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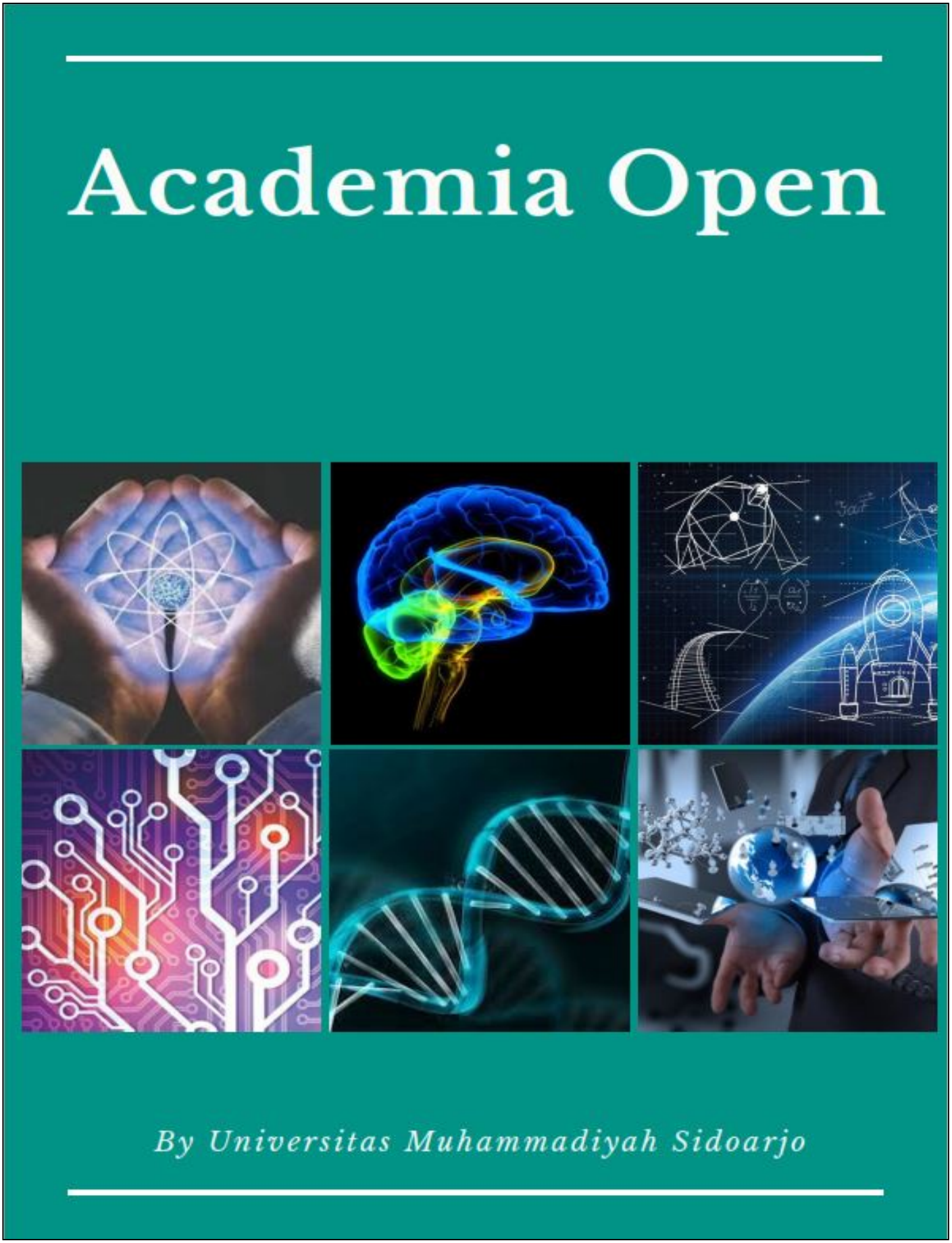


