Econometric Modeling of Environmental and Economic Risk Management

Sativaldiyeva Dono Abdurakhmanovna[1*], Bobir Tursunov[2], Onorboyev Shukhratjon Mirzayevich[3], Ergasheva Mukaddas Shukhrat Qizi[4], Khaydarova Dildora Jakhongir Qizi[5]

Abstract

The article studies econometric modeling of environmental and economic risk management. The paper emphasizes that it is necessary to conduct a comprehensive assessment of environmental and economic development and the effects associated with risk factors from environmental pollution, as well as to introduce a system of indicators of "environmental" health.

Key Words: Ecological Risks, Analyzing, Econometric Modelling, Regression, Parameters.

DOI Number: 10.14704/nq.2022.20.6.NQ22023 **NeuroQuantology 2022; 20(6):207-217**

Introduction

In world practice, the sustainable development of the regions is considered in the mutually beneficial harmony of their economic and ecological systems. In particular, the development of countries is directly related to the stability of the regions, and the positive aspects of this issue include the rational and efficient use of resources based on the expansion of the innovative economy. In particular, the proper organization of production activities in the economy, ensuring the continuity and growth of the industry depends on the availability of resources. This is due to the effective implementation of management decisions aimed at ensuring the compatibility of economic and environmental systems in ensuring the sustainability of regions. The Concept of Sustainable Development Goals was adopted by the United Nations General Assembly on September 25, 2015. [21] The concept focuses on important criteria that reflect the effectiveness of economic and environmental management, such as sustainable cities and settlements, responsible consumption and production, conservation of marine and terrestrial ecosystems, and climate change prevention.

A number of research works to improve the management of economic and ecological systems in the world, in particular, the study of institutional aspects of economic and ecological systems of regions, the organization of their development on the basis of effective management, management of rational and efficient use of resources; carried out. Currently, research is being conducted in the world to improve the methodological aspects of the management of economic and ecological systems of regions, the development of indicators and criteria for their sustainability, the application of modern methods of economic and mathematical modeling of management efficiency.

Literature Review

Extensive research has been conducted by foreign and domestic scientists in the field of economic and ecological systems and their management.

Corresponding author: Sativaldiyeva Dono Abdurakhmanovna

Address: [1*]Ph. D, Associate Professor at "Accounting" Department, Tashkent State University of Economics, Tashkent City, Republic of Uzbekistan; [2]DSc., Associate Professor, Head of the "Economic Security" Department, Tashkent State University of Economics, Tashkent City, Republic of Uzbekistan; [3]Senior Teacher at "Accounting" Department, Tashkent State University of Economics, Tashkent City, Republic of Uzbekistan; [4]Researcher at "Accounting" Department, Tashkent State University of Economics, Tashkent City, Republic of Uzbekistan; [5]Assistant at "Accounting" Department, Tashkent State University of Economics, Tashkent City, Republic of Uzbekistan.

Including Costanza R. [1], Cataldo A.L. [2], Burgstaller D., Anthony S.F. with global economic and environmental problems abroad. Chiu [4], Geng Yong, Brian Boyd [3], Yue Yang, Zhaoqi Wang [5], Jianlong Li, Chencheng Gang, Raul P. Lejano, Daniel Stokols [6], Yanzhen Zhang, Ying Zhang, Inakwu Odeh, Jiaguo Qi and others economists engaged scientists.

Studies related to the management of economic and ecological systems in the regions of the CIS countries studied by scientists such as Troitsky V.A., Gizatullin H.N. [7], Munasinghe M., Cruz V. [8], Ananenkov, A.G., Bronshteyn A.M., Studies related to the management of economic and ecological systems in the regions of the CIS countries Troitsky V.A., Gizatullin H.N. [7], Munasinghe M., Cruz V. [8], Ananenkov, A.G., Munasinghe M.[8], Kuznetsov A. [10], Malyshev A.A. [12], Reznik G.A.[13], Kuzina E.L. [14], Druzhinin P.V. [15], Alimov S. [16], Rakhmonnazarov P.Y.[17], Ahmad S., Ng Ch., McManusc L. [19], Amoore, L. [20], Der Derian, J. [21], Foroni C. [22], Burkhanov A. [23], Feigenbaum, A.V. [24], Akramov T.A. [25], Mentel U. [26], Sharipov K.A., Jumaev N.H., Eshov, M.P. [27], Osamy W., Aziz A. [28], Pulatovich, E.M.[29], Tursunov B. [30], Kholmuminov S. [31], Zarova E.V. [32], Yuldashev N.K. [33], Yusupov S., Bekmuradova N. [34], Mustafakulov S.I. [35].

On the issues of sustainable development of socio-economic systems and management of economic and ecological systems in Uzbekistan A. Abdullaev, A. Gafarov, B. Ataniyazov, AEIshmuhamedov, S. Gulomov, I. Kayumova, T. Shodiev, Yu. Muhammedov, N Scientists such as M. Mahmudov, B. Khodiev, R. Kulmatov, U. Djanibekova, A. Rasulov, I. Soliev, S. Yu. Yusupov were engaged.

