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ANALYSIS OF ECOLOGICAL INDICATORS OF TERRITORIES

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Abstract
This article identifies the economic and ecological systems of the regions and the factors affecting their sustainability. The article also analyzes the indicators of environmental sustainability of Fergana region and develops proposals for sustainable development of economic and ecological systems. This allows for effective management of economic and ecological systems.

Keywords: ecology, economic-ecological system, economic-ecological system stability, environment, ecological policy, ecological security.

Introduction

Sustainable development of regions around the world is seen 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 region, 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. Without the use of intellectual resources and the active use of advanced science and technology, it is impossible to achieve balanced economic growth and sustainable development of economic and ecological systems. At the

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heart of sustainable development, of course, is the efficient use of available resources.

In particular, the development of the economic system, in turn, requires a high level of resource spending. This has a negative impact on the sustainability of the ecosystem. Therefore, the study of sustainable development in general requires a separate consideration of the interdependence of economic and ecological systems. In studying this continuity, it is necessary to systematically study the scientific basis of the concept of "sustainable development".

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 noted above, the economic and ecological systems operate in a mutually integrated manner, i.e., one does not work without the other. Deep, if we study, sustainable development is aimed at solving the fundamental problem of the economy.

Materials and Methods

We know that the concept of sustainable development emerged as a result of the combination of three areas of society, namely, social, economic, environmental activities [1].

Ecologically sustainable development includes the sustainability of biological and physical systems. At the same time, the focus is on ensuring that ecosystems adapt to change. The use of natural resources, environmental pollution and the loss of biological species make it impossible for ecosystems to regenerate themselves [2].

A number of measures are being taken around the world to address this issue. In particular, management programs are being adopted by international organizations. In 2011, the United Nations Environment Program (UNEP) developed a strategy for developing a green economy. According to him, by 2050 it is planned to invest in this sector at the level of 2% of world GDP in the following 10 areas: 1) agriculture, 2) housing and communal services, 3) energy, 4) fisheries, 5) forestry, 6) industry, 7) tourism, 8) transport, 9) waste disposal and recycling, 10) water resources management [3].

An important internal factor that determines the management of economic and ecological systems are natural conditions and resources. This factor is characterized

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by the functioning and use of economic and ecological systems. If we evaluate the development of the economy, which in many cases depends on natural resources, the availability of different resources will allow the sustainable development of sectors of the economy. Natural resources also have a role to play in this regard. The impact of agriculture, especially irrigated agricultural products, food, technical raw materials, etc., supplied by dry farming and pastoralism, on the growth of the national economy is quite high. We all know that environmental resources account for 32% of the world's GDP.

In our view, the role of environmental resources in economic development is expected to increase in the future. This is because population growth will lead to a quantitative increase in livestock and agricultural production (requiring the supply of grain and livestock products in per capita terms) [4].

It has not been recognized that the economy is supplied with natural raw materials and has long been dependent on the laws of nature, especially environmental laws and regulations. As a result of the development of production and the widespread application of scientific and technological advances in industry and agriculture, the location of natural resources, their potential, regenerative capacity, levels of self-purification, including dependence on environmental laws, were later substantiated by experts [5].

Results and Discussion

Environmental indicators play an important role in the system of indicators representing the sustainable development of regions. The amount of pollutants and harmful gases emitted into the atmosphere is important in the composition of these indicators. When these indicators were analyzed, it was found that the amount of toxic gases released into the atmosphere increased (Table 1). In particular, the amount of hydrogen fluoride in the toxic gases contained in carbon dioxide increased by an average of 0.4-0.5 per thousand per year, nitrogen oxide by 0.2 per thousand and methane by 1.1 percent.

