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## Environmental Innovations as a Factor of Increasing the Economic Efficiency of Production. Study Case: Pavlodar Region

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### Abstract

The relevance of the research topic is that the world has turned its face to the environmental problem, which is the created real threat of a global environmental catastrophe. The aggravation of relations between society and the environment is facilitated by a technogenic type of economic development, of a nature-destructive nature, based on the use of natural resources and means of production without taking into account environmental restrictions.

Environmental innovations as a factor in increasing the economic efficiency of production in order to improve products and services require the development of technologies, which include environmentally friendly biotechnology, waste processing technologies, low-polluting technologies, etc. There is a need for radical changes in the methods and means of environmental protection, which reduce the technogenic impact on the biosphere of the Earth, and contribute to the preservation of human health.

**Keywords:** electricity generation; building energy conservation; rural area.

**JEL Classifications:** O13; O41; C39; R11; Q43.

## Introduction

The crisis in the innovation sphere of industry due to the reason associated with the reform and recession in the economy is also due to the lack of purposeful work to improve the efficiency of production in general and innovation as its most important component. In this regard, it is necessary to note the special importance of the timely identification and systematic use of the reserves of innovative activity in order to increase its efficiency. Innovations are the most important means of ensuring the stability of economic functioning, efficiency of functioning and competitiveness. Thus, innovation is an innovation introduced into the activities of an enterprise in order to increase its efficiency on the basis of better satisfaction of a certain social need. It should be noted that efficiency should be understood as a certain economic, production, social, environmental and other result expected from the introduction of an innovation. There is a strict relationship between competitive positions, the efficiency of an enterprise and its innovative potential. The efficiency of the enterprise can be achieved by improving the quality of products, implementing a resource-saving policy, issuing new, competitive projects, and developing profitable business projects.

## 1. Literature Review

This study was based on statistical data, modern works, scientific articles and research of domestic and foreign scientists and specialists in this field, in particular on such as Gretchen K. Daly - Nobel laureate in biology and ecology, Pavana Sukhdeva is studying the economic benefits of biodiversity and the economic costs of its degradation and loss, and also relied on the works of Kemp, R., Arundel, A., Smith, K., Abdelnaser O., Abdullahi NZ, Auwalu S.Sh., Huong Ha, Ramona Pîrvu, Nicoleta Mihaela Florea, which investigated indicators of environmental innovation, as well as used regulations and government programs in the field of ecology and economics. According to biologists, ecologists and economists, for the transition to a sustainable economy, it is necessary to use fewer resources, but use them more efficiently.

## 2. Methodology

The methodological basis of the research is a combination of theoretical and scientific methods: analysis, synthesis, systematization and comparison, theoretical and logical generalization. In particular, the following methods are used: analysis and synthesis - when studying the investment activity of an enterprise; systematization and comparison - to identify the elements that determine the structure of the organizational and economic mechanism for stimulating the investment activities of enterprises; scientific abstraction - for the formation of theoretical generalizations and conclusions. Analyzing products already in the development stage is a very effective approach, given that it is possible at the development stage without large investments, possible future risks associated with a new presented product, and allows for appropriate changes in the choice of materials or production processes of the researched product. The presented methods, based on the analysis of the activities of environmental innovative enterprises, which allow to identify problems associated with the materials used, technologies and related environmental aspects of the production process, the use of the product by the consumer, as well as when returning the product at the end of its service life and disposal. Based on the identified shortcomings, it is possible to determine the priority areas of their development and innovation. The presented application of a simplified life cycle assessment methodology is a suitable tool for determining innovative potential, contributing to increasing the usefulness of products or services for consumers and achieving the goals of environmental policy of companies.

In fact, ecology is on the cusp of a revolution, with new and emerging technologies opening up new possibilities for understanding nature and applications for biodiversity conservation. The exacerbation of crisis processes in the economy impedes trends in technology improvement, however, the authors presented the foundations for the formation of an organizational and economic mechanism for rational nature management.

Innovative activity should ensure: the most complete and timely satisfaction of needs; the company's competitiveness in terms of product quality and production efficiency; achieving a balance between stability and efforts to introduce new technologies; efficiency in a number of radical innovations; flexible adaptation to evolving, constant innovation and radical periodic innovation.

