https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

Erkaboyeva Jasmina Safarali qizi

2nd-year student, Faculty of Tourism, Tashkent State University of Economics

erkaboyevajasmina2007@gmail.com +99894 268 84 80

CHALLENGES OF ENHANCING ENERGY EFFICIENCY IN UZBEKISTAN UNDER THE GREEN ECONOMY FRAMEWORK

Abstract: This article examines the main directions for enhancing energy efficiency in Uzbekistan's transition to a green economy. The study analyzes the importance of improving energy efficiency, identifies existing challenges in this process, and evaluates the measures required for their effective solution. It provides an in-depth overview of the current state of energy efficiency in the country, the potential for utilizing renewable energy sources, and the key policies essential for increasing energy efficiency. In addition, the article offers a comparative analysis of the practices implemented by various countries - particularly China and the European Union - in improving energy efficiency. Using a comparative method, international best practices are examined to determine the most appropriate strategies for Uzbekistan and to adapt them to local conditions. The findings highlight the necessity of overcoming technological, financial, and institutional barriers, as well as implementing modern energy management systems as part of efforts to enhance energy efficiency. The study concludes with well-grounded recommendations for developing strategic measures to improve energy efficiency and ensure a successful transition to a green economy in Uzbekistan.

Keywords: green economy, energy policy, energy efficiency, investments, renewable energy sources, sustainable development, energy efficiency improvement, energy-saving technologies, environmental safety.

Аннотация: В данной статье рассматриваются направления повышения энергоэффективности в процессе перехода Узбекистана к «зелёной» экономике. В исследовании проанализированы значимость повышения

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

энергоэффективности, существующие проблемы в этой сфере и меры, которые следует реализовать для их эффективного преодоления. Подробно освещено текущее состояние энергоэффективности в нашей стране, возможности использования возобновляемых источников энергии и ключевые политики, необходимые для повышения энергоэффективности. Кроме того, приведён сравнительный анализ практик разных государств — в частности, опыта Китая и Европейского Союза - в области повышения энергоэффективности. С помощью компаративного метода проанализированы международные практики с целью определения наиболее целесообразных стратегий для Узбекистана и их адаптации к существующим условиям. Результаты исследования показывают важность устранения технологических, финансовых и институциональных барьеров, а также внедрения современных систем энергетического менеджмента в процессе повышения энергоэффективности. В завершение предложены обоснованные рекомендации по разработке ключевых стратегий повышения энергоэффективности и успешной реализации перехода к «зелёной» экономике в Узбекистане.

Ключевые слова: зелёная экономика, энергетическая политика, энергоэффективность, инвестиции, возобновляемые источники энергии, устойчивое развитие, повышение энергоэффективности, энергосберегающие технологии, экологическая безопасность.

Annotatsiya: Ushbu maqolada O`zbekistonning yashil iqtisodiyotga o`tish jarayonida energiya samaradorligini oshirish yo`nalishlari muhakama qilinadi. Tadqiqotda, energiya samaradorligini oshirishning muhimligi va bu jarayonlardagi mavjud muammolar hamda ularni samarali hal qilish bo`yicha amalga oshirilishi kerak bo`lgan chora-tadbirlar tahlil qilingan. Mamlakatimizning energiya samaradorligini oshirishdagi hozirgi holati, qayta tiklanuvchi energiya manbalaridan foydalanish imkoniyatlari va energiya samaradorligini oshirish

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

uchun muhim bo`lgan siyosatlarga batafsil to`xtalib o`tilgan. Shu bilan bir qatorda, maqolada shu yo`nalishda tajribali, turli mamlakatlarning energiya samaradorligini oshirish bo‘yicha amalga oshirgan amaliyotlari, jumladan, Xitoy va Yevropa Ittifoqining tajribalari solishtirilgan. Komparativ metod yordamida, O‘zbekiston uchun eng maqbul strategiyalarni ko`rib chiqish hamda mavjud sharoitga moslashtirib amalga tadbiq etish uchun xalqaro tajribalar tahlil qilingan. Tadqiqot natijalari esa, energiya samaradorligini oshirish jarayonida texnologik, moliyaviy va institutsional to‘siqlarni bartaraf etish va zamonaviy energiya boshqaruv tizimlarini joriy etish muhimligini ko‘rsatadi. Tadqiqotda, O‘zbekistonning energiya mahsuldorligini oshirish bo‘yicha muhim strategiyalar ishlab chiqish hamda yashil iqtisodiyotga o‘tish jarayonini muvaffaqiyatli amalga oshirish uchun asosli tavsiyalar berib o`tilgan.