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# Methods For Assessing The Environmental Impact of Large Industrial Enterprises on The Regional Economy

## *Metode Untuk Menilai Dampak Lingkungan dari Perusahaan Industri Besar Terhadap Perekonomian Daerah*

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**Abstract**

The article presents an analysis of the methods that can be used to assess the impact of large industrial monopolies on the ecological state of the region, their sizes and indicators. The analysis of the methods of determining the coefficient indices of large enterprises in ensuring the ecological safety of the region while achieving economic well-being, environmental impact and efficient use of natural resources, reflecting environmental criteria and environmental quality indicators in financial statements in standard market assessments, which evaluate the activities of the enterprise from the point of view of balanced ecological and economically sustainable development, is presented.

**Highlights:**

1. Impact Analysis: Assess industrial monopolies' ecological effects and regional safety.
2. Methods: Evaluate coefficient indices linking environmental impact with economic well-being.
3. Sustainability: Balance ecological criteria in financial reports for sustainable development.

**Keywords:** ecological state, assessment of the ecological state, environment, ecological safety, ecological impact in stabilizing the regional economy, environmental objects, ecological impact coefficient index

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# Introduction

The strategic direction of industrial development in the region determines the formation and transit of impulses that change the functions and structure of almost all sectors of the national economy [2]. Regionalization of the country's economy determines the emergence of specific forms of economic relations and the features of the formation of regional economic systems, the invariable attribute of which is the study of their resource supply as an activity of this social form. The socio-economic situation of the region is a specific paradigm for organizing production. One of the most important elements of providing regions with resources is the potential of large regional enterprises [3].

The role of large enterprises in stabilizing the regional economy cannot be ignored. They create new jobs, increase tax revenues, and attract investments, which is of great importance for the regional and national economy. The activities of such large monopoly enterprises have a significant impact on the social and environmental environment. Understanding the aspects of such large “driver” industrial enterprises located in the region is very important for developing sustainable development strategies. The results of the study can be used to improve and evaluate policies regarding large corporations and their role in regional development.

The study is expected to consider such aspects as the contribution of such large monopoly enterprises to the formation of regional gross product, the creation of new jobs, investments aimed at the development of social and infrastructure, as well as an assessment of the impact of their activities on the environmental situation in the region. Particular attention will be paid to the analysis of tax incentives and their role in the regional budget. The study involves the use of complex methods of economic analysis, including the processing of statistical data, analysis of enterprise reporting and the use of regional economic data. The results of the work can be used to develop recommendations for alternative ways of interaction between large enterprises and regional authorities for the sustainable economic development of regions. Greening (ecologization) of the production process of an individual entrepreneur is closely related to the concept of economic damage, which is one of the components of the enterprise's costs for environmental protection activities. Another component is current costs, depending on the level of negative impact of pollutants on the environment. These include, for example, the costs of preventive safety measures such as the construction of treatment plants and dams.

The main priority of modern society is to achieve economic prosperity while ensuring environmental safety, therefore, there is a need to fully disclose information about the activities of the enterprise in terms of compliance with the requirements of environmental impact and efficient use of natural resources. Environmental criteria and environmental quality indicators are usually outside the scope of standard market assessments and are not reflected in traditional financial statements, which makes it difficult to assess the activities of the enterprise in terms of balanced ecological and economically sustainable development.

The relevance of the study lies, on the one hand, in its importance for a wide range of stakeholders. Having tools that allow an objective assessment of the level of environmental safety of the enterprise, and on the other hand, a reliable assessment of the activities of the enterprise, which indicates balanced ecological and economic development, becomes an additional competitive advantage of the enterprise.

**Analysis of the literature on the topic.**

In many works of Russian authors (L.I.Abalkin, A.A.Andreev, Yu.E.Blagov, S.E.Litovchenko, N.A.Krichevsky, M.I. Liborakina, A.N. Garkavenko and others) it is noted that the social [4] economic, environmental responsibility of large enterprises increases the stability of not only the economic entity, but also the entire economic system - due to the stable replenishment of the budget, improvement of the environmental situation and conservation of natural resources, and increase in the quality of life of the population.