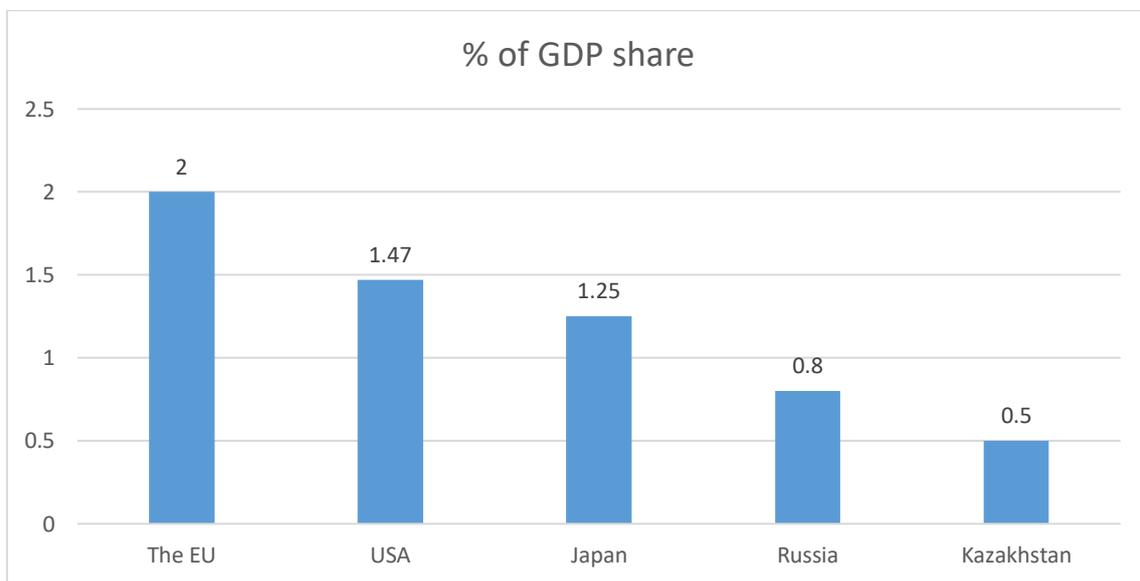
Companies are now under increasing pressure due to the environmental impact of their activities. A company's relationship with the environment and improving its environmental profile are no longer a matter of compliance with legal requirements, but are increasingly becoming a tool for strengthening a company's market position and motivating companies to take an active voluntary approach.

Improving products in terms of their environmental impact and increasing the economic prosperity of a company are often seen as two opposing lines of business. However, innovations in the field of improving the environmental parameters of the product and the production process bring the company an increase in its competitiveness and, ultimately, increase the economic efficiency of the company, especially in the following areas. These are benefits for both manufacturers and consumers: increasing the usefulness of a product or service, improving the efficiency of raw materials and energy, preventing and reducing future risks associated with product ownership, reducing costs and aspects of environmental monitoring and waste management. The growth potential of start-up companies that are innovation leaders is low, and the productivity of frontier companies (high performance companies), which are considered to have the most advanced technologies.

Environmental expenditures are an indirect indicator of the attitude of the state and its citizens to nature. According to environmental experts, to stabilize the environmental situation requires spending at least 3% of GDP, to improve it - at least 4% of GDP, for a fundamental change - at least 5% of GDP (<http://www.ecogazeta.ru>)

Picture 1.

Share of environmental protection costs in 2019



However, the share of expenditures on environmental protection in 2019 in the EU countries will be about 2% of GDP, in the USA - 1.47%, in Japan - 1.25%, in Russia it is only 0.8%, and in Kazakhstan the share costs for environmental protection in 2018 amounted to 0.5% of the GDP of the Republic of Kazakhstan. These figures, perhaps, can measure the level of the country's ecological culture.

Saving on ecology has led to the fact that the environment has become dangerous to human health. If you do not invest in environmental protection now, then, according to scientists, a global planetary collapse will inevitably await us, which will simply force the inhabitants of the planet to throw all means to restore nature. Unfortunately, at the moment, accidents at enterprises, which entailed damage to the environment, often become an incentive to increase investments in the environment. Financing the environment, on the contrary, pays dividends. The demand for sustainability in the world is constantly growing.

Improving resource efficiency means producing units of economic output with fewer resources (raw materials, energy) on average, as before. The EU Resource Efficiency Initiative is integrated into all major EU policies such as circular economy, climate and energy policies, etc.