Kalit so‘zlar: yashil iqtisodiyot, energiya siyosati, energiya samaradorligi, investitsiyalar, qayta tiklanuvchi manbalar, barqaror rivojlanish, energiya samaradorligini oshirish, energiya tejash texnologiyalari, ekologik xavfsizlik.

INTRODUCTION

Uzbekistan’s transition to a green economy represents a key strategic direction aimed at supporting the country’s sustainable development, environmental security, and economic resilience. Central to this process are objectives such as improving energy efficiency, developing renewable energy sources, and reducing environmentally harmful emissions.

On 23 September 2025, during the 80th Session of the United Nations General Assembly, the President of Uzbekistan, Shavkat Mirziyoyev, emphasized the country’s commitment to advancing the green economy, stating: “In alignment with the Sustainable development goals, we are pursuing a policy to build a democratic, legal, social, and secular New Uzbekistan. Our priority is to fundamentally transform the lives of every family and every citizen, enhancing

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

human dignity and well-being. In recent years, Uzbekistan has succeeded in reducing the poverty rate from 35 percent to 6.6 percent. This achievement has been driven primarily by reforms in education and science, the establishment of innovative sectors and high-tech industrial enterprises, the modernization of green energy and transport infrastructure, the comprehensive development of small businesses, and, ultimately, the creation of millions of new jobs."[1]

This statement highlights the importance of improving energy efficiency and promoting renewable energy sources as essential measures for enhancing human welfare.

Globally, in 2024, over 40 percent of electricity generation came from renewable sources, marking one of the highest levels recorded worldwide. However, this growth remains insufficient relative to the increasing global energy demand, as efforts to improve energy efficiency are still not adequate. [2]

Moreover, in 2025, given the evolving international energy policies and the forthcoming Sustainable Development Goals, improving energy efficiency and transitioning to a green economy are becoming critical priorities for Uzbekistan within the global context.

By 2025, the global energy sector is facing significant growth pressures. The integration of new technologies and energy sources is prompting countries to reconsider and reshape their national energy strategies.

In recent years, research in this field has focused on examining the economic, social, and environmental aspects of improving energy efficiency. Numerous scholars have explored the challenges arising in this process and proposed prospective solutions to enhance energy efficiency.

H. Toyirova, in her article "Long-term decision-making in energy efficiency management in Uzbekistan" (O'zbekistonda energiya samaradorligini boshqarishdagi uzoq muddatli qarorlar qabul qilish), investigates the long-term

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

relationship between energy consumption, economic growth, and political changes. The study demonstrates that economic growth and effective policy measures are key determinants in managing energy consumption. [3]

Similarly, N. Ikramov, in the article “Monitoring energy consumption in irrigation systems in Uzbekistan” (O‘zbekistondagi sug‘orish tizimlarida energiya iste’molini monitoring qilish), emphasizes the necessity of implementing online monitoring systems for energy use within irrigation networks. The research identifies that 1,693 stations consume between 8 and 8.2 billion kWh of energy. [4]

In the study “Energy saving technologies and efficiency in the post-pandemic world” by W. Strielkowski, L. Gorina, E. Korneeva, and O. Kovaleva, the authors analyze changes in energy consumption and efficiency during the pandemic. The research highlights the role of digital technologies and smart grids in enhancing energy efficiency. [5]

Overall, these studies indicate that effective strategies for improving energy efficiency rely not only on technological advancements but also on appropriate governmental policies. Moreover, Uzbekistan’s unique climatic and economic conditions provide new opportunities for applying innovative approaches and technologies to further enhance energy efficiency.

METHODS

This study employs a set of complementary research methods to examine approaches for increasing energy efficiency within Uzbekistan’s transition to a green economy. The methodological framework integrates comparative analysis, statistical examination, and economic modeling, each contributing to a deeper understanding of the factors influencing energy efficiency.