Little attention has been paid to scientific research on the development of scientific and methodological aspects of this issue, improving the efficiency of management based on the study of its factors. Insufficient attention is also paid to the development of scientific recommendations, taking into account the specifics of the management of economic ecosystems in the regions of the country. The lack of a comprehensive study of the management of economic and ecological systems in the regions, the need to study this issue in terms of effective management and efficiency, served as a basis for choosing this topic.

The concept of “sustainable development” was introduced in 1987 by the International Commission on Environment and Development (Brutland Commission). "Sustainable development" is about meeting current needs without compromising the needs of the next generation. As mentioned above, the economic and ecological systems operate in a mutually integrated manner, i.e., one does not work without the other. In-depth, if we study, sustainable development is aimed at solving a fundamental problem of the economy.

As a result of the development of views on solving this fundamental problem, the concept of sustainable development emerges. The concept of sustainable development emerged as a result of the merger of three spheres of society, namely, social, economic and environmental activities. [7]

Environmentally sustainable development involves the sustainability of biological and physical systems. At the same time, the main focus is to ensure that ecological systems adapt to change. The use of natural resources, environmental pollution, and the loss of biodiversity deprive ecosystems of the ability to self-repair. [8]

At the present stage, the issue of stability and balance management plays an important role in the development of socio-economic systems. At the same time, an important and relatively little-studied aspect of sustainable and balanced development is the provision and management of environmental sustainability.

In some studies, this concept is understood as “the achievement of the environmental goals of the concept of sustainable development”. [10] A broad classification of this concept is given in UN General Assembly Resolution 44/428 of 1989, which states that "... a system of views that develops states, the world community and the world in character, substance and structure." [11]

Sustainability management of the economic-ecological system is an opportunity to independently ensure the balance between the elements of the internal environment as a result of external influences of this system. [12] In general, it is understood as the management of the ability of a system to maintain the properties, qualitative and quantitative properties, and interrelationships of its elements under the adverse effects of the external environment. In other words, the system is considered to be stable if it performs its functions to the required level under adverse external influences. [13] The qualitative description of economic-ecological systems consists of ecological,

economic, social and institutional components and consists of their interrelationships. [14]

Methodology

The World Bank, which makes extensive use of methodological approaches to assessing the sustainable development of economic and environmental systems, uses a model to determine the actual savings rate in assessing sustainability. This process consists of two stages. In the first stage, the net internal fund (NDS) is determined. To determine it, the depreciation of production assets (CFC) is deducted from the Gross Domestic Fund (GDS). In the second stage, the net domestic fund is added to the cost of education (EDE), minus the consumption of natural resources (DPNA) and the damage caused by environmental pollution (DME). The appearance of this model is as follows:

$$GS = (GDS - CFC) + EDE - DPNR - DMGE \quad (1)$$

In our opinion, the result of the economy is not savings, but GDP (revenues such as SIM, MD). Also, the above method requires large-scale processing of statistical data. This creates uncertainties for the problem under study to find a clear solution.

The following model is used by the UN to assess economic and environmental systems:

$$EDP = (NDP - DPNA) - DGNA \quad (2)$$

Here: EDP - environmentally friendly pure domestic product; NDP - pure domestic product; DPNA - value of spent natural resources (oil, gas, deforestation); DGNA is the value of environmental damage.

This method used by the UN has a number of shortcomings compared to the above approach. In particular, one of the main indicators of the economy, which is evaluated and taken as a basis, is the gross domestic product. However, there are a number of controversial indicators in this method. Normally, gross domestic product is expressed in values, and the figures are required to be expressed in values. However, there are uncertainties in the value of felled forests. This creates uncertainties and difficulties for the practical application of this model.

In her research, SA Surkova used the index method to assess economic and ecological systems. It assesses the relevant indicators of the regions and determines the rating. EA Tretyakova also used a dynamic method to assess the sustainable development of economic and ecological systems. [15] His research assessed economic, social and environmental criteria. Financial results as an economic criterion in the evaluation process, the rate of change in GRP, fixed assets, labor productivity, average real wage growth trends, the cost of innovative products, research and development costs, industrial output, growth rate of loss-making enterprises , describes indicators such as the wear coefficient. Environmental criteria include the growth rate of neutralized and recycled waste, changes in the actual volume of fuel saved through the use of secondary energy resources, the difference between environmental protection and investment in fixed assets, the growth rate of environmental protection expenditures. The social criteria include the growth of GRP per capita, changes in average per capita income, the reduction of low-income families, and the improvement of the demographic situation. This assessment approach focuses on a comprehensive study of economic, environmental, and social sustainability. [16] It also focuses on environmental criteria and their variation in relation to economic indicators. In our view, in this approach, it is appropriate to link environmental change to social criteria. This is because with changes in social indicators, there will be a change in both the consumption of raw materials and their consumption, and this situation represents the right relationship.

E.L. Kuzina's research has studied the modeling of management processes of economic and ecological systems. In the study, the author used economic-mathematical methods to assess the cost-effectiveness of measures related to environmental protection. The appearance of the model is as follows:

$$Пр\,(У)ooc = (S1 - S2) - (К/n1 + Э/n2 + P) \quad (3)$$

herea: Pr (U) ooc - profit as a result of measures taken to protect nature (hidden profit); S1, S2 - damage to the environment caused by users before and after the application of environmental measures; K - capital investments made by nature conservationists in nature protection measures; n1 - guaranteed period of nature protection, the effectiveness of which does not change; E - operating costs appropriate for the implementation of nature protection; n2 - period of validity of nature protection measures; P - charges for environmental pollution and other negative effects on it. [14] In this method, the author focuses on the environmental situation and the investments made to improve it. Typically, capital investment in changes in economic performance or technological processes, i.e., improvements, also results in resource-efficient production. At the same time, the involvement of professionals or the change in their qualifications

will lead to similarly positive changes. Given this situation, the use of equality allows for a complex implementation of the evaluation method.

