

## EVALUATION OF COSTS AND BENEFITS IN ENVIRONMENTAL PROTECTION IN INDUSTRIAL ENTERPRISES

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**Abstract** This study examines approaches to evaluating costs and benefits when implementing environmental protection measures in industrial enterprises. To identify the most pressing issues related to the research topic, an analysis of scientific research periodicals is also conducted. In addition, the study analyzes the evaluation of private costs when implementing environmental protection measures in an industrial enterprise.

**Keywords:** industrial enterprises, current costs, damage, calculation methods, simulation model, capital expenditures.

### **Introduction**

The interaction between society and nature is a key issue in the political and socio-economic development of society. By expanding and intensifying anthropogenic and technogenic pressures on nature, society disrupts the environment. This, in turn, leads to an increase in economic and social damage as a feedback loop. Nature cannot independently restore the disrupted ecological balance or regenerate the benefits derived from it to the appropriate extent. The processes of environmental degradation lead to a deep ecological crisis, which affects economic growth and ultimately impacts the economic security of the country.

Environmental safety issues have serious consequences, which can be divided into two parts: economic and social. Undoubtedly, economic and social consequences are interrelated. However, it is necessary to distinguish between them to justify the organizational and economic tools for increasing the efficiency of

environmental measures, as their impact can be both economic and social. Moreover, both require current and investment expenditures, which are associated with forming the cost of production, the profit of the enterprise, as well as the structure of investments. All these factors, in turn, affect the efficiency of the enterprise.

The economy of the environment and natural resources involves the study of the complex and structured interactions and relationships between the environment and organisms. Its primary research objects are natural and anthropogenic ecosystems, i.e., integrated natural and anthropogenic complexes (landscapes) composed of living organisms and the environment in which they live<sup>1</sup>.

### **Main Section**

The mechanism of influence of environmental and economic tools involves altering the costs and benefits of various actions available to economic entities, including small enterprises, thereby affecting their economic interests. In this case, the mechanism of regulation is played by redistribution payments. These tools influence the interests of economic entities. The components of this mechanism that regulate changes in resource prices (which determine value, costs, and economic benefits) serve as regulatory elements. Evaluating and comparing costs and benefits allow for informed decision-making in both public and private entrepreneurship sectors. In both cases, it is necessary first to identify the components of costs and, second, to determine the scope of consequences they lead to as fully and accurately as possible. Third, economic indicators must allow for the evaluation of various elements of costs and benefits on a single scale. Fourth, the net income, i.e., the difference between benefits and costs, should be determined. To meet these requirements, simulation methods have gained recognition. The term "simulation" emerged in the early 1960s in connection with the study of systems whose development stages depended on random parameters.

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<sup>1</sup> Jumaev T. Ekologiya iqtisodiyoti: nazariya va amaliyot. Monografiya. – T., 2014.

The development of a simulation model for evaluating private costs and benefits when implementing environmental protection measures involves several stages<sup>2</sup>:

**1. Problem Statement:** The technical and economic efficiency of the environmental measure being studied is substantiated, and a brief description is provided regarding the manufacturer, implementation timeframe, and investment volume.

Types of environmental protection include:

- **Production and technological measures:** installation of purification equipment, management and monitoring of technological processes, implementation of closed technological lines, mastering the production of environmentally friendly products, waste disposal, and secondary resource recycling measures.

- **Organizational and management measures:** developing and implementing new environmental standards and regulations, creating a unified regional system for environmental monitoring control, and others.

- **Research and development measures:** related to the creation of environmental protection equipment, environmentally friendly processes, products, etc.

- **Educational measures:** aimed at implementing a continuous system of environmental education, raising local population awareness about environmental protection, etc.

**2. Collection of information on the state of the environment within the industrial enterprise's impact zone.** It is necessary to determine the initial state of the environment in the active impact zone of the enterprise according to the following parameters: air pollution, water, environmental, soil quality, noise level, biodiversity quality, and others.

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<sup>2</sup> Бобошко В.И., Разработка механизма эколого-экономического регулирования деятельности малых предприятий (теория, методология, практика). Диссертация- Москва - 2009 г.

3. **Assessment of efficiency through multi-criteria analysis.** First, the costs and revenues or the costs and benefits associated with implementing the project are identified. The project costs are understood as the total value of all types of goods and services necessary to implement the measure (see Table 1).