The comparative approach is used to review international experiences and policy practices aimed at improving energy efficiency. Particular attention is given to developments in the European Union and China, whose progress in expanding

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

renewable energy sources offers relevant insights for formulating strategies tailored to Uzbekistan's conditions.

Statistical analysis is applied to evaluate national indicators related to energy performance. The assessment includes patterns of energy consumption, losses occurring across production processes, the structure and share of various energy sources, and their overall efficiency. These data provide an empirical basis for identifying existing gaps and potential areas for improvement.

Economic modeling is utilized to simulate the impact of different policy measures under alternative scenarios. Through modeling, it becomes possible to assess how specific mechanisms, regulatory tools, or incentive systems may influence national energy efficiency outcomes.

Together, these methods enable a comprehensive and analytically grounded exploration of effective pathways for advancing energy efficiency within Uzbekistan's green economic transition. The combined application of these approaches ensures both methodological rigor and a nuanced understanding of the issue.

RESULTS

In recent years, significant changes have been observed worldwide in efforts to enhance energy efficiency and transition toward a green economy.

According to a 2025 report by McKinsey and Company, global energy demand is expected to double by 2050. However, this growth may outpace the expansion of renewable energy sources, highlighting the increasing need to improve energy efficiency. [6]

Uzbekistan has also made notable progress in improving energy efficiency and promoting a green economy. By the end of 2024, the country had commissioned 14

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

solar and 3 wind power plants with a total capacity of 4,100 MW. [7] In the same year, green energy production reached 4.9 billion kWh.

On August 7, 2024, President Shavkat Mirziyoyev signed the law of the Republic of Uzbekistan “On energy saving, rational use of energy, and improving energy efficiency,” establishing a unified national policy framework to enhance energy efficiency. [8]

Enhancing energy efficiency is a critical component of Uzbekistan’s green economic transition and long-term sustainable development. Nevertheless, several challenges hinder this process, including technical, economic, social, and institutional factors:

1. Aging infrastructure and technology. Much of Uzbekistan’s energy network is outdated, resulting in significant efficiency losses. For instance, in 2019, electricity distribution losses reached 12.5%, reflecting substantial wastage of energy resources. [9]

2. Insufficient implementation of energy efficiency policies. Ineffective enforcement of policies targeting energy efficiency has led to persistent challenges in the sector. [10]

3. Limited financial resources. A lack of adequate investment in green technologies and energy efficiency measures poses a major barrier to progress. [11]

4. Socioeconomic disparities. Certain regions, particularly Karakalpakstan and Khorezm, face energy supply challenges. According to the Multidimensional Poverty Index (MPI), approximately 13% of the population lacks safe and adequate heating. Low-income households, especially female-headed families, struggle with energy poverty, spending up to 87% of their income on energy costs. [12]

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

5. Low awareness and education. Public understanding of energy efficiency and the role of individuals in the green economy remains limited.

6. Barriers to renewable energy adoption. Technical, financial, and institutional obstacles continue to impede the transition to renewable energy sources.

To address these challenges and enhance energy efficiency, several key solutions should be implemented:

1. Modernizing infrastructure and technology. Upgrading the energy supply system is essential to improve efficiency nationwide.

2. Ensuring effective policy implementation. Strict monitoring and enforcement mechanisms should be established to guarantee that energy-saving and efficiency policies are applied effectively.

3. Mobilizing financial resources. Strengthening collaboration between the state and private sector is crucial to attract the necessary investments for efficient energy management and the development of renewable energy sources.

4. Social and economic imbalances. Enhancing effective energy management in regions with limited access requires a strong focus on social equity. In rural areas, improving energy supply and promoting energy efficiency can be supported through targeted subsidies and preferential loan programs.

5. Low awareness and educational levels. To increase public understanding of energy efficiency and the societal role in transitioning to a green economy, it is essential to implement wide-reaching media campaigns, educational initiatives, and specialized workshops.

6. Obstacles in transitioning to renewable energy sources. Addressing technical, financial, and institutional barriers to renewable energy adoption necessitates the

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

modernization of energy infrastructure and the attraction of investments in renewable energy projects.

These measures offer a practical and effective approach to overcoming challenges in enhancing energy efficiency and advancing the green economy in Uzbekistan.