V.I.Menshikova [5] studied several methodological approaches to determining the economic potential of regions, divided the economic potential of regions into systematic components. Another Russian scientist N.A.Chizhova [6] in her research carried out a classification of the economic potential of regions and factors influencing its development.

A.A. Kutin and S.V. Lyutsuk [7] consider the production potential of a machine-building enterprise to consist of energy and material resources, fixed production assets, information resources, personnel and organizational resources.

According to A.P. Moskalenko [8], “the current state of ecological and economic modeling allows us to reproduce in the most general form the individual tasks facing certain regions.

# Methods

In current practice, the responsibility of large monopoly enterprises in stabilizing the regional economy, both

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economic relations and social and ecological processes, is becoming relevant. Therefore, the established practice of assessing the role of large enterprises in the ecological, socio-economic development of the region is, as a rule, assessed by their share in the gross regional product, regional budget revenues and the share of jobs in their total number.

Before assessing the impact on the environment and its consequences, it is necessary to have a good understanding of the territory in which they occur - all its natural and socio-economic diversity. If we draw a parallel with medicine, it is impossible to treat and even prevent a patient without knowing the characteristics of his body, his previous and chronic diseases. This problem is solved by the procedure for assessing the current state of the environment within the framework of engineering and ecological research.

In order to determine the priority areas of state policy in the field of environmental protection [1], to introduce effective mechanisms for the prevention, detection and prevention of violations of legislation in the field of nature protection, to strengthen the personal responsibility of state bodies, heads of economic entities and citizens for the sanitary and ecological condition of the republic's settlements, as well as to ensure the achievement of the National Goals and Objectives in the field of sustainable development for the period up to 2030, the following have been established:

- preservation and quality assurance of environmental objects (atmospheric air, water, land, soil, subsoil, biodiversity, protected natural areas) from anthropogenic impact and other negative factors;

- priority use of materials, products, production facilities and other objects that pose the least ecological risk;

- expansion of protected natural areas;

- ensuring the environmentally safe use of toxic chemical and radioactive substances;

- improvement of the environmentally safe system for carrying out work related to waste;

- forming the ecological culture of the population, increasing the level of transparency of the activities of state bodies in the field of environmental protection, and strengthening the role of civil society.

The above Decree of the Head of our country forms the first and most important process in the framework of environmental assessment of industrial production facilities, construction projects, mine development and other types of territorial development in the framework of environmental assessment of the current social state of the environment (AMIHB).

The purpose of AMIHB is to assess the current state of the natural and social environment of the facility for the subsequent development of an environmental impact assessment.

The goals of AMIHB are:

• component-component characteristics of the natural environment of the object territory (relief, water, soil, vegetation, etc.);

• Assessment of the level of pollution of AM (environmental) components;

• Creation of a geographic information system and additional cartographic materials for the AMIHB of the object territory;

• General assessment of environmental damage, including a comprehensive description of existing man-made areas;

• Features of the social environment, including issues of preserving traditional environmental management of local peoples;

• Development of preliminary environmental recommendations.

