

Involvement of the Government in Supporting Bioeconomy Policy in Uzbekistan From An Institutional and Legal Perspective

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Received: 19 January 2025; **Accepted:** 26 February 2025; **Published:** 13 March 2025

Abstract: This article examines the institutional and legal measures supporting bioeconomy policy in Uzbekistan, focusing on strategies for transitioning to a green economy. The authors highlight key legislative frameworks, including the Strategy for Agricultural Development (2020–2030) and the Strategy for Transition to a Green Economy (2019–2030), as foundations for sustainable economic growth. Additionally, the article explores international commitments, such as Uzbekistan's ratification of the Paris Agreement, underscoring its dedication to climate goals and emission reductions.

The study discusses the main challenges in developing a bioeconomy, including limited financial resources, public awareness, and gaps in technological infrastructure, particularly in rural regions. The authors suggest that improvements in public administration, development of sectoral statistics, and enhanced international partnerships can support Uzbekistan's bioeconomic goals. This research offers insights into Uzbekistan's approach to harmonizing economic growth with environmental sustainability, providing useful perspectives for policymakers interested in advancing bioeconomic initiatives in similar developmental contexts.

Keywords: Bioeconomy, bioeconomy policy, green economy, agriculture, sustainable development, strategy.

Introduction: In recent decades, the concept of the bioeconomy has gained widespread recognition amidst the growing global need for sustainable resource utilization. The bioeconomy involves using renewable biological resources to produce goods and services, promoting not only economic growth but also enhanced environmental sustainability and social well-being. This approach emphasizes the integration of environmental, economic, and social factors to achieve sustainable development goals and mitigate the adverse effects of climate change.

For Uzbekistan, transitioning to a bioeconomy and

green economy is a strategic priority, as the country faces significant environmental and economic challenges, including vulnerability to climate change and limited water resources. Uzbekistan's natural resource-dependent economy and its largely rural population make it particularly susceptible to risks like droughts and declining water availability. The shift towards sustainable practices is essential for building resilience and ensuring a stable future for the country.

The government of Uzbekistan has undertaken several strategic initiatives to support the bioeconomy, particularly within the agricultural sector, which is key

to the country's economy. One of the foundational measures includes the Agriculture Development Strategy of the Republic of Uzbekistan for 2020-2030, aimed at improving food security, fostering a favorable agribusiness environment, and reducing the state's direct involvement in the sector to boost its investment attractiveness. Furthermore, Uzbekistan has enacted pivotal legislative measures such as the Law on the Rational Use of Energy (1997) and subsequent presidential decrees focused on advancing renewable energy and energy efficiency. These laws establish a framework for environmentally sustainable growth, laying the groundwork for a comprehensive bioeconomy.

Additionally, Uzbekistan has taken steps to align its bioeconomy goals with international standards. By ratifying the Paris Agreement in 2018, the country committed to integrating climate change considerations into its sustainable development plans, fostering collaboration with other nations on green economy initiatives. This commitment highlights Uzbekistan's alignment with global standards and its dedication to reducing greenhouse gas emissions.

This article explores the institutional and legal measures that facilitate the development of the bioeconomy in Uzbekistan. Specifically, it examines strategic initiatives such as the adoption of green technologies, the establishment of a regulatory framework for renewable energy, and legislative acts focused on intellectual property protection in biotechnology. Through this framework, Uzbekistan aims to foster innovation, enhance agricultural sustainability, and advance its green economy in alignment with national and international goals.

RESEARCH RESULTS AND DISCUSSION

The legislative and legal framework plays a crucial role in shaping and advancing bioeconomy policy in all countries including Uzbekistan. The development of bioeconomy policies requires a solid foundation of laws and regulations to address various aspects of biotechnology, agriculture, and sustainable development. In Uzbekistan, the legal framework supporting bioeconomy policies encompasses a range of laws related to agriculture, environmental protection, intellectual property, and biotechnology. These laws provide a framework for implementing policies that promote the sustainable and responsible use of biological resources for economic development. The Agriculture Development Strategy is a key element that outlines the government's approach to enhancing agricultural productivity while ensuring environmental sustainability. This strategy is fundamental to bioeconomy policies, emphasizing the importance of

adopting advanced technologies, including biotechnology, to achieve food security and economic growth.