In the researches of PV Drujinin and GTShkiperova the problem of modeling of economic ecological systems is studied:

$$Z(t) = F(U_1(t), U_2(t), U_3(t), t) \quad (4)$$

here: $Z(t)$ – the environmental factor under study; U1 (t) - size, which represents the development of the economy and has a negative impact on the environment (investments in the economy and new construction, GRP); U2 (t) - a factor that reflects the nature protection activities and has a positive impact on the environment (investments in nature protection, current expenditures in this area); U3 (t) - a factor that changes the existing production and has a positive impact on the environment (investment in modernization of production); t - year.

Based on the research, the following econometric model was developed:

$$Z(t) = 8{,}79 * U_1^{0,191}(t) * U_2^{-0,033}(t) * U_3^{-0,042}(t) \quad (5)$$

In other words, a 1 percent increase in investment in new construction increased waste by 0.191 percent, investment in modernization reduced waste by 0.042 percent, and investment in nature conservation reduced waste by 0.033 percent. [15]

In doing so, the author focuses on comparing the sources of investment with each other. That is, an assessment was made of the extent to which unit-by-unit changes in the source of investment would affect sustainability, including environmental sustainability indicators. Thus, on the basis of a group of indicators classified by the author proposed the following model for determining the integral indicator (I) of the quality of regional economic development:

$$I = \sqrt[3]{I_1 I_2 I_3} \quad (6)$$

I_1, I_2, I_3 – Indicators are indices obtained on the basis of grouping of economic, social and environmental indicators, respectively, to determine which the following equation is proposed:

$$I_j = \frac{\sum_{i=1}^{n} y_{норм} i}{n} \quad (7)$$

here: I_j – development index of economic, social and environmental spheres; $y_{норм}$ – is the normative level of each indicator included in the economic, social, and environmental groups.

Taking into account a number of shortcomings in the approaches to assessing the state of economic and ecological systems classified in our study, and to expand the quality and effectiveness of assessment capabilities, we believe that it is necessary to develop a methodology for assessing economic and environmental systems. The new assessment methodology to be developed should be aimed at expanding the possibilities of determining and increasing the level of efficiency in the assessment and management of economic and environmental systems.

Analysis and Results

The global environmental situation has been a major concern in recent decades, influencing a number of issues as a factor. In particular, it is assessed as a source that affects investment attractiveness, living standards and the direction of its development. It should be noted that the ecological situation includes not only the state of the environment, but also the level of available natural resources. In this regard, it is necessary to forecast strategic development in determining the effectiveness of management. This is because planning and forecasting are important principles in the management process.[9]

Socio-economic situation, economic-ecological situation and economic indicators are taken into account in the development of forecast parameters. In the future, it is important to ensure the sustainable development of the region. This process depends on the efficient and rational use of the potential of the regions, i.e. the management process. [11]

Effective management of the economic and ecological system requires special attention to the external and internal environment. As internal sources, we determine the impact of industries and sectors on the sustainability of the economic and ecological system.

In assessing the impact of internal environmental factors, we rely on the results of correlation-regression analysis. To do this, we will develop an equation that includes the outcome indicator - the economic-ecological system and the factors associated with it - the development of industries.

To do this, the internal factors in the direct production process of the enterprise are selected:

Atmospheric pollutants emitted on the territory of the country, thousand tons - Y1 (free binder);

Carbon dioxide (SO2) emitted into the atmosphere on the territory of the Countrywithout taking into account YFYFO'OX (mln.t.SO2- eq. / Year) - Y2 (free binder);

Nitric oxide (N2O) emitted into the atmosphere on the territory of the Republic of Uzbekistan, excluding YFYFO'OX (mln.t.SO2- eq. / Year) - Y3 (free binder);

Hydrofluorocarbons (GFU) emitted into the atmosphere on the territory of the Country(million tons .SO2-eq. / Year) - Y4 (free binder);

Sewerage of apartments (houses) in the territory of the Country(in% of total apartments (houses) - -X_1 (involuntary connection)

Provision of apartments (houses) with drinking water in the territory of the Country(in% of total apartments (houses) - -X_2 (involuntary connection)

Total land area of forestry in the system of the State Committee of Forestry of the Country(as of January 1), hectare -X_3 (involuntary connection)

Volume of felled timber in the system of the State Committee of Forestry of the Republic of Uzbekistan, m3 -X_4 (free binding)

Area damaged by forest fires in the territory of the Republic of Uzbekistan, hectare -X_5 (involuntary connection)

Mining and quarrying volumes of the Country(billion soums in current prices) -X_6 (involuntary connection)

Protected natural areas in the Republic of Uzbekistan, thousand hectares -X_7 (involuntary connection)

Total amount of water received in the territory of the Republic of Uzbekistan, m3 -X_8 (involuntary connection)

