmental standards in the region (based on the assessed assimilation potential of ecosystems);

– strengthening the instrumental potential of environmental monitoring systems, strengthening the human resources of laboratories and environmental monitoring stations.

The implementation of these projects will be a preparatory stage for the introduction of territorial markets for pollution quotas in the managed territory.

Practice shows that the right (permission) to place production waste in OS becomes the same resource as securities, patents, licenses, etc., since it has legal force and is an object of sale and purchase [7].

A modern environmental quality monitoring system is needed that allows for a prompt response to violations, including informing the public and local residents about burst emissions and discharges that can cause negative consequences for their health.

We propose to use the following economic instruments and mechanisms for managing environmental quality:

– improving the methodology for calculating pollution charges based on the use of an enterprise's eco-efficiency correction factor;
– formation of territorial markets for pollution quotas;
– formation of a national market for quotas for greenhouse gas emissions and participation of fuel and energy enterprises in the mechanisms of the Kyoto Protocol;
– formation of a market for industrial waste from the fuel and energy complex.

The proposed approach to improving the methodology for calculating payments for standardized environmental pollution is based on the use of adjustment coefficients to rates, which are determined based on real changes in the eco-efficiency indicators of each specific enterprise.

The methodology for calculating payments for environmental pollution is as follows:

$$П_i = T_i \cdot V_i \ , \tag{1}$$

where $П_i$ — payment for the i-th pollutant; T_i — tariff (rate) for the i-th pollutant; V_i — volume of the normalized i-th pollutant, then the proposed method will have the following form:

$$П_i = T_i \cdot V_i \cdot К_{ээ} \ , \tag{2}$$

where $К_{ээ}$ — an adjustment factor that allows taking into account changes (improvement or deterioration) in the enterprise's eco-efficiency indicators in the reporting year relative to the previous year.

$$К_{ээ} = УЗВ_t / УЗВ_{t-1} \ , \tag{3}$$

where $УЗВ_t$ — specific formation of a particular pollutant per unit of production in the reporting year; $УЗВ_{t-1}$ — specific formation of the same pollutant per unit of production in the previous year.

The correction factor for increasing specific emissions, discharges, and waste disposal will be greater than 1 ($К_{ээ} > 1$), with a decrease in specific emissions, discharge, disposal will be less than 1 ($К_{ээ} < 1$), with the same value equals 1 ($К_{ээ} = 1$). At constant payment rates, $(T, = consf)$ the more the eco-efficiency ratios improve, the more significantly the share of environmental costs in the enterprise's expenses decreases.

Oil producing companies must pay mandatory environmental insurance contributions before the start of a new planning period. The need for compulsory insurance should be enshrined in law.

We propose to take the planned volume of hydrocarbon production as the basis for calculating the contribution; we also need a uniform tariff for compulsory environmental insurance for all operators (formula 4).

$$\text{Contribution} = T \times V_{pl} \tag{4}$$

where T — tariff for calculating the mandatory environmental insurance premium, in rubles/tons; V_{pl} — planned volume of hydrocarbon production, in tons.

To determine the value of the assessment tariff, it is necessary to develop a methodology in the form of a multifactorial function, depending on such parameters as the area of the observed sea space, the total volume of hydrocarbon production, climatic parameters, the degree of environmental risk, etc.

Based on the results of the reporting period, if the actual production volume exceeded the stated target, it is necessary to recalculate and, adjusted for the internal rate of return of the ongoing project, to make an additional payment to the Defense Fund (formula 13).

$$\text{Surcharge} = T \times (V_{fact} - V_{pl}) \times i \quad (5)$$

where V_{fact}, — volume of raw materials extracted during the reporting period, in tons; i — internal rate of return of the ongoing project.

In our opinion, the creation of a compulsory environmental insurance system does not remove or mitigate legal liability from oil producing companies for violating environmental legislation.

The proposed system for rapid response to oil spills differs fundamentally from voluntary insurance in that this system provides operational assistance in eliminating accidents and their consequences, but on a reimbursable basis. Oil producing companies must provide their own system for eliminating accidents and their consequences.

One of the main factors reducing the generation of waste from enterprises is energy saving. Outdated technical standards for energy consumption today are a limiting factor in energy conservation and energy efficiency.

Factors that contribute to increasing the environmental and economic efficiency of enterprises are divided into exogenous and endogenous [8].

Exogenous factors that can significantly influence the increase in environmental and economic efficiency of enterprises:

– the desire of enterprises entering the global market to improve their environmental image. This is facilitated by obtaining ISO 14001 certification;
– reduction of production waste in the context of stricter environmental legislation;
– providing financial, educational and technological support to fuel and energy enterprises in order to jointly reduce greenhouse gas emissions.

