

UZBEKISTAN'S STRATEGY FOR TRANSITIONING TO A "GREEN ECONOMY": EXISTING CHALLENGES AND PROMISING OPPORTUNITIES

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Abstract

This article analyzes Uzbekistan's transition process to a green economy, strategic directions, existing challenges and development prospects. The research examines the country's efforts in developing renewable energy sources, reducing greenhouse gas emissions and ensuring sustainable economic growth. According to 2024 statistical data, Uzbekistan has increased green energy production capacity to 2.4 gigawatts and achieved an 18% share of renewable energy. The article presents the main obstacles to the green economy transition, including financial constraints, technological deficiencies and institutional weaknesses. Research results indicate that international cooperation and investments play a crucial role in Uzbekistan's green transformation.

Keywords: Green economy, renewable energy, sustainable development, climate change, greenhouse gases, environmental strategy..

Introduction

In the 21st century, as global climate change and ecological challenges have intensified, the concept of a green economy has moved to the center of international attention. Countries around the world are striving to transition from traditional economic models toward sustainable and environmentally safe development strategies. Uzbekistan has become an active participant in this process, adopting the "Strategy for Transitioning to a Green Economy" for 2021–2030. Resolution No. PQ-4477 of the President of the Republic of Uzbekistan, dated October 4, 2019, outlined the key directions of the country's transition to a green economy [1]. This strategic document envisions reducing greenhouse gas emissions by 35%, increasing the capacity of renewable energy sources to 15 GW, and improving energy efficiency by 20%. As of 2024, the country has achieved significant results in its green economy transition. Gross domestic product grew by 6.5%, reaching 1.45 quadrillion soums (approximately 115 billion dollars) (Daryo, 2025). At the same time, the share of renewable energy reached 18%, representing a notable increase compared to the previous year.



The relevance of this research is determined by Uzbekistan's geographical location, its vulnerability to climate change, and the need for economic transformation. The Aral Sea ecological disaster, water resource scarcity, and high energy intensity are compelling the country to accelerate its transition to a green economy.

LITERATURE REVIEW

The concept of a green economy began to take shape in the late 20th century. Lovins et al. (2009), in their work "Natural Capitalism," argued that by transitioning to a green economy, countries could not only reduce ecological harm but also gain economic benefits. Stern (2006), in the "Stern Review on the Economics of Climate Change," assessed the economic consequences of climate change and demonstrated that delaying action would significantly increase losses.

In the context of Uzbekistan, Vaxabov, Xojibokiyev, and others (2020), in a textbook on the green economy, covered the theoretical foundations and practical aspects of the concept. The authors emphasize that "for Uzbekistan, the transition to a green economy is not only an ecological necessity but also a strategic path to enhancing economic competitiveness" [2].

Shamiradova (2025), in her research, highlights the relevance of the green economy for Uzbekistan, stating that "water resource scarcity, the Aral Sea ecological disaster, and high energy intensity necessitate the country's transition to a green economy." The author particularly notes the importance of Uzbekistan fulfilling its international obligations in combating global climate change [3].

Fakhriyev (2024), analyzing the historical development of the green economy within the framework of the "Uzbekistan-2030" strategy, writes that "globally, the concept of the green economy was introduced by ecologists in 1989 and was subsequently adopted by economists and policymakers" [4].

International financial institutions, in particular the World Bank (2025), note in their report that "Uzbekistan has recently made notable progress in transitioning to a green economy, opening pathways to sustainable growth by directing state financial institutions toward green projects" [5].

An analysis by the IEA (International Energy Agency) highlights Uzbekistan's renewable energy potential, indicating that "the country's total renewable energy potential amounts to 117,984 Mtoe (million tonnes of oil equivalent), while its technical potential stands at 179.3 Mtoe, with the largest share attributed to solar energy" (IEA, 2020) [6].

Annual reports published by the Ministry of Energy of the Republic of Uzbekistan between 2021 and 2024 provide a detailed account of the development dynamics of renewable energy sources. According to these reports, the country has been consistently expanding its solar and wind energy capacities and achieving specific targets in the construction of new power plants (Ministry of Energy, 2021–2024) [7].

Statistical compilations of the Statistics Agency under the President of the Republic of Uzbekistan for 2021–2024 reflect the country's socio-economic development indicators, including changes in the energy sector and quantitative outcomes of the green economy transition process [8].



RESEARCH METHODOLOGY

The following scientific methods were applied during the research process, including the analytical method, comparative analysis method, statistical analysis, and document analysis techniques, as well as a systematic approach through which the green economy was examined as a complex system and the interrelationships among its various components were elaborated.

ANALYSIS AND RESULTS

Current State of the Green Economy in Uzbekistan:

The legal foundations for Uzbekistan's transition to a green economy are enshrined in a number of regulatory and legal documents. Presidential Decree No. PQ-4477 "On the Strategy for the Transition of the Republic of Uzbekistan to a Green Economy for the Period 2019–2030," adopted on October 4, 2019, defined the key directions.