Uzbekistan has also prioritized legal measures to protect intellectual property rights in the field of biotechnology. Patent laws and regulations aim to encourage innovation and research by providing legal protection for new inventions and technologies. This not only fosters a culture of innovation but also attracts investments in the bioeconomy sector. Environmental laws are an integral part of the bioeconomy framework, ensuring responsible exploitation of biological resources. These regulations establish guidelines for sustainable agricultural practices, biodiversity conservation, and the mitigation of environmental impacts associated with bioeconomy activities. Furthermore, Uzbekistan's legal framework promotes international cooperation in the field of biotechnology. The country actively participates in international agreements and conventions related to biodiversity, ensuring alignment with global standards and fostering collaboration with other nations in research and development. Since 2017, progress on reforms has been strong in Uzbekistan. The 2017–2021 Development Strategy was ambitious in its intent to rapidly dismantle barriers to a market-based economy and shared prosperity. The COVID-19 pandemic has had a significant impact on economic growth in most countries and has hindered progress towards achieving the 2030 Agenda for Sustainable Development goals. The Government of the Republic of Uzbekistan is taking important steps to address the impact of COVID-19 on the economy and the health of its population. The economy's robust performance in 2019 was largely due to the first phase of reforms: new firms and jobs were created, horticultural exports increased, tourism arrivals reached record levels, and poverty declined. Foreign direct investment (FDI), which nearly doubled relative to the prior year, flowed to an unprecedentedly diverse range of economic sectors. Having just started the transition process, it is an opportune time for Uzbekistan to invest early, and at a relatively lower cost, to build a greener economy. There are clear limits to Uzbekistan's current natural resource dependent growth model. Uzbekistan needs a path that will increase the efficiency and sustainability of its natural resources, lower carbon intensity, and ensure that the benefits of the transition are durable and inclusive for all its citizens. By following a path that prioritizes green investments, embraces systematic innovation, and manages risks and trade-offs, the country can deliver lasting benefits for its people. This path will increase the resilience of the country's economy, which is acutely vulnerable to a changing climate and declining

access to water - risks that are no longer distant but imminent.

Adopting new technologies and processes could also enable Uzbekistan to increase its competitiveness in the global marketplace as trading preferences become more sensitive to environmental impacts. Shifting to an environmentally sustainable growth model is particularly important for a highly natural resource-dependent country like Uzbekistan for several reasons. First, Uzbekistan has a significant comparative advantage in natural resources and is highly dependent on them for exports, government revenue, and perhaps most importantly, as a source of livelihood for most of its rural population. Second, this reliance on natural resources, coupled with significant sensitivity to climate change, exacerbates the country's vulnerability. Third, with the country undergoing rapid structural, spatial, and social transformation, it is at a stage where policies and investment choices can substantially shape its development trajectory. While the drivers of green growth are clear and the benefits are tangible, some key ingredients are required for implementing the green transition. A green growth strategy will require multi-sectoral reforms under a unified direction. This calls for central coordination of economic policy among multiple government and nongovernment actors and an institutional and regulatory framework that cuts across sectors. Many aspects, such as decarbonization, have an extended time horizon and require effective long-term planning, implementation, and a credible commitment to ambitious policies over multiple political cycles.

Green policies may be debated and contested, and tradeoffs may have to be made between sectors and constituencies. Strong political commitment is needed, and this must be supported by technically informed and objective recommendations. Finally, there will be technical and resource needs. There will be data gaps that need to be filled to support modeling and options analysis. The government needs to be adequately staffed and knowledgeable about green growth. Pursuing a long-term low-carbon development strategy is consistent with sound economic growth. Building a sustainable growth model now – at the earlier stages of the transition to a full market economy – is a smart insurance strategy for avoiding higher and costlier risks in the future and for advancing more expeditiously on policies and the adoption of innovative technologies. However, there is no 'one-

size-fits-all' prescription for fostering greener growth. Uzbekistan will have to chart its path based on its policy and institutional settings, level of development, social structures, resource endowments, and environmental pressure points. Consistent with good international practice, Uzbekistan's green transformation priorities should be anchored by a long-term (for example, to 2050) low-carbon development strategy. Table 1 and 2 below summarizes the main legal acts adopted since the beginning of independence. It is worth noting that the government started to consider the use of renewable energy sources in 2017. Monitoring systems to control energy consumption were established from that year, and favorable conditions for attracting investments and promoting innovative development have been created for the period from 2019 to 2021. Unlike traditional economics, which aims primarily to increase gross domestic product (GDP) or gross national income (GNI), a green economy promotes three objectives: maintaining and enhancing economic, environmental, and social well-being.

The green economy can also be an effective means of achieving the Sustainable Development Goals (SDGs). Green economy measures can be incorporated into many targets due to the multi-directional nature of the SDGs, as shown below. The pandemic experience highlights the importance of planned green recovery as the means to achieve the goals of the National Green Economy Strategy of Uzbekistan.

Additionally, in 2019, the Strategy of Agricultural Development of the Republic of Uzbekistan for 2020-2030 was adopted. The primary aim of this strategy is to enhance the state policy that focuses on ongoing reforms to increase the competitiveness of the agri-food sector.

The strategy covers the following strategic priorities: ensuring food security for the population, creating a favorable climate for agribusiness and value chains, and reducing the state's role in managing the sector while increasing its investment attractiveness. To promote the rational use of natural resources and safeguard the environment, it is recommended that modern public administration systems be developed. It is suggested that public expenditures be diversified to support the sector in a phased manner. It is also recommended that science, education, information, and consulting services in agriculture be developed, along with rural territories. Furthermore, it is advisable to establish a transparent system of sectoral statistics.

Table 1. Laws of the Republic of Uzbekistan on development of green economy.