Amount of water received for irrigation in the territory of the Republic of Uzbekistan, m3 -X_9 (involuntary binding)

The amount of water received for the total industrial, communal and technical needs in the territory of the Republic of Uzbekistan, m3 -X_91 (involuntary connection)

Amount of water received for energy in the territory of the Republic of Uzbekistan, m3 -X_92 (involuntary connection)

Amount of water received for industrial use in the territory of the Republic of Uzbekistan, m3 -X_93 (free binder)

Amount of water received for public utilities in the territory of the Republic of Uzbekistan, m3 -X_94 (involuntary connection)

Amount of water taken for fishing in the territory of the Republic of Uzbekistan, m3 -X_95 (involuntary connection)

Passenger turnover by road in the territory of the Republic of Uzbekistan, bln. passenger-km -X_10 (involuntary connection)

Passenger traffic by air in the territory of the Republic of Uzbekistan, bln. passenger-km -X_11 (involuntary connection)

Turnover of goods transported by road in the territory of the Republic of Uzbekistan, bln. passenger-km -X_12 (involuntary connection)

The turnover of cargo transported by air in the territory of the Republic of Uzbekistan, bln. passenger-km -X_13 (involuntary connection)

A total of 15 factors have been selected by us for the study, the most important of which we will consider. [20]

We can see in Figures 1 and 2 the descriptive statistics of factors affecting economic and ecological systems in the Countryand the distribution of factors selected for econometric analysis of factors affecting economic and ecological systems in the regions.

The above results were obtained by examining the Skewness / Kurtosis tests of X_1, X_2, X_3, X_5, X_6, X_7, X_9, X_91, X_92, X_93, X_94, X_95 obtained for econometric analysis. According to Appendix 1 above, we can see that the p-value of X_1, X_2, X_3, X_5, X_6, X_7, X_9, X_91, X_92, X_93, X_94, X_95 is mostly less than 0.05, and the resulting set obeys the law of normal distribution.

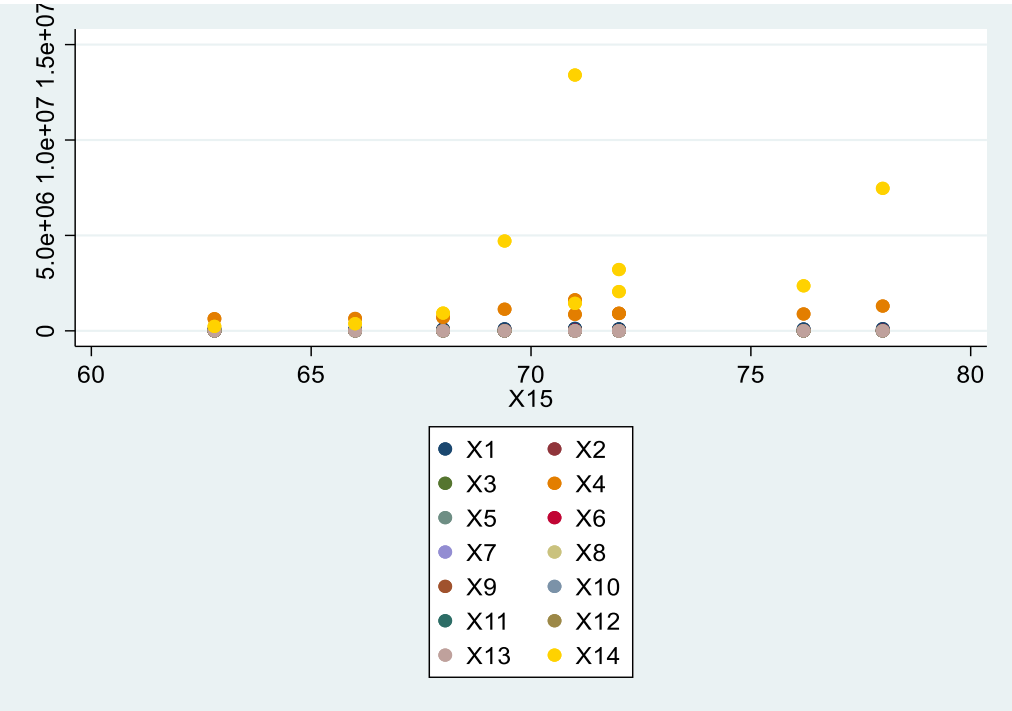

Figure 1. Correlation diagram of factors affecting economic and ecological systems in the Republic of Uzbekistan

From the correlation diagram of economic indicators of textile enterprises of the Countrywe can see that the number of observations is much lower than the factors. Only the most important ones should be left here. (Figure 1)

Based on the selected factors, their degree of interdependence is determined in the Stata 16 program by a correlation coefficient. According to the table, there is a strong correlation between $|r_{x_1,x_2}| < 0{,}8$ the resulting factor and the selected factors. can be created.

Figure 2. Correlation diagram of factors affecting economic and ecological systems in the country

The regression equation shows what functional relationship exists between the resulting factor and the selected factors. (Figure 3).