Additionally, the experiences and policies of China and the European Union in promoting energy efficiency provide valuable insights for boosting Uzbekistan's green energy potential. For instance, in 2024, China installed 357 gigawatts (GW) of new solar and wind capacity, achieving its 2030 target six years ahead of schedule. From January 1, 2025, China introduced a new energy law aimed at fostering renewable energy, ensuring energy security, and supporting private sector participation. In 2024, China invested $818 billion in the energy transition, representing the largest global investment in this area.

In the European Union, renewable energy accounted for 46.9% of electricity generation in 2024. The EU also introduced a new roadmap that year to further develop renewable energy, emphasizing innovative technologies, infrastructure expansion, and support for local governance. In 2023, the EU set a mandatory target to achieve at least a 42.5% share of renewable energy by 2030.

Energy efficiency policies implemented by Uzbekistan, China and European Union [13]

Indicator	Uzbekistan	China	European Union
Green energy production	4.9 billion kWh	357 GW of new solar and wind capacity	46.9 % of electricity generated from renewable sources
New laws and polices	Law "On energy saving, rational use, and increasing energy efficiency"	New energy law	100 % renewable energy plan (2024-2029)
Investments		$ 18 billion	-
National Agencies	Natinal energy efficiency agency	-	-

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

In comparison with the experiences of China and the European Union, Uzbekistan is still in the early stages of implementing policies and practices aimed at enhancing energy efficiency. Nevertheless, the country's initiatives to develop renewable energy sources have begun to produce tangible benefits. To achieve more substantial improvements in energy efficiency, it is crucial to incorporate insights from international best practices and to adopt advanced technological solutions.

A detailed regional analysis of energy efficiency based on 2024 data can illuminate disparities across different provinces, providing a basis for formulating targeted strategies to optimize energy performance nationwide.

Energy efficiency indicators by region (2024)

Region	Energy efficiency, %	Share of fuel expenditure relative to total area, %	Share of electricity expenditure relative to total area, %	Share of heat energy expenditure relative to total area, %
Republic of Uzbekistan	4.2	53.2	41.0	5.8
Republic of Karakalpakstan	6.4	79.1	20.3	0.5
Provinces:				
Andijan	1.3	33.5	61.3	5.3
Bukhara	2.1	47.3	44.7	8.0
Jizzakh	2.5	29.9	60.0	10.0
Qashqadaryo	5.6	73.1	26.6	0.3
Navoi	7.4	39.3	58.2	2.4
Namangan	2.9	31.9	67.5	0.6
Samarkand	2.2	32.3	65.3	2.5
Surkhandarya	2.3	37.2	62.6	0.2
Sirdarya	2.7	29.1	69.6	1.3
Tashkent	8.0	60.2	38.1	1.7
Fergana	3.8	27.9	57.9	14.2
Khorezm	2.5	36.8	60.0	3.2
Tashketn city	3.5	60.5	28.9	10.7

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

The analysis of energy efficiency indicators across various regions of Uzbekistan for the year 2024 highlights notable changes in the use of energy resources throughout the country. For instance, the Republic of Karakalpakstan and Tashkent region demonstrate relatively high levels of energy efficiency (6.4% and 8.0%, respectively), indicating an increased focus on the effective utilization of energy resources in these areas. However, in certain regions - such as Andijan and Namangan - the energy efficiency level is comparatively lower, which may be linked to local industrial structures and living conditions.

Although the global process of improving energy efficiency and transitioning to a green economy continues to expand, numerous challenges still remain. While Uzbekistan's efforts in this direction are yielding positive outcomes, further improvement in energy efficiency will require the study of international experience and the introduction of modern technologies to ensure more effective implementation.

DISCUSSION AND CONCLUSION

Uzbekistan's transition to a green economy and the improvement of energy efficiency play a crucial role in ensuring the country's long-term economic development and environmental sustainability. However, the process is being slowed by several challenges, including the ineffective implementation of energy-efficiency policies, outdated infrastructure and technologies, financial constraints, and existing social inequalities.

In our view, it is advisable to implement the following measures to enhance energy efficiency within Uzbekistan's green economy transition:

1. Developing a unified and consistent state policy aimed at improving energy efficiency across the country.

2. Modernizing outdated energy supply systems, increasing energy efficiency, and implementing technological upgrades.

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

3. Strengthening cooperation between the public and private sectors to attract the necessary investments for renewable energy and energy-efficiency initiatives.