The Strategy encompasses the following objectives:

- Reducing specific greenhouse gas emissions relative to GDP by 35% from 2010 levels;
- Increasing renewable energy production capacity to 15 gigawatts;
- Improving energy efficiency in the industrial sector by at least 20%;
- Introducing water-saving irrigation technologies across up to 1 million hectares.

The laws "On Public-Private Partnership" and "On the Use of Renewable Energy Sources," adopted in 2019, created a favorable environment for green investments. The latter law introduced a number of privileges and benefits for renewable energy producers.

The "Programme for Ensuring the Transition to a Green Economy and Green Growth in the Republic of Uzbekistan until 2030," approved in 2022, clarified the strategic objectives and established implementation mechanisms (Presidential Decree, 2022).

The year 2024 marked significant achievements for Uzbekistan in the field of the green economy. GDP grew by 6.5%, reaching 1.45 quadrillion soums (approximately \$115 billion). GDP per capita exceeded at least \$3,000. Notable growth was recorded in the renewable energy sector. Throughout the year, 10 solar and wind power plants with a combined capacity of 2.4 gigawatts were commissioned, producing 1.6 billion kilowatt-hours of "green" energy. This made it possible to save half a billion cubic meters of natural gas (Spot.uz, 2024). The share of renewable energy in total electricity generation reached 18%, a significant increase from 10% in 2023. Nine large solar and wind power plants were commissioned in the regions of Bukhara, Jizzakh, Kashkadarya, Navoi, Samarkand, and Surkhandarya. Six hydroelectric power stations with a combined capacity of 183 megawatts were put into operation in the Andijan, Samarkand, Surkhandarya, and Tashkent regions. International financial institutions and development partners are playing a significant role in Uzbekistan's green transformation. The World Bank has supported the development of 1,000 megawatts of solar and 500 megawatts of wind energy since 2020. In addition, in 2024 the International Finance Corporation (IFC) signed a financing agreement worth \$240 million with ACWA Power. The project envisages the construction of a 1-gigawatt solar photovoltaic plant, a 668-megawatt battery energy storage system (BESS), and approximately 500 kilometers of high-voltage transmission lines. Table 1. The European Bank for Reconstruction and Development (EBRD) provided more than \$54 million in financing for the construction of a 100-megawatt solar power plant in the Khorezm region. The World Bank, in turn, provided a payment guarantee of up to \$3.5 million for this project. In



2024, the World Bank allocated \$46.2 million to Uzbekistan under the "Innovative Carbon Resources for Energy Transition – iCRAFT" project, while in partnership with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), €12 million was allocated for the project "Private Sector Support and Policy Advisory in Uzbekistan."

Table 1 Macroeconomic Indicators and Green Economy of Our Country Year 2024

Indicator	Value	Change (vs. 2023)
Gross Domestic Product	1.45 quadrillion soums (\$115 bln)	+6.5%
GDP per Capita	\$3,000+	+5.8%
Share of Renewable Energy	18%	+8 percentage points
Green Energy Production Capacity	2.4 gigawatts	+0.8 gigawatts
Green Energy Output	1.6 billion kWh	25% more
Savings: Natural Gas	500 million cubic meters	—
Solar Power Plant Capacity	2.6 gigawatts	+1.0 gigawatt
Wind Power Plant Capacity	900 megawatts	+300 megawatts
Battery Energy Storage System (BESS)	400 megawatts	New
Foreign Investment (green energy)	\$240+ million	—
CO ₂ Emission Reduction (forecast)	1.3 million tons/year	—
Number of Commissioned Projects	28 (total 6.3 GW)	+7 projects
Commissioned Power Stations	10 (renewable) + 6 (hydroelectric)	New
"Solar Home" Programme Participants	11,000+ households	2,000+ more

In order to more comprehensively assess the dynamics of Uzbekistan's transition to a green economy, the key indicators for the period 2021–2025 are presented in the table below. This data consistently illustrates the country's development trajectory in the areas of renewable energy, investment, and emissions.

Table 2 Key Indicators of Green Economy Development in Uzbekistan

Indicator	2021	2022	2023	2024	2025
Renewable Energy Capacity (GW)	0.9	1.2	1.6	2.4	4.0
Share of Renewables in Total Electricity Generation (%)	7	9	10	18	27
Foreign Investment in Green Projects (mln. USD)	85	140	185	300+	580
CO ₂ Emission Intensity (kg/USD GDP)	0.62	0.58	0.54	0.49	0.43
Number of Commissioned Renewable Energy Projects	3	5	7	16	22
GDP Growth Rate (%)	7.4	5.7	6.0	6.5	6.8



The indicators in Table 2 demonstrate that Uzbekistan's transition to a green economy is being implemented at a consistent and rapid pace. The share of renewable energy nearly doubled from 8.2% in 2021 to 18% by 2024. Green energy production capacity increased fivefold during the same period, rising from 0.5 GW to 2.4 GW. International investment volumes have also grown significantly year on year, from \$85 million in 2021 to over \$300 million in 2024. Positive dynamics are also observed in CO₂ emission reductions: from 0.2 million tons in 2021 to 1.3 million tons in 2024. These indicators confirm that important steps are being taken toward achieving the strategic targets set for 2030.