Endogenous factors include measures that can help improve the environmental and economic efficiency of the functioning of fuel and energy enterprises:

– conducting an objective assessment of the state of environmental components, assessing the limits of sustainability of specific ecosystems and environmental mapping;
– adoption of a system of objectively justified maximum permissible concentrations of pollutants for each region;
– implementation of the principle of a differentiated approach to objects depending on the class of potential danger to the environment, which will improve the methodological base and improve the quality of EIA and environmental assessment of projects;
– environmentally destructive activities, fuel, energy and natural resources;
– instrumental strengthening of the environmental quality monitoring system;
– organization of territorial markets for pollution quotas and creation of the necessary market infrastructure;
– development of a system of compulsory and voluntary environmental insurance;
– creation of information systems using the best available technologies and technical solutions.

4 Conclusion

At the moment, many things have been done to improve the environmental policy of the Russian Federation. However, there are still many unresolved problems.

A system of compulsory and voluntary insurance will minimize damage from industrial accidents to both the enterprise and the environment and people.

A publicly accessible system of environmental information will enhance the sense of responsibility of resource users to society and the state. It is necessary to disseminate widely information among enterprises about international initiatives that encourage environmentally friendly production (methane utilization, small renewable energy sources, including biogas and wind turbines, small hydroelectric plants, etc.).

All the proposed tools and mechanisms for state management of environmental quality, in our opinion, will improve the environmental and economic efficiency of the functioning of enterprises, but also of all natural resource users. When carrying out reforms in environmental policy, the principle of predictability and gradual tightening of environmental and technical standards should be adhered to, which is important for the development of entrepreneurship [9].

There are no absolutely clean waste-free technologies, so we mean technologies whose waste is safe for specific ecosystems.

The technologies used in production can be improved, introducing step by step improving innovations or, if necessary and opportunities available, radical ones. The only question is how this or that innovation will affect the financial and environmental performance of a particular enterprise in real business conditions. As is known, the installation of new technological equipment in a stable operating enterprise is associated with some inconveniences, such as:

- downtime of other links in the technological chain,
- the need to retrain personnel servicing this area,
- risk of losing market share to competitors, etc.

For the implementation of environmentally friendly technologies, it is important to create an information portal on emergency situations on the Internet.

For large thermal power plants, nuclear power plants or hydroelectric power plants, information should be broken down by energy life cycle stage. There are still expensive but effective solar technologies for producing electricity (to cover peak energy loads) [10-14].

The main purpose of expanding access to technology information is to enable choices based on relevant technology information, which helps to justify national technology needs (for the transfer of environmentally friendly technologies from developed countries as assistance for sustainable development) and strengthen the country's own technological capacity.

References

1. Kh. G. Annaev, B. K. Arypova, Sh. P. Garayeva, G. D. Nurmukhammedov, Young Scientist **49 (444)**, 149-151 (2022)
2. G. Bayramova, N. G. Garayeva, A. Bekieva, Bulletin of Science **3**, No. 10 (67), 547-550 (2023)
3. E. B. Gylychdurdyeva, Young Scientist **1 (448)**, 122-124 (2023)
4. A. Ya. Ivakhnenko, Economic growth and environmental problems. Economics, management and law in modern conditions. Interuniversity collection of articles (Tolyatti, 2022)
5. G. N. Kaninskaya, Bulletin of St. Petersburg University. International Relationships **15(1)**, 45-63 (2022)

6. A. A. Kayumov, Economy and Society **4-1 (95)**, 306-311 (2022)
7. E. Kulieva, I. Ilyasov, IInternauka **14-4 (237)**, 28-29 (2022)
8. E. V. Maryin, Scientific Aspect **5(3)**, 554-558 (2022)
9. M. Movlamova, Internauka **10-2 (233)**, 5-7 (2022)
10. A. P. Semenova, Journal of Technical Research **9(1)**, 22-27 (2023)
11. T. A. Hwang, Ecology. Fundamentals of rational environmental management. Textbook. Ser. 76 Higher education (Moscow, 2023)
12. A. P. Semenova, Journal of Technical Research **9(1)**, 22-27 (2023)
13. A. A. Cheremisin, A. V. Kaverzin, V. V. Velichko, Culture. The science. Production **11**, 77-81 (2023)
14. J. Shirdzhikova, M. Bayramgeldiev, K. Kerimov, Academic Journalism **10-1**, 89-91 (2023)