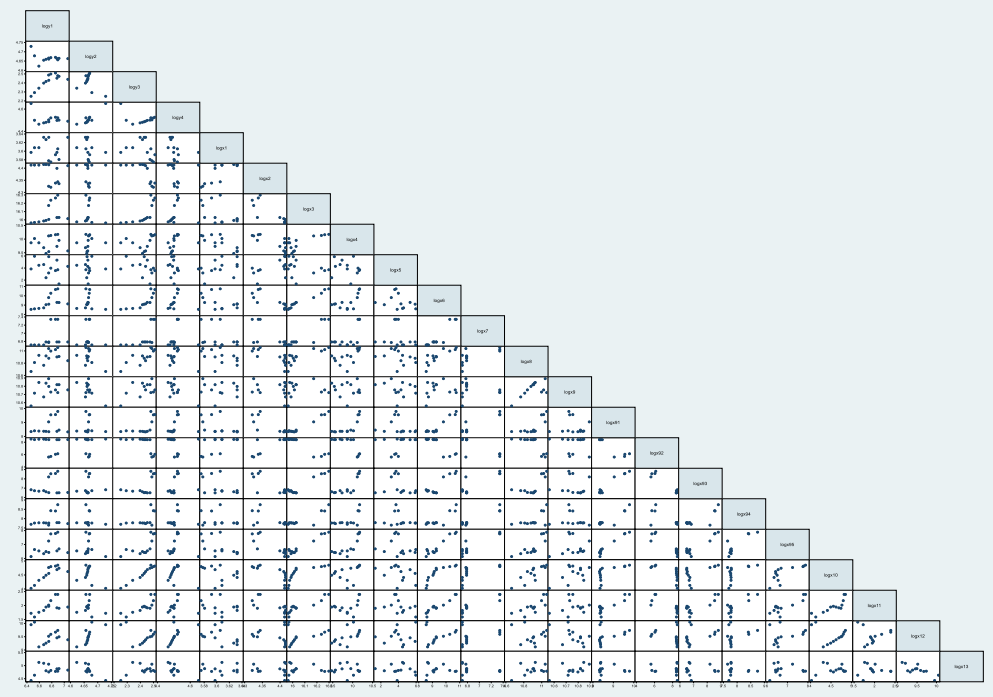

Figure 3. Diagram of the correlation matrix of factors affecting the economic and ecological systems of the country

To construct the regression equation, it is appropriate to use the Stata 16 program, which is currently the most convenient. In this case, of course, the reliability and adequacy of the identified regression equations should be checked on the basis of certain criteria. Since the units of measurement of the factors are different, it is advisable to logarithm the variables.

A correlation matrix of logarithmic factors is constructed and expressed in the form of a diagram. (Figure 3).

Figure 4 shows a diagram of the group of factors of economic indicators of textile enterprises of the Republic of Uzbekistan.

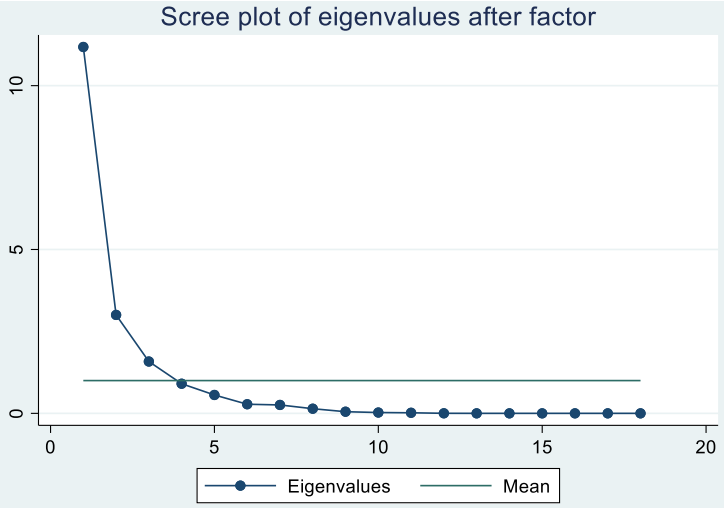

Figure 4. Diagram of the group of factors of economic indicators of textile enterprises of the country

Figure 5 shows the location of a group of factors in the indicators of economic and ecological systems in the Republic of Uzbekistan, we can see that the factors are mainly divided into 3 groups.

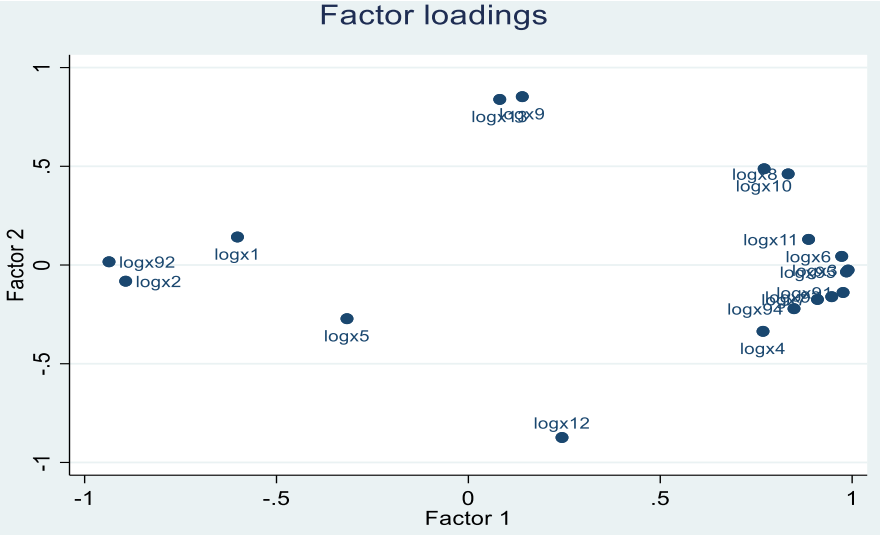

Figure 5. Location of a group of factors of indicators of economic and ecological systems in the country

In order to verify the model results, an F-test was performed, the essence of the F-test is to test the hypothesis that the simple determination coefficient is $R^2 = 0$. Because this figure represents the part of Y that can be explained by the regression equation. If it is zero, then it turns out that Y cannot be explained by X.

