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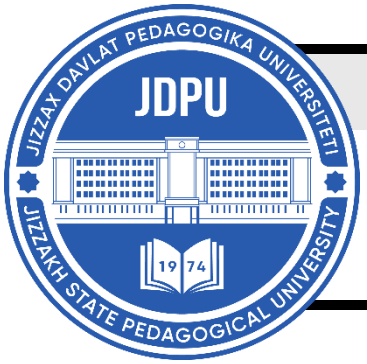

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ECOLOGICAL AND ECONOMIC DEVELOPMENT STRATEGY OF UZBEKISTAN: ISSUES AND PROSPECTS

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ABOUT ARTICLE

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Abstract: The article analyzes the essential characteristics Tactical training of football players during the period of advanced specialization reveals the age-specific characteristics of 14-15-year-old football players and identifies the means and methods of tactical training for football players in training groups. In global football, football players must precisely execute their speed, technical, and tactical moves. Now, in the world football competitions, alongside European and South American footballers, footballers from other continents also perform at a high level. According to global football experts, Asian football is developing rapidly. This is evidenced by the fact that talented young footballers in East Asian countries are reaching adulthood and successfully playing for the world's top clubs. Their tactical actions, as well as their on-field thinking, are considered by industry experts to be indicative of the model of a modern football player.

Introduction. It is well known that over the past century, the process of ensuring economic growth has increasingly been accompanied by environmental degradation and the depletion of natural resources. Globally, scientific research is recording more and more evidence of ecological crises, yet these alarming trends are often not adequately reflected in political decision-making. A series of major international forums — the Rio de Janeiro Summit

(1992), the Johannesburg World Summit on Sustainable Development (2002), the Copenhagen Climate Conference (2009), the Rio+20 Conference (2012), and the Paris Climate Agreement (2015) — have not significantly slowed the deterioration of the global environmental situation. [1]

In many countries, the current economic mechanisms for environmental management remain inefficient. The ongoing degradation of the environment and the weakening of ecological security raise serious concerns. According to the United Nations, every hour more than 3,000 acres of tropical forests are destroyed, and about 1,700 acres of fertile land are being degraded into deserts due to improper land use. Nearly 900 million people are currently living in arid and environmentally vulnerable areas. Air pollution has reached alarming levels in almost every country.

Over the past century, the concentration of carbon dioxide (CO_2) in the atmosphere has increased by 12–18%, airborne particulate matter has risen by 10–20%, and incoming solar radiation has decreased by 7–10%. The ozone layer, which protects humanity from harmful ultraviolet radiation, has thinned by approximately 2%. At the same time, rapid melting of glaciers in Greenland, Antarctica, and mountainous regions has been observed. The area of tropical forests has declined by 20–30% over the last decade, and forest areas in Eurasia and the Americas are shrinking by millions of hectares each year. As a result, 70–80% of the world's pastures have already been desertified. The annual socio-economic and environmental damages to the global economy are estimated at approximately 40 billion USD. [2]

Materials and methods. The theoretical and practical foundations of ecological and economic development are currently at the center of attention in numerous international and national scientific studies. The sources utilized in this article primarily include Uzbekistan's national strategic documents, reports issued by international organizations, and fundamental works based on ecological and economic theories.

First and foremost, the scientific collection edited by Medvedeva L.I. and Ryazantsev I.I. [3], titled "The Strategy of Ecological and Economic Development of Modern Russia: Problems and Prospects", analyzes the application of the concepts of environmental security, sustainable development, and green economy in the context of Russia (Medvedeva & Ryazantsev, 2016). The structure of this article was developed on the basis of this source and subsequently adapted to the context of Uzbekistan.

A number of strategic documents adopted by the President of the Republic of Uzbekistan between 2019 and 2023 [4]— including the "Strategy for Transition to a Green Economy", the "Environmental Protection Concept", and the "Development Strategy – 2026" — serve as

important legal frameworks for enhancing environmental safety and resource efficiency in the country. The targeted indicators embedded in these policy documents constitute the primary objects of analysis in this study (Presidential Decrees PQ–4477, PF–5863, PF–60).

In addition, reports issued by international organizations — in particular, the World Bank (2022) [5], IQAir (2021) [6], and the Global Footprint Network (2021) [7]— have been used to assess Uzbekistan's environmental indicators in a global context, including waste generation, air pollution levels, and ecological footprint metrics. These data serve as critical statistical foundations for evaluating the effectiveness of national environmental policy.