4. Eliminating technical and institutional barriers in the development of renewable energy sources and diversifying energy resources to accelerate this process.

5. Facilitating international cooperation to introduce cutting-edge energy-efficiency technologies into the country and integrate them into practice.

6. Enhancing public awareness of energy efficiency through dedicated educational programs, seminars, and awareness campaigns.

Uzbekistan's efforts to improve energy efficiency have already yielded significant results, however, there is still considerable work to be done. Through the development of a new energy policy, technological modernization, investment attraction, and the enhancement of public awareness, Uzbekistan can substantially increase its energy efficiency and successfully advance its transition toward a green economy.

REFERENCES

1. Mirziyoyev, Sh. (2025). O'zbekiston Respublikasi Prezidenti Shavkat Mirziyoyevning Birlashgan Millatlar Tashkiloti Bosh Assambleyasining 80-sessiyasidagi nutqi. President of Uzbekistan https://president.uz/oz/lists/view/8525

2.The Guardian. (2025, April 8). Clean energy powered 40% of global electricity in 2024, report finds. https://www.theguardian.com/business/2025/apr/08/clean-energy-powered-40-of-global-electricity-in-2024-report-finds

3.Toyirova H. U. (2025). Long-term decision-making in managing energy efficiency in Uzbekistan. (O'zbekistonda energiya samaradorligini boshqarishdagi uzoq muddatli qarorlar qabul qilish). Frontiers in Energy Efficiency, 16(1), 1–15. Frontiers Media.

4.Ikramov N. (2025) Monitoring energy consumption in irrigation systems in Uzbekistan "O'zbekistondagi sug'orish tizimlarida energiya iste'molini monitoring qilish". Journal of Water and Land Development, 13, 45–52. De Gruyter.

https://wordlyknowledge.uz/index.php/gpble
Qabul qilingan sana: 07.12.2025
Nashr etilgan sana: 30.01.2026

5. Strielkowski W., Gorina L., Korneeva E., & Kovaleva O. (2023). Energy-saving technologies and energy efficiency in the post-pandemic world. (Pandemiyadan keyingi dunyoda energiya tejash texnologiyalari va energiya samaradorligi). Energy Policy, 160, 112–118. Elsevier.

6. Sharon Kits Kimathi. (2025, October 16) Fossil fuels to dominate global energy use past 2050, McKinsey says. https://www.reuters.com/sustainability/climate-energy/fossil-fuels-dominate-global-energy-use-past-2050-mckinsey-says-2025-10-16

7. Eurasia Magazine. (2024) Uzbekistan's energy transformation: A phased transition to market mechanisms. https://eurasiamagazine.com/uzbekistans-energy-transformation-a-phased-transition-to-market-mechanisms

8. O'zbekiston Respublikasining "Energiyani tejash, undan oqilona foydalanish va energiya samaradorligini oshirish to'g'risida"gi qonuni, 07.08.2024 yildagi O'RQ-940-son.

9. UNECE. (2024, March). Uzbekistan's policy brief. https://unece.org/sites/default/files/2024-07/uzbekistan%20%284%29.pdf

10. UNDP. (2021). Green recovery and the transition to Green Economy in Uzbekistan. https://files.acquia.undp.org/public/migration/uz/Uzb_GRGE_PolicyBrief_ExSum_v1_20210303_DESIGNED.pdf

11. Louis Skyner. (2025, February 21). Uzbekistan's energy transition depends on systematic reforms. Bourse & Bazaar. https://www.bourseandbazaar.org/articles/2025/2/21/uzbekistans-transition-depends-on-structural-reforms

12. UNDP. (2025, September 11) Uzbekistan and UN partners advance just energy transition through strategic foresight workshop. https://www.undp.org/uzbekistan/press-releases/uzbekistan-and-un-partners-advance-just-energy-transition-through-strategic-foresight-workshop

13. Eurasia Magazine. (2024). Uzbekistan's energy transformation: A phased transition to market mechanisms.

https://eurasiamagazine.com/uzbekistans-energy-transformation-a-phased-transition-to-market-mechanisms