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Table 1. Analysis of air pollutants in Fergana region

№	Years	Pollutants released into the atmosphere, thousand tons	Change status (in%)	Greenhouse gas emissions (total value of emissions (in CO_2 equivalent))			
				Excluding carbon dioxide (SO2) YFYFO'O'X (million tons. CO_2 - eq. / Year)	Nitric oxide (N_2O), excluding YFYFO'O'X (million t. CO_2 - eq. / Year)	Methane (CH_4), excluding YFYFO'O'X (mln. T. CO_2 - eq. / Year)	Hydrofluorocarbons (GFU) (million tons of CO_2 - eq./Year)
1	2008	38,56	100,0	12,541	0,824	8,124	0,051
2	2009	40,46	104,9	11,921	0,859	6,990	0,034
3	2010	43,0	106,3	11,278	0,902	6,749	0,034
4	2011	42,8	99,5	11,644	0,954	6,827	0,119
5	2012	73,5	171,7	11,699	0,971	6,866	0,160
6	2013	40,2	54,7	11,712	0,984	6,898	0,187
7	2014	38,4	95,5	11,741	0,995	6,932	0,238
8	2015	38,9	101,3	11,748	1,008	6,982	0,255
9	2016	103,2	265,3	11,760	1,029	7,000	0,306
10	2017	60,1	58,2	11,778	1,043	7,013	0,340
11	2018	53,2	88,5	11,805	1,056	7,142	0,357
12	2019	49,6	93,2	11,825	1,068	7,184	0,372
13	2020	50,9	102,6	11,664	1,036	7,145	0,357

Emissions of harmful gases into the atmosphere are affected by the negative consequences associated with the activities of the population and industrial enterprises living in the region. The constant increase in the concentration of toxic gases on the environment complicates the ecological situation in the region. It is also affected by the deforestation and water use levels available in the area. When we analyzed the table data below, we found that the area of felled trees had increased by an average of 1.9 points over the last three years (Table 2). Deforestation is detrimental to the ecosystem of the area.

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Table 2. Analysis of felled trees and water consumption in Fergana region

№	Years	Information on felled trees, m^3	Total amount of water received (mln.m^3)	шу жумладан:							
				Irrigation	For industrial, utility and technical needs	шу жумладан:					
						Энергетика		Industry	Utilities	Fishing	Others
						Total taken	Used without refund				
1	2008	2967,00	3325,4	2933,2	392,2	19,5	4	75,0	152,2	71,1	89,8
2	2009	2518,00	3405,2	2860	545,2	19,5	4	75,0	227,7	71	167,5
3	2010	2895,00	4364,8	3819	545,8	19,5	4	75,0	227,7	71	168,1
4	2011	2390,00	4124,6	3566,7	557,9	19,5	4	75,0	242,8	71	165,1
5	2012	2035,00	4359,7	3806,6	553,1	19,5	4	75,0	241,2	71	161,9
6	2013	2117,00	4352,2	3791,2	561	19,5	4	75,0	242,8	71	168,2
7	2014	1802,00	4223,1	3671,8	551,3	19,5	4	75,0	234,5	71	166,8
8	2015	2672,00	4377,6	3816,6	561	19,5	4	75,0	242,8	71	168,2
9	2016	2430,80	4377,6	3816,6	561	19,5	4	75,0	242,8	71	168,2
10	2017	1770,00	4373,9	3812,9	505,5	4	75	19,5	-	242,8	168,2
11	2018	4052,00	4071,5	3512,7	1062,1	4	75	19,5	558,8	240,7	168,1
12	2019	4137,09	4173,3	3654,6	1065,8	4,2	75	20,1	559,2	240,9	170,1
13	2020	4211,56	4294,3	3721,3	1079,3	4,2	75	21,4	563,7	252,4	171,1

When analyzing the amount of water obtained using the data in this table by sector, 77.5% or 3721.3 million m^3 for irrigation (agriculture) and 22.5% or 1079.3 mln. m^3 for industrial, communal and technical needs. It allowed to increase the production of necessary agricultural products without the efficient use of water used for irrigation (reduction of water consumption). However, the amount of water used for industrial, communal and technical needs and the share of industries in it is also growing.