This study employs a scientific-analytical approach, applying a systematic analysis method to examine the subject matter. Official statistical data, international rankings (IQAir, Global Footprint Network), and formal documents of the Government of the Republic of Uzbekistan — including national strategies, presidential decrees, and environmental policy concepts — were used to identify current challenges and possible solutions. Through comparative analysis, Uzbekistan's situation was evaluated against global trends. Furthermore, content analysis was applied to interpret the key goals and indicators outlined in national strategic documents, supported by scientific commentary. This methodological framework allows for a comprehensive assessment of the effectiveness of Uzbekistan's ecological and economic policy.

Result and discussion. The need for a new ecological-economic model to ensure global sustainable development has been emphasized in the conceptual documents of many countries. In particular, during the Rio+20 Conference held in 2012, more than 150 countries and thousands of regional communities declared their commitment to cooperate in achieving the goals of the declaration "The Future We Want." The conference highlighted the need to expand best practices in sustainable ecological and economic development, identifying energy, sustainable urban and rural development, and water issues as key priority areas. It is worth noting that recent global crises - such as climate change, pandemics, and others - have demonstrated the urgent need for innovative approaches that ensure the harmonious development of nature and humanity. One such solution is the concept of "green growth" proposed by the United Nations, which aims to qualitatively transform production and consumption models, integrate green principles into strategic planning and budgeting, and promote the greening of business and infrastructure sectors.

Thus, the concept of a green economy is increasingly recognized by the international community as an adequate mechanism for modern economic growth. In this context, the

rational use of natural resources and the protection of the environment have become critical factors in ensuring the effective development of national economies.

Uzbekistan is no exception to the ongoing global ecological-economic transformations—its economic development is closely intertwined with growing environmental challenges. The modern Uzbek economy has largely relied on the intensive use of natural resources for its growth. As a result, Uzbekistan ranks fifth globally in terms of greenhouse gas (GHG) emission intensity, the highest in the Europe and Central Asia region [5]. This is mainly attributed to the country's heavy dependence on coal and natural gas for energy, the insufficient adoption of energy-efficient technologies in industry, and the legacy of outdated infrastructure.

Consequently, Uzbekistan's ecological footprint (i.e., per capita demand for natural resources) significantly exceeds its biocapacity (i.e., the ecosystem's capacity to regenerate those resources). For instance, while the ecological footprint per capita is estimated at approximately 2.3 global hectares (gha), the domestic biocapacity stands at only 0.9 gha per capita—indicating that the country operates under an ecological deficit [8]. The level of resource consumption has surpassed the rate of natural regeneration, placing Uzbekistan among the world's ecological debtor nations.

Environmental challenges in Uzbekistan also manifest spatially across different regions. One of the most severe examples is the Aral Sea crisis, which has transformed vast areas in the northwestern part of the country into an ecological disaster zone. The desiccated seabed of the Aral Sea has accumulated toxic salts and chemical residues that are now dispersed by wind, negatively affecting an estimated 1.5 to 2 million square kilometers of Central Asia [9]. Estimates suggest that more than 700 million tons of toxic dust and salt are released into the atmosphere annually from the Aral Sea region, traveling vast distances and contributing to widespread soil and water salinization, while severely damaging agriculture and public health.

Currently, about 70% of Uzbekistan's territory (over 31 million hectares) is classified as arid or semi-arid land, vulnerable to desertification and salinization processes. More than half of the country's irrigated land is already salinized, with some districts—particularly around Muynak in the Republic of Karakalpakstan—reporting over 90% of land affected by high salinity [9]. These conditions result in decreased soil fertility, loss of biodiversity, and deterioration of living standards in affected communities.

The environmental situation in Uzbekistan's urban and industrial centers is also a cause for concern. In major cities such as Tashkent, Fergana, and Samarkand, up to 80% of air pollutants are emitted by motor vehicles. The rapid growth in the number of automobiles in recent years has exacerbated air pollution. For example, in 2022, the volume of harmful gases

released into the atmosphere by vehicles in Uzbekistan increased by 26.6 thousand tons compared to the previous year [9].

According to research conducted by IQAir, the concentration of PM2.5 particles in Uzbekistan's air in 2021 was several times higher than the World Health Organization's recommended limits. As a result, Uzbekistan was ranked 12th among countries with the most polluted air. Such levels of air pollution pose significant health risks to the population, contributing to the rising incidence of respiratory and cardiovascular diseases [10].