The purpose of the t-test in the model is to verify that the coefficients of the estimated linear regression equation of the general set are significantly different from zero, i.e., that they are not random. Suitable zero and one-sided hypotheses can be constructed as follows:

$$H_0: \beta_1=0$$
$$H_1: \beta_1\neq0$$

From the matrix in Annex 3, we construct the following regression equation:

lny1 = 8,33lnx1-7,28lnx2-0,11lnx93+9.44 (8)

If we interpret the determined regression equation, one percent increase in sewerage supply of apartments (houses) in the territory of the Countryis 8.33% increase in the amount of pollutants emitted into the atmosphere in the territory of the Republic of Uzbekistan. Percentage increase in the number of pollutants emitted in the territory of the Countrydecreased by 7.28% and a one percent increase in the supply of industrial water for the regions decreased by 0.11%.

The p-value required in the t-test for all coefficients is less than 0.05. That is, all coefficients accurately represent the impact of factors on pollutants emitted into the atmosphere in the territory of the Countrywith a confidence of at least 56%.

From the matrix in Annex 4, we construct the following regression equation:

lny2 = 0,014lnx6-0,13lnx8-0.07 lnx13+6,38 (9)

According to the regression equation, if other factors do not change, a one percent increase in mining and quarrying in the Countrywill increase carbon dioxide emissions in the Countryby 0.014 percent, a total increase in water emissions in the Countryby one percent. A 0.13% decrease in carbon dioxide and a 1% increase in air freight turnover in the territory of the Countryled to a 0.07% decrease in carbon dioxide emissions in the territory of the Republic of Uzbekistan.

Using the decisive rule, the H0 hypothesis is rejected because the p-value is <0.005. Hence, the general set regression coefficient differs significantly from zero and is not random. From this, the change in factors leads to a change in the amount of carbon dioxide released into the atmosphere (in direct proportion). Determination coefficient (definition, formula and their interpretation). Conclusions on the matter. The determinant coefficient in a multivariate regression - R2 represents the part of the quantity Y variable that can be explained using the regression equation found by the predicted variables.

It is calculated on the basis of the following formula:

$$R^2 = 1-\frac{SSE}{SST} = 1-\frac{\sum\left(Y-\hat{Y}\right)^2}{\sum\left(Y-\bar{Y}\right)^2} = 0{,}864 \quad (10)$$

here,

SST is the sum of total squares,
SSE is the sum of the residual squares.
From the matrix in Annex 5, this regression equation looks like this:

lny3 = -3,20lnx2-0,24lnx4+0,70lnx6-
0,18lnx96+19.31 (11)

According to the above regression equation, if other factors do not change, a one percent increase in the supply of drinking water to apartments (houses) in the regions will reduce nitrogen (I) oxide emissions in the Countryby 3.2 percent, mining and open pit production by regions One percent increase in nitrogen (I) oxide emissions in the Republic of Uzbekistan.

lny4 = 0,66lnx6-0,52lnx8+9.63 (12)

(Appendix 6) According to the regression equation, if other factors do not change, a one percent increase in mining and open pit production by regions will increase the amount of hydrocarbons released into the atmosphere by 0.66 percent and a one percent increase in total water intake in the regions. [0.5]
Statistically, the determination coefficient is R2– 0.53, which can explain 53% of the whole process, and the F-statistical value according to Fisher is also statistically significant (p = 0.000).

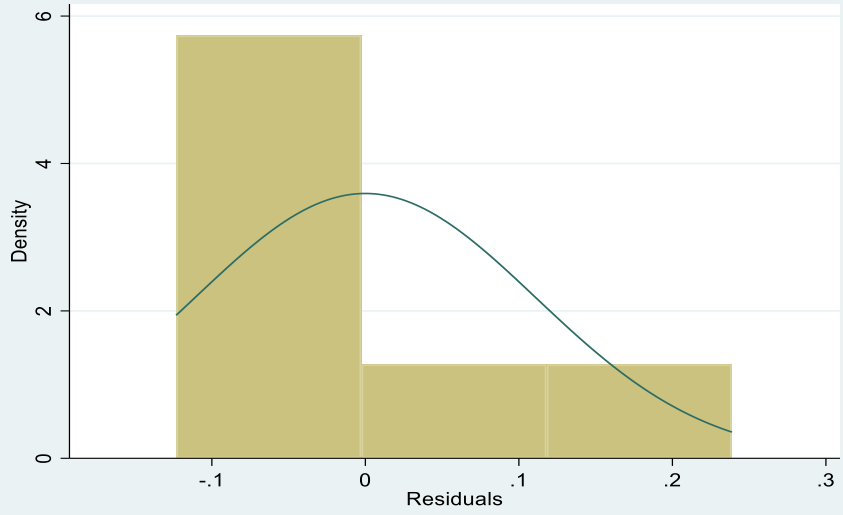

Figure 6. Diagram of the distribution of residues of the multifactor regression model of economic and ecological systems in the country