One of the important steps directly supporting the introduction of innovative products aimed at environmental protection is the ability to use environmental management programs to achieve environmental policy goals at the enterprise level.

In the country, due to the heat of the sun and atmospheric humidification in the region, the forest-steppe landscapes in the north are changing with steppe and dry-steppe landscapes in the south. Current expenditures for environmental protection in the Republic of Kazakhstan in 2017 amounted to 17.8 billion tenge, 4.7 billion tenge were paid for standard emissions (discharges) of pollutants; for an excess of 0.1 billion tenge. In 2017, in compensation for damage caused by violation of environmental legislation, claims and fines in the amount of 1.2 billion tenge were collected on enterprises and officials. Kazakhstan annually increases costs of environmental protection

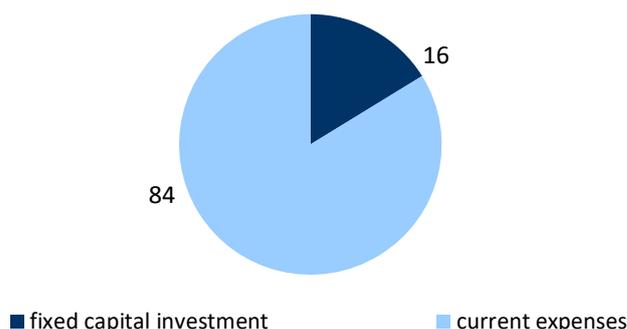
Territorial differences in Pavlodar region are also manifested in agricultural production. According to the Office of Land Relations of Pavlodar region, agricultural land occupies 89.5% of the entire land area of the region. Their structure is dominated by pastures with an area of 8229.5 thousand hectares and arable land - 1569.1 thousand hectares, deposits occupy more than 1 million hectares. More than half of the cultivated area is occupied by cereals and legumes, which are cultivated on rainfed lands.

The costs of business entities aimed at protecting the environment amounted to 34.6 billion tenge in 2018 against 25.5 billion tenge in 2017.

According to the data of the Ministry of National Economy of the Republic of Kazakhstan, the Committee on Statistics, the structure of costs for environmental protection in Pavlodar region in 2018 is shown in Picture 2.

Picture 2.

Cost structure for environmental protection in 2018

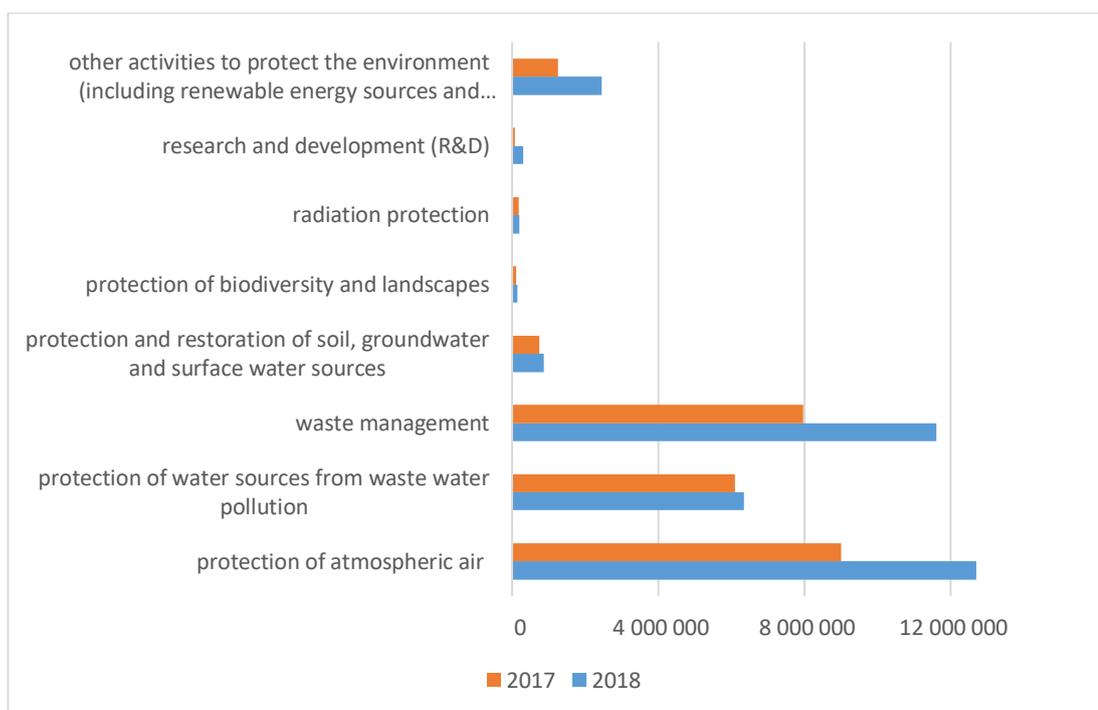


Source: Official Internet resource [www.stat.gov.kz](http://www.stat.gov.kz) of the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan.