In parallel, the management of water resources has emerged as a critical issue. Water scarcity in Central Asia is responsible for nearly 70% of the region's development challenges, and Uzbekistan is listed among the top 25 countries most vulnerable to severe water shortages globally. Climate change is expected to further intensify this problem. Rising temperatures and declining precipitation levels may reduce water volumes in the Amu Darya and Syr Darya river basins in the coming decades [5].

Currently, a significant portion of the population in Uzbekistan still lacks access to safe drinking water. The groundwater table is falling, and in some areas, wells have completely dried up. These developments threaten the stability of agricultural production and pose serious risks to food security across the country.

Waste management, both industrial and municipal, remains one of the unresolved issues in Uzbekistan. In recent years, there have been certain improvements in the infrastructure for collecting and transporting household waste—for instance, the coverage of municipal solid waste collection services has expanded. However, the overall volume of waste generated across the country continues to grow, and the majority of it is disposed of in landfills, while the recycling rate remains low [9].

The industrial waste recycling and disposal system is underdeveloped; specialized mechanisms for the collection and safe treatment of hazardous waste—such as electronic waste and batteries—have yet to be established. Moreover, a comprehensive system for the storage and disposal of medical and biological waste is still lacking [9]. These shortcomings may lead to secondary environmental impacts, including soil and water contamination.

These facts highlight the serious environmental challenges confronting Uzbekistan's economic development. Nevertheless, in recent years, the country has taken substantial steps toward improving environmental conditions and integrating green economy principles. The Government of Uzbekistan has adopted several strategic policy documents aimed at harmonizing economic growth with environmental sustainability and has begun implementing them in a phased manner.

To redirect the country's environmental-economic development toward a green economy model, Uzbekistan has adopted a number of strategic frameworks. Most notably, in October 2019, the President of the Republic approved the "Strategy for Transition to a Green Economy for 2019–2030" . This national strategy formally signaled Uzbekistan's commitment to a green growth trajectory and outlined specific objectives and measures for greening key sectors of the economy [5, 11].

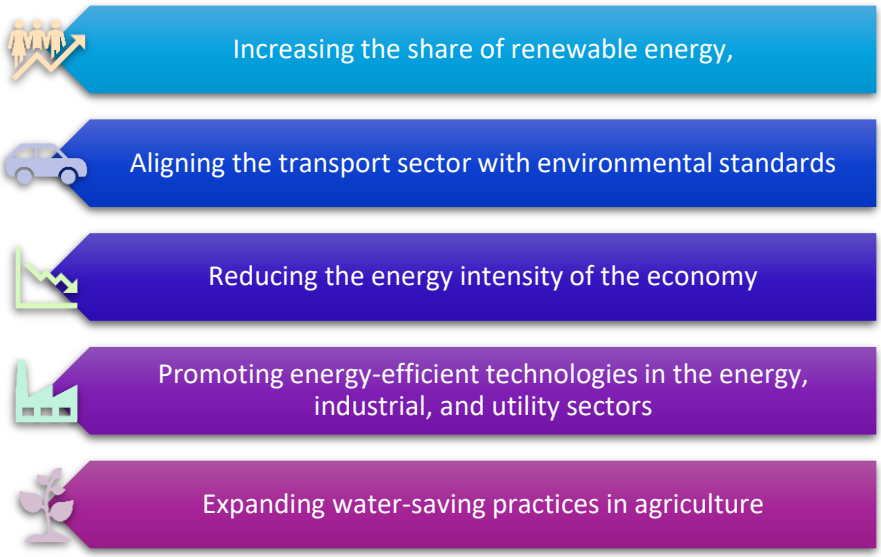

Figure 1. Key components of Uzbekistan's green economic transition strategy, including renewable energy, transport modernization, energy efficiency, and sustainable agriculture.

As part of the strategy's implementation, an Interdepartmental Green Economy Council was established under the Cabinet of Ministers to coordinate the activities of ministries and agencies involved in the transition [5].

In addition, in November 2019, by Presidential Decree, the "Environmental Protection Concept of the Republic of Uzbekistan until 2030" (also referred to as the Environmental Safety Concept) was adopted. This Concept outlined the national environmental policy's priority directions up to the year 2030. Specifically, it includes measures such as protecting and improving the quality of atmospheric air, water resources, subsoil, and soil from anthropogenic impacts; promoting the use of environmentally safe technologies in production; expanding the area of protected natural territories; ensuring the safe disposal of hazardous chemical and radioactive substances; improving the waste management system; enhancing environmental awareness among the population; and ensuring the transparency of state agencies' activities [12].