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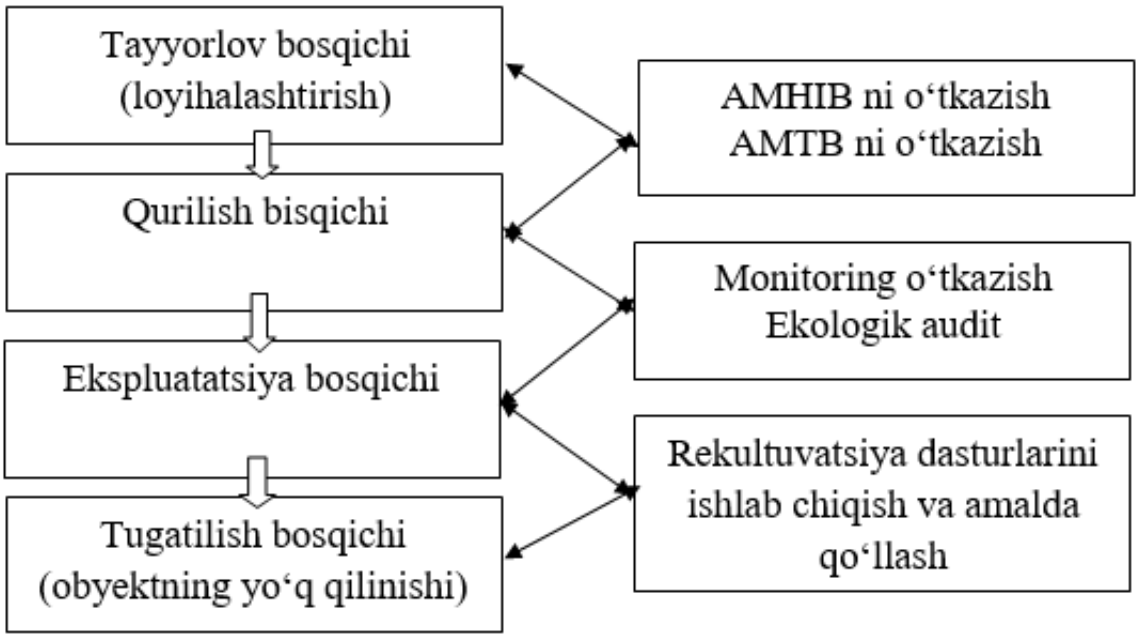


**Figure 1.** ***Stages of regional development and environmental support for projects****[9]*

Thus, the AMIHB should provide a detailed description of the environment of the affected facility, including its natural and socio-economic components.

At the same time, it is important to assess not only the state of natural ecosystems, but also the degree of their existing anthropogenic changes as a result of previous economic activities. Based on the information obtained during the AMIHB and its analysis, an AMT is carried out, which allows calculating the possible harm to the environment as a result of economic activity in the future in the process of environmental support of development projects and developing ways to minimize it.

It is also necessary to conduct an environmental audit of the facility and monitor the state of the environment in the area of the facility. Monitoring allows you to track changes in the state of the operating system and adjust business activities accordingly, the audit checks the compliance of technological operations with environmental standards.

In our opinion, in order to increase the reliability of assessing the contribution (share) of large enterprises to the development of the region, namely the impact on economic growth and industrial volume in the region, the following methodology should be used: it is based on determining the coefficient of influence of large monopolized enterprises with socio-economic responsibility on the regional economy, assessing the indicators of regional development by increasing the indices of the impact of its activities on economic growth, improvement of the environmental situation, and the standard of living and quality of life of the population.

In order to ensure comparability and proportionality of indicators for each constituent, growth rates are calculated. The calculation of general indicators is carried out through individual synthesis. Results based on the geometric mean value allow the analysis results to remain unchanged, and not the quantity, and the individual indicator allows for an accurate measurement of values.

# Result and Discussion

Russian scientist M.V. Zavyalov [10] proposed his own method based on the research of a multi-level assessment of a large monopoly enterprise approach to sustainable development indicators, which suggests that all components of the sustainable development of the industry are the objects of selection of assessment indicators. He justified the multi-level assessment model as a new system of sustainable development indicators as follows:

$$\text{Isust.dev} = \prod_{N=1}^{F} (\text{Isust. dev N}) \quad (1)$$

**Figure 2.**

where:

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F - the number of enterprises of the industrial complex;

Isust.dev - the indicator of the complex index of sustainable development of the Nth largest enterprise of the regional industry;

Isust.devN - is calculated on the basis of indices indicating the comprehensive development of the regions: social, environmental, institutional, economic development.