Operating expenses accounted for 83.8% of operating expenses, investment in fixed assets accounted for 16.2%. The structure of expenses for environmental protection in Pavlodar region by types of environmental protection activities as a percentage of the total. Let's take a closer look at the structure of environmental protection costs by type of activity in Pavlodar region in 2018, in Picture 3.

Picture 3.

Cost structure for environmental protection in Pavlodar region



Source: Official Internet resource [www.stat.gov.kz](http://www.stat.gov.kz) of the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan.

The largest share in the Pavlodar region is occupied by the protection of atmospheric air and climate 36.7 in fixed assets and 35.4 for operating costs, then waste management in fixed assets 33.5 and 31.3 for operating costs, in third place is the protection of water sources from wastewater pollution 18.3 to fixed assets and 24.0 to operating costs. Least of all costs are made for the protection of biodiversity and landscapes 0.4 in fixed assets and 0.4 for operating costs, slightly more protection against radiation exposure 0.6 in fixed assets and 0.7 for operating costs and research and development 0.9 in fixed assets and 0.3 for operating costs. As well as other expenses of 7.1 in fixed assets and 5.0 on operating costs.

Large costs for the protection of atmospheric air and climate are associated with the fact that in the Pavlodar region there is an increased level of atmospheric air pollution by suspended solids, PM-10 suspended particles, carbon monoxide, nitrogen dioxide, nitrogen oxide, ozone, hydrogen sulfide, phenol, and hydrogen chloride.

Also in the Pavlodar region there are high costs for the protection of water sources from wastewater pollution and waste management, since they are the most common water pollutants - household waste, industrial wastewater, as well as insecticides and pesticides. A concrete example is the discharge of insufficiently treated wastewater into natural water bodies, which can lead to the degradation of aquatic ecosystems. Other harmful effects include diseases such as typhoid and cholera, eutrophication and destruction of ecosystems that negatively affect the food chain.

**Table 1.**

Number of businesses with environmental innovation

	2016	2017	2018	2019
The Republic of Kazakhstan	70	48	21	21
Pavlodar	4	3	2	1

The number of enterprises with environmental innovations in Kazakhstan has been declining since 2016, this is due to the revision of the environmental safety of the methods of work for the production of products and services to ISO 14001 and ISO 9000 standards. That is, these enterprises do not meet international standards, which means they do not have the right to be included in statistical indicators as environmentally innovative enterprises.

Industrial enterprises in the course of their activities carry out industrial environmental control, which provides for quarterly production monitoring, within the framework of which independent accredited laboratories make observations at the sources of emissions of pollutants into the atmosphere and at the sanitary protection zone (SPZ), document the results and submit them to the Department on a quarterly basis.

However, it is necessary to use high technologies in order to form an organizational and economic mechanism for rational environmental management.

Now is the time to focus on solutions that we know exist or have the potential to develop, and this is where technology, along with behavior change, can help us reboot the health of our nature and planet. To develop an algorithm to detect deforestation from the spread of palm oil using remote sensing data, and use drones to protect the world's forests, track that the earth - in the right places - is protected or restored, and is healthy, providing people and wildlife what they need to survive, such as clean air and water, food and jobs.

In the process of forming an innovative and investment model of the economy, priority should be given to the modernization, reconstruction and development of production based on new technologies, the expansion of innovations to translate the results of scientific and technical developments into production, the creation of new technological processes and the restructuring in the modern scientific and technical base of all branches of material production. It is innovation and investment activity that allows enterprises to develop and produce competitive products, modernize technologies and technical production base, enter world markets with competitive products, thereby ensuring stable economic development

Environmental technology is made possible by the expansion of Internet connectivity as a result of the increased availability of WiFi, Bluetooth and smart sensors in buildings and cities. Experts predict that the cities of the future will become places where every car, telephone, air conditioner, light, and more will be interconnected, creating the concept of energy-efficient smart cities. The mechanism should be built on technologies to protect the environment, made possible by the expansion of Internet connectivity as a result of the increased availability of WiFi, Bluetooth and smart sensors in buildings and cities. Experts predict that the cities of the future will become places where every car, telephone, air conditioner, light, and more will be interconnected, creating the concept of energy-efficient smart cities.

