

**GREEN ENERGY PROJECTS AND THE TRANSITION TO RENEWABLE ENERGY SOURCES IN UZBEKISTAN: CURRENT STATE AND PROSPECTS***Uzoqova Shaxriya To'liqin kizi**Institutional Affiliation: University of World Economy and Diplomacy**Student of Master's degree in Faculty of Foreign Economic Activity**Scientific Advisor: Akabirkhodjaeva Dilfuza**University of World Economy and Diplomacy, Associate Professor of the Department of "Systems Analysis and Mathematical Modeling", PhD in Physical and Mathematical Sciences*

**Abstract:** This article analyzes the implementation of green energy initiatives in Uzbekistan, focusing on the development trends of renewable energy sources such as solar, wind, hydro, and biogas. It examines the economic and technological opportunities and challenges associated with introducing these sources. The study also explores the country's energy policy aimed at ensuring ecological sustainability, enhancing energy security, and fulfilling international commitments. Furthermore, the article provides recommendations for expanding green energy infrastructure in the future.

**Keywords:** green energy, renewable energy, solar power plant, wind energy, Uzbekistan energy sector, environmental sustainability

**Introduction**

In recent years, climate change, environmental pollution, and energy security have emerged as some of the most pressing global challenges. The international community has responded by prioritizing a shift toward development models based on the principles of a green economy and expanding the use of renewable energy sources.

Uzbekistan has not remained on the sidelines of these global trends. The country is implementing firm policies aimed at ensuring environmental safety and strengthening energy independence within the framework of sustainable development goals. In particular, the phased implementation of green energy projects based on renewable sources such as solar, wind, hydro, and biogas is gaining momentum. According to Uzbekistan's national energy strategy, by 2030, it is planned that at least 25–30% of the country's electricity production will come from renewable sources. This shift is expected to contribute not only to energy diversification but also to a significant reduction in harmful emissions, the fulfillment of international environmental obligations, and the accelerated transition to a green economy.

**Ongoing Green Energy Projects**

Green energy programs in Uzbekistan have become a key component of state energy policy. Currently, large-scale renewable energy projects are being gradually implemented in cooperation with several international companies and financial institutions. Notably, the Masdar company from the United Arab Emirates commissioned a 100 MW solar power plant (SPP) in Navoi region in 2021. This project represents Uzbekistan's first industrial-scale solar energy

facility and has served as a significant learning experience for the country. Additionally, Saudi Arabia's ACWA Power is partnering with Uzbekistan on major solar and wind energy projects in Bukhara, Kashkadarya, and Samarkand regions. Among them, the 500 MW wind power plant under construction in Bukhara is recognized as one of the largest wind projects in the region.

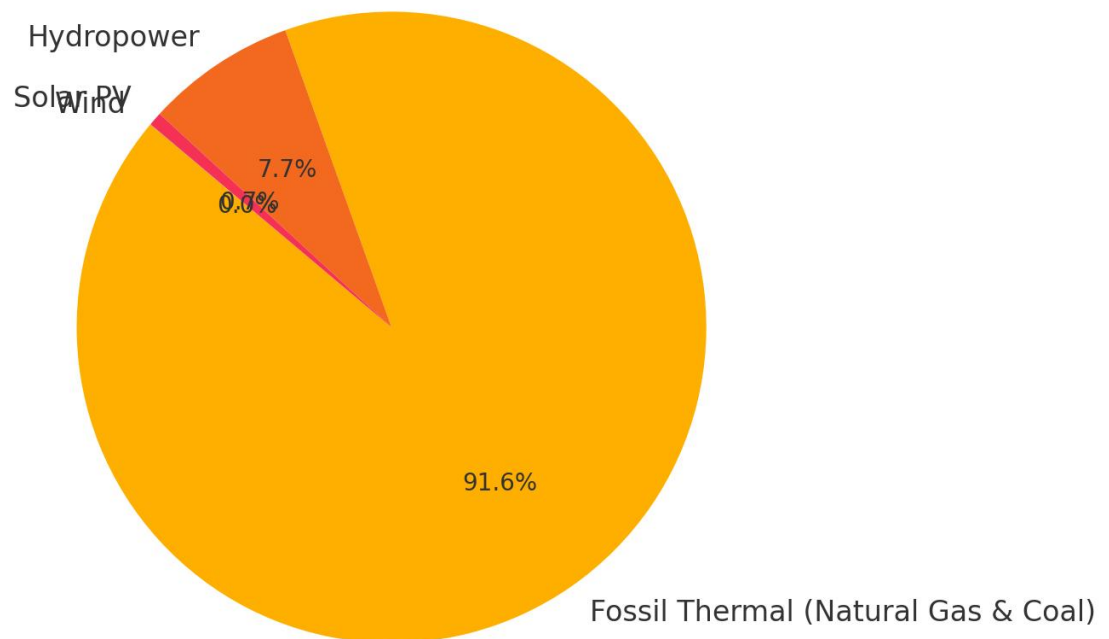
Furthermore, international financial institutions such as the World Bank, the Asian Development Bank (ADB), and the International Finance Corporation (IFC) are supporting the renewable energy market in Uzbekistan through technical and economic assessments, grid modernization, and the development of energy exchange systems. These projects not only expand the country's generation capacity but also create new job opportunities, strengthen local technical expertise, and contribute to the fulfillment of Uzbekistan's environmental commitments. At the same time, they play a vital role in establishing sustainable energy infrastructure across the region.