Since the obtained indices characterize changes in the total volume of activities of a large monopoly enterprise, in our opinion, it is advisable to calculate the integral coefficient of the influence of the social environment of a monopoly enterprise on the development of the region using the geometric mean value:

$$\text{Kmin.soc.ec.res} = \sqrt{(Kmin.ec.res \cdot Kmin.p.res \cdot Kmin.ecol.res)} \quad (2)$$

**Figure 3.**

where:

Kmin.soc.ec.res - coefficient of influence of the socio-economic responsible activities of a large monopoly enterprise on the development of the region;

Kmin.ec.res - index of influence of the activities of a large monopoly enterprise on the economic growth of the region (determined by multiplying the growth index of gross added value and the growth index of tax payments to regional and local budgets in the period under consideration by the base);

Kmin.p.dar.ta's - index of influence of the activities of a large monopoly enterprise on the standard and quality of life of the population of the region (determined by multiplying the growth index of the average salary of its employees in the period under consideration by the growth index of the number of employees in the period under consideration by the base period);

Kmin.ecol.res - index of influence of the activities of a large monopoly enterprise on the ecological situation in the region (determined by multiplying the index of reduction of emissions of harmful substances into water and the index of reduction of sources of emissions of harmful substances into the atmosphere).

The coefficient of the impact of socially responsible activities of a large industrial enterprise on the development of the region shows the change in the scale of the enterprise's activities in individual areas for the period under study. This means that the volume of products produced by such an enterprise in the region, the amount of taxes paid to the regional budget, the level of employment at the enterprise, and the lower the emissions of pollutants into the atmosphere and water bodies, the higher the value of this coefficient. Its development during the period under study indicates an increase in the contribution of this enterprise to regional investments.

There are two types of sources of environmental pollution by the enterprise:

- existing technology of the production process;

- technical equipment of production.

The greening of the production process of a large monopoly enterprise is closely related to the concept of economic damage, which is one of the components of the costs of the enterprise for environmental protection activities. Another component is the current costs, depending on the level of negative impact of pollutants on the environment, for example, the costs of preventive safety measures, such as the construction of sewage treatment plants, dams, etc.

Modeling using ecological and mathematical methods, such a mechanism for greening the activities of monopoly enterprises, ensuring a normal state of the environment, and maximizing profits under the conditions of effective operation of wastewater treatment plants (i.e. without environmental degradation) [13].

The economic effect for the region (the index of the impact of the activities of a large monopoly enterprise on economic growth) is expressed in the growth of gross regional product. The social impact (the index of the impact of the activities of a large monopoly enterprise on the standard and quality of life of the population of the region) is to ensure social stability and the conditions for maintaining a decent level and quality of life of the population of the region. Environmental impact (an index of the impact of a corporation's activities on the environmental situation in the region) is reflected in the reduction of the negative impact of a corporation's activities on the environmental situation in the region.

The main characteristics of monopoly production are the volume of production and the related selling price S, (a

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function of market demand S(Q)). Since the monopolist must reduce the price with an increase in production, in our opinion [11], in order to assess the environmental impact of a monopoly enterprise on the regional economy, it is necessary to start by determining the total revenue, total costs, marginal profit and costs of the enterprise, the regional pollution indices and their damage amounts using the following equation, and it is expedient to assess the environmental impact in this sequence:

$$\frac{dC}{dQ} =<0 \ (3)$$

**Figure 4.**

The total income (gross income) of the enterprise will have the following form:

W(Q) = C(Q)*Q (4)

If we express the total cost function in the form X(Q),

Q=Qp.c+Qp.p (5)

where:

Q p.c - production costs;

Q p.p - costs associated with cleaning production from pollutants.

We write the expression for profit F(Q) as follows:

F(Q)=W(Q) – (Q) (6)

A necessary condition for maximizing profit is that the derivative be zero:

dF/dQ=dW/dQ-dX/dQ=0 (7)

dW/dQ=dX/dQ (8)

we express this equality as follows:

S=dW/dQ,T=dX/dQ (9)

where:

S-marginal revenue;

T – marginal costs.