To ensure the development of national innovation systems, the introduction of environmental innovations, by which they mean everything that has a positive effect on the environment, is of great importance.

To improve the efficiency of the enterprise, innovative activities should provide:

- 1) the most complete and timely satisfaction of needs;
- 2) the competitiveness of the enterprise in terms of product quality and production efficiency, achieving a balance between stability (management of traditional technology) and efforts to introduce new technology.
- 3) efficiency in a wide range of radical innovation and flexible adaptation to both evolutionary, constantly implemented innovations, and radical, periodically implemented innovations.
- 4) organization of interaction between internal and external elements of the development system, the main factors of which are the system of information about the market for innovations, the selection of projects from among the alternatives and mutual interest.

The formation of an organizational and economic mechanism for rational environmental management should be based on monitoring greenhouse gas emissions, monitoring methane using an infrared sensor and detecting gases using an unmanned aerial vehicle. For the implementation of what to use "Greenhouse gas sensors made of new materials for climatic use", use infrared sensors for reliable monitoring of methane, use an unmanned aerial vehicle attached to a gas sensor to measure harmful gases.

The diffuse environmental impact analysis tool is a product life cycle analysis. Comprehensive information can provide sufficient information for the decision-making process to help set priorities for product innovation in quantitative form. Throughout its life cycle, a product and service have an impact on the environment, this significantly affects it even at the end of its life cycle. These environmental impacts are borne by product manufacturers (payments for emissions and waste, treatment plant operation, health and safety issues, environmental management needs, administrative complexity, compliance costs, and more). They also burden consumers with their use (emissions, waste, energy and water consumption, service interventions, etc.). They also burden municipalities and other organizations that are involved in the disposal of products in incinerators or landfills.

Increased consumption and changing consumer habits are increasing pressures, especially on producers and the location of end-technology facilities (landfills). The general trend is to find ways to reduce these effects. Throughout its life cycle, a product and service have an impact on the environment, this significantly affects it even at the end of its life cycle. These environmental impacts are borne by product manufacturers (payments for emissions and waste, treatment plant operation, health and safety issues, environmental management needs, administrative complexity, compliance costs, and more). They also burden consumers with their use (emissions, waste, energy and water consumption, service interventions, etc.). They also burden municipalities and other organizations that are involved in the disposal of products in incinerators or landfills. Increased consumption and changing consumer habits are increasing pressures, especially on producers and the location of end-technology facilities (landfills). The general trend is to find ways to reduce these effects.

By analyzing the trend in consumer behavior or looking at developed markets, it can be assumed that customer needs (individual or institutional) will continue to grow and grow. They will not only ensure the performance of functions, but also have a socio-ecological aspect. A product that will / will be a valuable ecological material in the developing world, containing child labor assembly or insufficient attention of the supplier to environmental protection, may become one of the decisive factors for its purchase by the consumer in the future.

## Conclusion

One of the main goals of companies is making a profit. All activities of enterprises of a market economy are aimed at this. An important component of the economic health of manufacturing companies is a competitive product that is constantly being improved. When developing new products or improving existing products, it is also useful to take into account the product's environmental impact. The environmental aspect of product development is a complex issue that intersects with other aspects of the product such as choice of materials, manufacturing techniques and more. Therefore, it is necessary to consider not only the product, but the entire product system. Due to the fact that most of the environmental impacts of a product during its life cycle are determined during the design of the products.

Green innovation expands the scope and scope for sustainable environmental development. In connection with the progressing process of global warming, it is necessary to develop eco-innovations in the field of the development of renewable energy, improvement of technologies for sorting, processing, electromobility, organic farming, reducing plasticity from packaging and converting plastics into biodegradable materials, etc. Thus, through the development of environmental innovations and their implementation on an industrial scale, it is possible to ensure sustainable pro-ecological economic development in the modern economy. This is a key challenge for humanity in the 21st century. This is a challenge for a necessary and possibly quick implementation in the coming years.

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