In particular, 0.39% for electricity generation, 1.98% for industrial production, 52.23% for utilities, 23.39% for fisheries and 15.85% for others. The average annual growth of water consumption by industry was 3.3% in industry, 0.45% in utilities and 2.4% in fisheries. Increasing water volume across sectors leads to pollution of water and water resources and limited opportunities for efficient water use. Rational use of available water resources for irrigation will lead to the expansion of

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agricultural production, the development of processing, storage activities and a steady increase in exports, as well as investment in areas with high industrial potential and high concentration of productive forces. In particular, provides opportunities to expand the level of direct investment. At the same time, it is necessary to take into account the ecological situation, including the reclamation of arable land, which is the main resource of agriculture. Although the fund of irrigated land in the districts and cities of Fergana region is growing from year to year, the volume of work related to its development and management is also changing. At the same time, we pay special attention to the positive and negative changes in the land fund. In particular, the increase in irrigated area reflects the positive aspects of the land fund. We study and analyze the state of salinity to determine its negative aspects. This requires an assessment of the salinity of land and its dynamics. According to the data obtained as a result of the assessment of statistical data on the current situation, the total salinity level decreased by 2 times in 2019 compared to 2010, ie from 49% in 2010 to 25% in 2019 (Table 3).

Table 3. Analysis of reclamation of agricultural lands in Fergana region

№	Years	Irrigated area (ha)	Unsalted area		Total saline area	
			hectare	%	hectare	%
1	2010	365982	186517	51	179465	49
2	2011	366124	191149	52	174975	48
3	2012	366212	193650	53	172562	47
4	2013	366299	204404	56	161895	44
5	2014	367388	221173	60	146215	40
6	2015	362852	237576	65	125276	35
7	2016	368333	281914	77	86419	23
8	2017	368755	278204	75	90551	25
9	2018	368728	268500	73	100228	27
10	2019	368622	275742	75	92880	25

Given the natural and climatic conditions of the region, the share of agricultural production is the leader in the gross regional product. Therefore, it is important to conduct a more extensive study of land reclamation and to identify strong, weak and moderately saline irrigated areas. Half of the available irrigated land was accounted for by saline areas in 2010, but now accounts for a quarter (Table 4). In the reclamation condition of lands, weak salinity has increased, while medium and strong levels have decreased.

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Table 4. Structural analysis of the reclamation of irrigated lands in Fergana region

Years	Total salted		Salinity level (in percent)		
	hectare	%	hectare	Medium	Strong
2010	179465	100	75,23	22,14	2,64
2011	174975	100	75,24	22,33	2,43
2012	172562	100	78,03	19,65	2,32
2013	161895	100	81,22	16,68	2,09
2014	146215	100	76,53	21,38	2,08
2015	125276	100	81,80	16,66	1,54
2016	86419	100	89,32	9,27	1,40
2017	90551	100	92,08	7,32	0,60
2018	100228	100	90,96	8,47	0,57
2019	92880	100	92,44	7,03	0,53

During the follow-up period, the mean salinity decreased by 3 times and the strong salinity decreased by 5 times. The weak level index increased 1.4 times during this period. This requires taking environmental measures to prevent salinity levels not only in strong areas but also in weak areas. In our opinion, it is advisable to take the following measures to ensure the environmental and economic sustainability of the regions:

- Development of the legal and regulatory framework governing the protection and sustainable development of the environment, as well as legislation on environmental protection and natural resources;
- Development and implementation of state policy in the field of environmental protection;
- Environment, ecological security and sustainable development;
- Implementation of state environmental control in the field of environmental protection and compliance with environmental legislation;
- Establishment of norms and state standards that ensure maximum permissible environmental loads;
- State registration of natural resources, maintenance of state cadastres, as well as monitoring the condition and dynamics of environmental objects;
- Qualitative and quantitative assessment of the state of the environment, economic and ecological system of the region;

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- Financing of state programs aimed at the conservation of biodiversity, sustainable development and environmental protection;
- Protection of national parks and specially protected natural areas, unique natural monuments, prevention of poaching and violations of environmental legislation.

Conclusion

Ensuring the sustainable development of the region as a whole requires a special consideration of the interdependence of economic and ecological systems. Economic and ecological systems operate as a whole, that is, one does not work without the other. The study of the structural structure of the regional economic and ecological system and their interaction as a whole is necessary to ensure sustainable development through effective management. In particular, they consist of economic, environmental and social sections, and on the basis of their sustainability, sustainability is ensured by effective governance in general. Environmental sustainability differs from natural and economic sustainability in that it is assessed taking into account the level of natural resources available to the economy.

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