Then a necessary condition for maximizing the monopolist's profit is the equality of marginal revenue and marginal costs, i.e. S=T.

Taking into account formulas (4), (5) and (6), we write the last equality as follows:

S – Tp.c – Tifl.chiq.toz= 0 (10)

bunda:

Tp.c =dP/(dQ ), Tp.p.c=(dXp)/dQ (11)

S=dC/dQ •Q+C (12)

dF/dQ=S-Tp.c-Tp.p.c(13)

here:

Tp.c - marginal production costs

Tp.p.c - marginal costs of cleaning production from pollutants.

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A sufficient condition for maximizing profit is this inequality:

$$\frac{d^2P}{dQ^2} < 0$$

**Figure 5.**

Taking into account the expression (13), we express it in the following form:

$$\frac{dS}{dQ} - \frac{d\text{Tish.ch}}{dQ} - \frac{d\text{Tifl.chiq.toz}}{dQ} < 0$$

**Figure 6.**

The solution to equation (10) is the equilibrium point Q=Q0.

S(Q0) –T p.c (Q0) – Tp.p.c(Q0) ≡ 0 (14)

The indicator of the monopoly power of a monopolist producer at the equilibrium point is considered objective if we determine it using the Lerner index [12].

$$N=\frac{C_0-T_0}{C_0},$$

**Figure 7.**

where:

C0=C(Q0), T0=T(Q0) (15)

In the case under consideration, the expression of the Lerner index is as follows: (16)

where:

$$N=\frac{C0-\text{Tish.ch.0}-\text{Tifl.chiq.toz.(Q0)}}{C0}$$

**Figure 8.**

T p.c 0 = T p.c (Q0), Tp.p.c0= T p.p.c (Q0)

In this regard, special attention should be paid to the recreational areas of the regions, where regional monopolies based solely on natural resources (for example, the Navoi Mining and Metallurgical Combine) together with the state create additional conditions that hinder the emergence of new enterprises in the region, especially industrial ones.

# Conclusion

It can be concluded that the concept of sustainable development of the regional economy combines three main aspects: economic, social and environmental. In a market economy, sustainable development of the regional industry and economic growth are achieved through the introduction of advanced and environmentally friendly technologies, increasing the efficiency of resource use through the processing of production waste and their subsequent consumption.

First of all, it is necessary to distinguish the main components of the ecological-innovative-social-economic potential of an industrial enterprise. These include technical and economic potential, which characterizes the production base; investment and financial potential, which determines the financial capabilities for the introduction of ecological innovations; personnel potential, which characterizes the qualitative composition of participants in the creation and development of ecological innovations; innovative development potential, which reflects the level of innovative activity of the enterprise as a whole.

1. Analysis of the strengths and weaknesses of the identified approaches to studying the impact of the activities of

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large industrial monopoly complexes on the ecological environment and sustainable development of the region, economic growth, i.e., the coefficient indices proven in foreign experience of assessment showed that a separate study of the impact of such large monopoly enterprises on the regional economy does not give its full result.

2. In our opinion, the methodology considered above is based on the analysis of a system of indicators grouped into a forecast, which allows for a comprehensive assessment of the activities of a monopoly enterprise aimed at improving the socio-economic, ecological environment and comparing them with the activities of other enterprises.

3. Proposals. It is necessary to carry out a strategic environmental assessment (SEB):

4. Develop a regulatory and legal framework for the introduction of a full SEB system in accordance with the Protocol on Strategic Environmental Assessment of the Convention on Environmental Impact Assessment in a Transboundary Context;

5. Ensure that SEB and EIB become part of a coherent environmental assessment system;

6. Ensure awareness-raising and capacity-building of government agencies and other stakeholders in the field of SEB;

7. Conduct one or more stages of SEB is necessary.

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