### **Economic and Ecological Importance of the Energy Transition**

The gradual transition to renewable energy sources holds strategic importance for Uzbekistan, not only in terms of ecological sustainability but also from an economic efficiency perspective. Developments in this area contribute to energy system diversification, stabilization of energy prices, and more effective utilization of international financial resources. Firstly, the stabilization of electricity prices offers a significant advantage for both consumers and producers in terms of planning and investment. Renewable energy sources, particularly solar and wind, are not subject to fuel costs, allowing for reduced production costs and greater long-term tariff stability.

Secondly, the reduction of pressure on natural resources supports the strengthening of national energy policy. Uzbekistan is heavily reliant on conventional energy sources — natural gas, oil, and coal — the limitations and price volatility of which increase economic risks. Renewable energy, in this context, represents a viable and stable alternative. For example, it can be seen that following pie chart shows a concise visual snapshot of Uzbekistan's current electricity-generation mix. The chart highlights how overwhelmingly dominant fossil-fuel thermal power still is (91.6 %), with renewables—mainly hydropower—making up only a small slice of today's output. Solar and wind are just beginning to register, underscoring the scale of the transition challenge discussed in your article. Figures are derived from 2023 country-report data on total generation (80.8 TWh) and renewable output (6.8 TWh: 6.2 TWh hydro, 0.6 TWh solar, 0.001 TWh wind).

## Electricity Generation in Uzbekistan by Source (2023)



**Figure 1.** Electricity Generation in Uzbekistan by Source (2023)<sup>1</sup>

Thirdly, a notable decrease in harmful emissions, especially carbon dioxide (CO<sub>2</sub>), positively affects environmental safety and public health. This transition also strengthens Uzbekistan's participation in global environmental initiatives. Specifically, under the Paris Climate Agreement, Uzbekistan has committed to significantly reducing its greenhouse gas emissions by 2030. As part of fulfilling these obligations, the share of renewable energy in the national energy mix is increasing, and the country is gaining access to international green finance mechanisms, including green loans, climate funds, and technical grants. Moreover, the energy transition creates a new labor market for local producers, service providers, and technical specialists, contributing to the growth of green jobs. This, in turn, promotes more inclusive long-term economic development.

**Challenges and Barriers.** Although Uzbekistan has made notable progress in the field of green energy based on renewable sources, a number of systemic challenges still hinder consistent and large-scale development in this sector. The main barriers include:

➤ **Technological Limitations and Import Dependency**

High-performance technologies required for green energy — particularly solar panels, wind turbines, battery storage systems, and inverters — are mostly imported. The domestic industry currently lacks sufficient production capacity in these areas. This dependency increases foreign exchange risks and results in higher project costs.

<sup>1</sup> Source: Author's elaboration based on 2023 national energy data

➤ **Financing Constraints and Investment Gaps**

Renewable energy projects require substantial upfront investment. While profitable in the long term, attracting private investors is complicated by various risks and uncertainties. Financial institutions and banks remain cautious in funding such projects, directly impacting their scale and pace of implementation.

➤ **Legislative and Regulatory Gaps**

The current legal framework for green energy is still incomplete. There is a lack of clear provisions on tax incentives, tariff policies, certification of electricity produced from renewable sources, and standardized technical regulations. This legal ambiguity increases the perceived risk for investors.

➤ **Shortage of Skilled Workforce**

There is a deficiency of qualified specialists capable of working with green technologies, managing projects, and providing technical maintenance and engineering solutions. Educational institutions offer limited training programs specifically targeted at the renewable energy sector. This hampers the quality and efficiency of new project implementation.

To overcome these challenges, a comprehensive approach is needed that includes technological localization, financial incentives, legal reforms, and modernization of the education and training system as part of state policy.

**Development Prospects and Recommendations**

Uzbekistan's natural and geographical conditions, along with its climatic resources, offer significant potential for the development of renewable energy, particularly solar and wind power. With more than 3,000 hours of sunshine annually and stable wind flows in desert and semi-desert regions, these sources are highly attractive from an economic standpoint. To fully harness this potential, the following strategic directions are considered essential:

- **Encouraging local manufacturers and promoting technology localization:**  
By locally producing key technological components such as solar panels, inverters, and battery systems, Uzbekistan can reduce its dependence on imports and foster the creation of new industrial sectors. This, in turn, will stimulate domestic economic activity and lead to increased employment.
- **Introducing mechanisms to insure green investments:**  
To mitigate financial risks and provide stability guarantees for investors, Uzbekistan should implement insurance and support frameworks for green investments. Expanding public-private partnership (PPP) mechanisms in this field could also attract more private capital.
- **Developing energy storage technologies:**  
As solar and wind energy are intermittent by nature, modern storage systems are required to convert this energy into a stable power supply. These technologies are crucial to maintaining balance between energy generation and consumption.
- **Deepening international cooperation:**  
Strengthening collaboration with organizations such as the **United Nations**, **Asian Development Bank (ADB)**, **World Bank**, and the **European Union** is vital. These partnerships should focus on technical assistance, grant funding, joint research projects,

and financial instruments. Such cooperation also facilitates technology transfer and the exchange of legal and regulatory best practices.

### Conclusion

Reforms in the green energy sector have marked a new stage in Uzbekistan's national energy policy. This sector is not only important for strengthening energy security, but also for protecting the environment, supporting economic diversification, and fulfilling the country's international environmental commitments. The implementation of major projects, the involvement of foreign investors, and cooperation with international financial institutions have already begun to yield positive results. However, overcoming existing financial, technological, legal, and institutional constraints is essential for ensuring the sustainable and consistent growth of the renewable energy sector. Looking ahead, deepening green economy principles, enhancing local capacities, and adopting global best practices will enable Uzbekistan to become a regional leader in environmentally friendly energy development in Central Asia.

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