The distribution of residues of the multifactor regression model of economic and ecological systems in the Countrycan be seen in the diagram above and the values of Skewness and Kurtosis.

lny1 = 0,67lnx10-0,76lnx93+4.24 (13)

According to the above regression equation (5), if other factors do not change, a one percent increase in passenger traffic in the territory of the Countrywill increase the amount of pollutants emitted in the country by 0.67 percent and a one percent increase in the volume of industrial water. Leading to a decrease of 0.76 percent. Since the determination coefficient of the regression equation is R2- 0.81, the equation can explain 81% of the whole process, and the F-statistical value according to Fisher is also statistically significant (p = 0.000).
As a result of econometric analysis, the increase in pollutants emitted into the atmosphere in the country is based on: mining and open pit mining volumes; passenger traffic by road in the regions; to decrease: the total volume of water received in the regions; provision of apartments (houses) with drinking water by regions; Influenced by the total area of forestry in the system of the State Committee for Forestry of the Republic of Uzbekistan.
According to the study, in order to increase the efficiency of management of economic and ecological systems in A region, special attention should be paid to the sustainability of these two structures. At the same time, we must pay attention to the rational use of available resources. Given that the main share of environmental costs (average 65-70 percent) is the cost of water use, it is necessary to organize resource-efficient production. This requires the widespread use of innovative management methods, resource-saving types.
Thus, we have developed the following proposals to ensure effective management and sustainable development of the economic and ecological system of A region:
establishment of logistics centers aimed at developing infrastructure and expanding trade in it;
organization of clusters by industries and sectors with advanced production. In this case, the organization of clusters, taking into account the specialization of the regions;

It is necessary to organize the specialization of the border districts of the region, taking into account the networks of neighboring regions.

In general, it is advisable to take into account the strong influencing factors obtained in the management strategy based on the research conducted. As a result, the sustainability of economic and ecological systems will be ensured and their efficiency will be increased and balanced development will be achieved. This will ensure the balance of industries and sectors in the region as a whole, as well as economic, social and environmental stability in all systems.

References

Costanza, R., Stern, D.I., He, L., Ma, C. (2004). Influential publications in ecological economics: a citation analysis. Ecological Economics 50(3-4): 261-292.

Cataldo A.L., Burgstaller D., Hribar G, Jungbauer A, Satzer P, Economics and ecology: Modelling of continuous primary recovery and capture scenarios for recombinant antibody production, Journal of Biotechnology (2019). doi: https://doi.org/10.1016/j.jbiotec.2019.12.001

Brian Boyd. Ecologies of fiber-work: Animal technologies and invisible craft practices in prehistoric Southwest Asia. Quaternary International; Andrew Brennan. Asian traditions of knowledge: the disputed questions of science, nature and ecology. Stud. Hist. Phil. Biol. & Biomed. Sci. 33 (2002) 567–581.

Anthony S.F. Chiu, Geng Yong. On the industrial ecology potential in Asian Developing Countries. Journal of Cleaner Production 12 (2004) 1037–1045.

Raul P. Lejano, Daniel Stokols. Social ecology, sustainability, and economics. Ecological Economics; Sangwon Suh. Theory of materials and energy flow analysis in ecology and economics. Ecological Modelling 189 (2005) 251–269.

Yue Yang, Zhaoqi Wang, Jianlong Li, Chencheng Gang, Yanzhen Zhang, Ying Zhang, Inakwu Odeh , Jiaguo Qi. Comparative assessment of grassland degradation dynamics in response to climate variation and human activities in China, Mongolia, Pakistan and Uzbekistan from 2000 to 2013. Journal of Arid Environments.

Troitsky V.A., Gizatullin Kh.N. The concept of sustainable development: a new socio-economic paradigm. Social sciences and modernity, 1998. - No. 5. - pp. 124-130.

Munasinghe M., Cruz V. Economic policy and the environment. Experience and conclusions. World Bank Environmental Publications. Issue. No. 10. Washington, DC, 1995.

UNEP report "Towards a Green Economy: A Path to Sustainable Development and Poverty Eradication". (http://prirodasibiri.ru/show_new.php?id_new=759).

Kuznetsov A.P. Problems of assessing environmental and economic sustainability // International Research Journal. - M: No. 9 (40), 2015.

BMT Bosch Assembly 1989 yil december oyidagi 44/428-sonli resolutionsidan (https://www.un.org/ru/ga/44/docs/44res.shtml)

Malyshev A.A., Solodkov N.N. Factors affecting the sustainability of the ecological and economic system // -M., No. 1 (30), 2014. - p. 129-135.

Reznik G.A. Economic methods and tools for managing the ecological and economic system // Socio-economic problems of development of enterprises and regions: collection of articles of the VII-international scientific and practical conference. - Penza: Privolzhsky House of Knowledge, 2008. - p. 66-72.