Key Challenges in the Transition to a Green Economy:

Financial constraints: The introduction of green technologies requires large volumes of investment. In Uzbekistan, the price of conventional energy sources is relatively low, which makes the transition to renewable energy economically challenging. In 2018, the price of 1 kilowatt-hour of electricity in Uzbekistan was \$0.024 — significantly lower than in developed countries (Germany — \$0.338, Denmark — \$0.333) (IEA, 2020);

Technological weaknesses: A shortage of qualified personnel for operating and maintaining modern green technologies is observed. The electricity grid is outdated and requires modernization to integrate renewable energy sources;

Institutional challenges: Coordination issues exist among various government agencies in the implementation of green projects. Although the "green certificates" system was introduced on June 1, 2023, its practical application remains limited;

Data deficiencies: The system for collecting and analyzing statistical data is not fully developed. The size of the unobserved economy amounts to 34.8% of GDP (505 trillion soums), which makes it difficult to assess the effectiveness of green projects (Gazeta.uz, 2025).

Strategic Opportunities:

Renewable energy potential: Uzbekistan has significant solar energy potential — the technical potential amounts to 177 Mtoe, nearly four times the country's primary energy consumption (IEA, 2020). Its geographic location and climate allow for wide-scale utilization of solar energy;

International support: The World Bank, IFC, EBRD, and other international institutions are actively supporting Uzbekistan's green transformation. In 2024, total international investment attracted exceeded \$300 million;

Regional integration: Uzbekistan, Azerbaijan, and Kazakhstan are developing a project to export "green" energy to Europe, including Hungary and Romania. This will help strengthen ties between the countries' economies and energy systems (Uzconsulate-aktau.kz, 2024);

State support: Through the "Solar Home" programme, more than 11,000 households have installed solar panels and are receiving 1,000 soums per kilowatt-hour of electricity generated. Such programmes are increasing public interest in green energy.

Promising Directions:

Energy storage technologies: Battery energy storage systems (BESS) are being introduced for the first time in Central Asia and globally. In 2024, energy storage facilities with a capacity of 400 megawatts were commissioned, and an additional 668 MW BESS is planned for 2025;



Agrivoltaics development: The practice of installing solar panels on agricultural fields by agricultural producers is being studied. This combines efficient land use with energy generation;

Reducing the shadow economy: Plans are in place to halve the shadow economy between 2024 and 2029 and to attract an additional 20 trillion soums to the budget by 2025 (Gazeta.uz, 2025). This will create additional financing opportunities for green projects;

Nuclear energy: In 2024, construction began on Central Asia's first nuclear power plant in partnership with the Rosatom corporation. The project consists of six 55-megawatt reactors with a total capacity of 330 megawatts; the first unit is scheduled to be commissioned by the end of 2029, with all units fully operational by 2033 (Uzbekistan.fr, 2024).

CONCLUSIONS AND RECOMMENDATIONS

Uzbekistan has achieved significant milestones on the path toward a green economy. In 2024, the share of renewable energy reached 18%, 2.4 gigawatts of green energy capacity was commissioned, and 500 million cubic meters of natural gas were saved. Public-private partnership mechanisms, international investments, and the introduction of modern technologies are paving the way for sustainable development.

However, a number of challenges remain to be addressed: financial constraints, technological weaknesses, a shortage of qualified personnel, and the need to modernize the electricity grid. The high volume of the shadow economy (34.8% of GDP) necessitates improvements in the effectiveness of public administration.

Recommendations:

1. Improving financing mechanisms: Developing the green bond market, expanding tax incentives, and introducing a risk guarantee system for private investors.
2. Personnel training: Developing specialized educational programmes for training professionals in the renewable energy sector and expanding international experience-sharing.
3. Grid modernization: Improving electricity grid infrastructure and introducing modern automated management systems such as SCADA/EMS.
4. Strengthening the monitoring system: Fully launching a modern Monitoring, Reporting and Verification (MRV) system for greenhouse gas emissions.
5. Enhancing regional cooperation: Developing cooperation with Central Asian states in the field of green energy and implementing joint projects.
6. Applying innovative technologies: Advancing agrivoltaics, "green" hydrogen, and energy storage technologies.
7. Raising public awareness: Conducting wide-reaching information campaigns on the benefits of green technologies and sustainable lifestyles.

Although Uzbekistan's green economy transition strategy is being successfully implemented, a comprehensive approach, international cooperation, and innovative solutions are essential to ensuring long-term sustainability. Maintaining current momentum and attracting new investments are of critical importance in order to achieve the targets set for 2030.



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