**Table 1**

**Evaluation of private costs when implementing environmental protection measures in an industrial enterprise**

<b>Cost Type</b>	<b>Cost Elements</b>	<b>Calculation Methods</b>
<b>Capital Costs</b>	<ul style="list-style-type: none"> <li>- Equipment costs</li> <li>- Construction and installation work</li> <li>- Commissioning work</li> </ul>	- For single-purpose measures (aimed at reducing environmental pollution): total cost of cost elements is taken
<b>Current Costs</b>	<ul style="list-style-type: none"> <li>- Current costs for maintenance and technical servicing of environmental protection assets</li> <li>- Costs associated with improving environmental quality</li> </ul>	For single-purpose measures: total value of cost elements is taken  For multi-purpose measures: percentage of total value of cost elements is taken

When evaluating costs and benefits, criteria are applied to determine whether measures are justified or not. To assess environmental protection measures using the cost-benefit method, the net present value method can be used. An important point is developing appropriate mechanisms to incentivize employees to transition to environmental management principles. We focus on applying the cost-benefit principle to small enterprises transitioning to sustainable environmental management. The benefit is understood as the assessment of all positive results obtained from implementing the project (see Table 2).

In local studies, the so-called "integral economic effect" and "net discounted income" (net present value indicator) calculated during the project implementation period, represent the difference between the total revenue from products or profit

from sales during this period and the cumulative value of all types of costs or losses, considering the time factor. The maximum net present value serves as one of the most critical criteria for justifying the project. For an investor, risk represents the probability of certain losses.

**Table 2**

**Evaluation of private benefits when implementing environmental protection measures in an industrial enterprise**

<b>Types of Obtained Benefits</b>	<b>Elements of Profit (Effects)</b>	<b>Calculation Methods</b>
Revenue generated from increasing the volume of main products	<b>Net product (balance + depreciation) net income</b>	Modifying the operation of equipment
Revenue generated from increasing the volume of main products • <b>Raw materials and materials</b> • <b>Fuel, energy</b> • <b>Natural resources</b>	<b>Reducing the cost of products</b>	Direct calculation of cost elements
Savings on payments for natural resources	<b>Reducing the cost of logistics</b>	Direct calculation for reducing payments for natural resources
Savings during the operation of equipment, reduction of repair costs	<b>Reducing the cost of equipments</b>	Direct calculation of reducing equipment repair costs: wages, materials, energy
Strengthening a favorable image for investors, shareholders, local authorities, environmental control agencies, and the public.	<b>Favorable investment environment, tax incentives</b>	Reduction in stock value, reduction in transaction costs
Improving workplaces for employees, reducing illness and environmental risks	Increasing the work efficacy	Changing the labor capacity of employees to increase production volume

When discussing the public sector, costs and benefits should be evaluated from the perspective of the entire society. The net income that needs to be maximized is the difference between public benefits and public costs. Cost and benefit components must be evaluated, considering externalities, as the enterprise

operates in the public sector. The negative externalities of its activities should be fully accounted for as part of the costs, and their reduction should be considered a positive result.

Considering the environmental aspect of economic evaluation in the activities of industrial enterprises, it is essential to account for how effectively ecological consequences can be assessed in monetary terms and what the best methods for such evaluation are concerning different projects. First, it is necessary to identify the primary objects affected by the polluting enterprise. These include the population, industrial enterprises, the recreational sector, agriculture, forestry, hunting, and housing and communal services. A direct relationship exists between impacts and damage: the prevented damage becomes the potential impact. The social benefits of environmental protection are manifested in reducing the population's illness, improving working and recreational conditions, and preserving natural landscapes.

### **Conclusion**

Social impacts do not have a direct monetary value. While the costs of treating a person can be determined, it cannot be said that the restored health as a result of treatment has a value equal to the treatment costs. However, improving public health brings a number of economic results, including savings in social insurance and patient treatment costs, eliminating production loss damages on sick days, and preventing decreases in labor productivity.

Therefore, it is possible to discuss and determine the economic indicators of public benefits. The direct economic results of environmental protection include increasing the productivity of agricultural lands, expanding forests, increasing the productivity of water bodies, extending the service life of fixed assets, and reducing losses of raw materials and materials. Along with the economic indicators of social impact, these economic results represent the full