Based on the Concept, a “Roadmap for 2019–2021” was also adopted, with regular monitoring of its implementation. The adoption of this document laid the foundation for transitioning from fragmented environmental initiatives to a strategically planned and comprehensive environmental management system [12]. For example, following the Concept’s approval, a moratorium on illegal tree cutting was introduced, resulting in the preservation of thousands of rare trees in 2019–2020. Furthermore, a series of practical initiatives were launched, including the inventory of air pollution sources and the construction of gas collection facilities at landfills.

The Government of Uzbekistan is increasingly integrating environmental priorities into its overall socio-economic development programs. Notably, the Development Strategy for 2022–2026 marked the first time that the concepts of “green economy” and environmental sustainability were identified as separate strategic priorities [5]. This five-year strategy sets out key tasks such as harmonizing economic growth with environmental protection, expanding investments in green technologies, developing renewable energy, and reducing emissions in industry and transport sectors.

Within the framework of this development agenda, the “Uzbekistan – 2030” Strategy, adopted in 2023, further reinforced the country’s commitment to green growth. It established a new target of generating at least 40% of total electricity from renewable sources by 2030. Previously, the goal was to reach a 25% share by 2030, but the revised objective reflects Uzbekistan's accelerated efforts in this area. In pursuit of this target, large-scale investment projects have been launched to construct solar and wind power plants [13]. As of 2023, solar power plants with a total capacity of 1,300 MW had been commissioned, and tenders for several thousand additional megawatts were underway [11].

Uzbekistan’s international environmental commitments are also becoming more closely aligned with its domestic policies. At the United Nations Climate Change Conference (COP26) held in Glasgow in 2021, Uzbekistan pledged to reduce greenhouse gas emissions per unit of GDP by 35% from 2010 levels by 2030. To achieve this, the government has adopted a series of normative and policy documents in recent years. These include the Strategy for Adaptation to Climate Change and Mitigation of Its Consequences (2020) and the updated Nationally Determined Contributions (NDC) under the Paris Agreement (2021). Consequently, since 2021, Uzbekistan has become a full-fledged participant in the Paris Climate Agreement. Concrete national targets have been set for reducing greenhouse gas emissions and achieving carbon neutrality, with responsible ministries and agencies assigned to ensure the implementation of these objectives [5].

The adoption of the aforementioned strategies and concepts, along with Uzbekistan's international commitments, clearly reflects the country's strong political will to fundamentally shift the trajectory of its ecological and economic development. Of course, the implementation of these policy documents must proceed gradually, and initial results are already becoming evident. For instance, public expenditures allocated to environmental protection measures—financed by the state budget and international financial institutions—have been steadily increasing. In 2022, government spending on environmental activities was 1.5 times higher than in 2018, including funding for Aral Sea restoration and "green" energy projects, which is viewed as a positive trend.

The growing share of resources allocated to environmental protection is a critical factor in aligning economic growth with environmental sustainability. Encouragingly, a number of green initiatives have been launched in Uzbekistan in recent years with the support of the international community, attracting both grants and concessional loans for environmental programs. For example, projects funded by the Global Environment Facility (GEF) of the United Nations include the installation of solar panels, modernization of wastewater treatment facilities, and anti-desertification efforts. These initiatives not only support environmental restoration but also contribute to building institutional capacity for sustainable development in the country.

Conclusion. The analysis presented above demonstrates that integrating economic development strategies with the principles of environmental sustainability is an imperative task for Uzbekistan. Transitioning to an innovative and "green" economy not only addresses pressing environmental challenges but also contributes to enhancing the competitiveness of the national economy and improving the well-being of the population. In our view, Uzbekistan, by rapidly adopting various ecological solutions proposed by global scientific and practical communities, can achieve high economic potential and, in the future, contribute meaningfully to addressing not only its domestic environmental issues but also global ecological problems.

In this process, the role of the state must be particularly emphasized—without the implementation of an integrated economic mechanism for natural resource management, it will be impossible to achieve indicators of sustainable development.

In the near future, it is essential to further strengthen the legal and institutional foundations of environmental governance in Uzbekistan. To ensure the effective implementation of strategic documents adopted in the field of environmental safety, legislative support and the adoption of the necessary regulatory-legal frameworks are required. Specifically, it is vital to expand the system of economic incentives for resource users, provide

tax and customs benefits for the adoption of environmentally friendly technologies, and strengthen liability for environmental damage.

Moreover, it is necessary to improve the system of environmental taxes and fees by directing revenues from polluting enterprises toward environmental restoration. Such measures will lay the foundation for building a new, ecologically oriented model of economic development.

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