Kuzina E.L. Econometric modeling of environmental and economic risk management // Scientific Thought of the Caucasus. 2010, No. 3. - pp. 92-96.

Druzhinin P.V., Shkiperova G.T. Ecological and economic models and forecasts in the system of regional management // Problems of Forecasting. M., No. 1, 2012. pp. 88-97.

Tursunov, B. O. (2020). Mechanism for determining optimal management of use of production capacity at the textile enterprises. Vlakna a Textil, 27(1), 99–106. https://doi.org/ 10.5281/zenodo.3787291.

Akramov T.A., Hakimov Z., Tursunov B.O., Oqboyev A. (2021) Evaluation of competitiveness of brands of local sewing and knitting enterprises. Revista Geintec-Gestao Inovacaoe techhnologias. Vol. 11, No. 2, 716-739 pp.

Tursunov B.O., Umarkhodjaeva M., Rustamov N., Umarova G., Rejabbaev S. (2021) Analysis of industrial production potential in ensuring the economic security of the regions. Revista Geintec-Gestao Inovacaoe techhnologias. Vol. 11, No.3, 1411-1421 pp.

Alimov Sergey Aleksandrovich. Theoretical foundations of ecological audit of territorial and economic systems. Economic and human sciences. 7 (246), 2012.- p. 22-26 (https://www.elibrary.ru/item.asp?id=17783882)

Rakhmonnazarov P.Y. Improving the efficiency of management of economic and ecological systems of the regions. A dissertation for the degree of Doctor of Philosophy. A - 2022

Transforming our world: the 2030 Agenda for Sustainable Development (adopted by General Assembly resolution 70/1 of 25 September 2015) // https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/291/92/PDF/N1529192.pdf.

Ahmad S., Ng Ch., McManusc L. Enterprise risk management (ERM) implementation: Some empirical evidence from large Australian companies. Procedia - Social and Behavioral Sciences 164 (2014) 541 – 547.

Amoore, L. (2011) Data derivatives: On the emergence of a security risk calculus for our times. Theory, Culture & Society, 28(6): 24-43.

Der Derian, J. (1995) The value of security: Hobbes, Marx, Nietzsche and Baudrillard. In: Lipschutz, R. (ed.) On Security. New York, NY: Columbia University Press, 24-45.

Foroni C., Marcellino M., Stevanović D. Forecasting the Covid-19 recession and recovery: lessons from the financial crisis (2020). European central Bank. https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2468~068eec9e3e.en.pdf

Mentel, U., Wolanin, E., Eshov, M., Salahodjaev, R. Industrialization and CO2 Emissions in Sub-Saharan Africa: The Mitigating Role of Renewable Electricity. Energies, 2022, 15(3), 946.

Sharipov, K.A., Jumaev, N.H., Eshov, M.P., Aziz, A., Rakhmonov, D.A. Compressive Sparse Binary Signals Reconstruction

eISSN 1303-5150

Algorithm Using Simulated Annealing. ACM International Conference Proceeding Series, 2021, pp. 485–490.

Eshov, M., Osamy, W., Aziz, A., Khedr, A.M. Econometric Analysis of Stock Market Performance during COVID-19 Pandemic: A Case Study of Uzbekistan Stock Market: Uzbekistan Stock Market Performance during COVID-19 Pandemic, International Journal of Advanced Computer Science and Applications, 2021, 12(4), pp. 197–204.

Pulatovich, E.M. Impact of financial sustainability on enterprise value expansion. International Journal of Engineering and Advanced Technology, 2019, 9(1), pp. 4640–4645.

Tursunov, B. Provincial Features of Industrial Production Dynamics in the Research of Textile Enterprises' Financial Security in Uzbekistan. Lecture Notes in Networks and Systems, 2022, 368 LNNS, pp. 601–610.

Kholmuminov, S., Tursunov, B., Saidova, M., Abduhalilova, L., Sadriddinova, N. Improving the Analysis of Business Processes in Digital Era. ACM International Conference Proceeding Series, 2021, pp. 775–789.

Zarova, E.V., Tursunov, B.O. Regional features of industrial production dynamics in the research of textile enterprises` financial security in Uzbekistan. Vlakna a Textil, 2021, 28(1), pp. 108–115.

Yuldashev, N.K., Nabokov, V.I., Nekrasov, K.V., Tursunov, B.O. Modernization and intensification of agriculture in the republic of Uzbekistan. E3S Web of Conferences, 2020, 222, 6033.

Tursunov, B., Umarova, G., Yusupov, S., Bekmuradova, N. Methods for optimizing decision making in eliminating subjective psychological factors as a tool for ensuring the economic security of textile enterprises. Journal of Advanced Research in Dynamical and Control Systems, 2020, 12(5), pp. 330–341

Mustafakulov, S.I., Zarova, E.V., Tikhomirova, A.N., Tursunov, B.O. Research of efficiency of use of production capacity at the enterprises of textile industry on the basis of methods of multivariate statistical analysis: On the example of Namangan Region of the Republic of Uzbekistan. Journal of Advanced Research in Dynamical and Control Systems, 2019, 11(7), pp. 886–899

Burkhanov, A.U., Tursunov, B.O. Main indicators of textile enterprises' financial security assessment. Vlakna a Textil, 2020, 27(3), pp. 35–40.