Date of Adoption	Title	Main purpose
25.04.1997 № 412-I	Law of the Republic of Uzbekistan "On the Rational Use of Energy"	The purpose of this Law is to establish a general legal framework to ensure the conservation of national energy resources, efficient utilization of energy and production potential.
01.06.2017 № 3PY-432	Law of the Republic of Uzbekistan "On ratification of the charter of the international agency for renewable energy" (Bonn, 26 January 2009)	The purpose of this Law is Ratification of the Statutes of the International Renewable Energy Agency.
16.04.2019 № 2445-III	Resolution of the Legislative Chamber of the Oliy Majlis of the Republic of Uzbekistan "On the Law of the Republic of Uzbekistan on the Use of Renewable Energy Sources"	The purpose is improve and increase the use of renewable energy sources.
21.05.2019 № 3PY-539	Law of the Republic of Uzbekistan "On the use of renewable energy sources"	The purpose of this Law is to regulate relations in the field of utilization of renewable energy sources.

Source: Created by authors based on <https://lex.uz/en/>

In 2018, Uzbekistan ratified the Paris Agreement, thereby assuming a quantitative commitment determined at the national level. The radical transformation of the use of natural and energy resources contributes to the solution of several problems. The strategy adopted in 2019 is based on principles that correspond to the transition to a green economy in the long term. The development of this strategy is of particular importance, as it is aimed at integrating climate change issues into the sustainable development of the national economy. Achieving sustainable economic progress contributes to social development. The strategy itself is based on six main tasks:

- increasing the energy efficiency of the economy and rational consumption of natural resources through technological modernization and development of financial mechanisms.
- inclusion of "green" criteria based on advanced international standards in priority areas of public

investment and expenditure.

- assistance in the implementation of pilot projects in the areas of transition to a "green" economy through the development of government incentive mechanisms, public-private partnerships and intensified cooperation with international financial institutions.
- development of a system of training and retraining of personnel related to the labor market in the "green" economy, by stimulating investment in education, strengthening cooperation with leading foreign educational institutions and research centers.
- taking measures to mitigate the negative impact of the environmental crisis in the Aral Sea region.
- strengthening international cooperation in the field of green economy, including through the conclusion of bi-lateral and multilateral agreements.

Table 2. By-laws of the Republic of Uzbekistan on development of green economy.

Date of Adoption	Title	Main purpose
18.01.2017 № IIII-2731	Resolution of the President of the Republic of Uzbekistan "On the state Program for the development of the Aral Sea region for 2017-2021"	The purpose is development of the Aral Sea region
30.05.2017 № IIII-3012	Resolution of the President of the republic of Uzbekistan "On the Program of measures for further development of renewable energy, increasing energy efficiency in economic sectors and social sphere for 2017-2021"	The purpose is further development of renewable energy
14.11.2017 № 908	Decision of the Cabinet of Ministers of the Republic of Uzbekistan "On approval of the regulation on the mechanism of identification of an organization as specializing in the production of renewable energy production facilities"	The purpose is further development of renewable energy
09.11.2017 № IIII-3379	Resolution of the President of the Republic of Uzbekistan "On measures to ensure rational use of energy resources"	The purpose is measures to ensure rational use of energy resources
30.04.2018 № IIII-3687	Resolution of the President of the Republic of Uzbekistan "On additional measures for the implementation of investment projects in the field of renewable energy sources"	The purpose is development of investment projects in responsible energy sources
21.05.2018 № 365	Decision of the cabinet of Ministers of the Republic of Uzbekistan "On measures to Organize the activity of the free tourist zone "Charvak""	The purpose is development tourist zone "Charvak"
22.09.2018 № YII-5544	Decree of the President of the Republic of Uzbekistan "On approval of the Strategy of innovative development of the	a) the main objective of the Strategy is to develop human capital as the main factor

republic of Uzbekistan for 2019-2021”

determining the level of the country's competitiveness in the world arena and its innovative progress.

b) the main objectives of the Strategy to achieve the main goal are:
entering the Republic of Uzbekistan by 2030 into the 50 advanced countries of the world according to the Global Innovation Index rating.

Improving the quality and coverage of education at all levels, developing a system of lifelong learning, and ensuring the flexibility of the training system based on the needs of the economy.

Strengthening scientific potential and the effectiveness of research and development, creating effective mechanisms for the integration of education, science and entrepreneurship for the widespread implementation of the results of research, development and technological work.

Increasing public and private investment in innovation, research, development and technology, and introducing modern and effective forms of financing in these areas.

Improving the efficiency of public authorities through the introduction of modern management methods and tools. Ensuring the protection of property rights, creating competitive markets and equal conditions for doing business, and developing public-private partnerships. Creation of a sustainably functioning socio-economic infrastructure.

The main objective of this Concept is to implement a set of measures aimed at creating modern engineering and communication infrastructures in cities through the introduction of Smart City technologies, in particular:

- ensuring sustainable growth of the quality of life and formation of a comfortable urban environment for residents and visitors, favorable conditions for doing business.
- increasing the efficiency of public expenditures, including through the introduction of public-private partnership.
- systematic introduction of all Smart City technologies corresponding to foreign analogues.

- improving the efficiency of city services and road transport infrastructure through the introduction of innovative solutions.

The purpose is development and reform of the electric power industry.

The purpose is approval and development of the Strategy for Solid Waste Management

The purpose is further development of renewable energy

The purpose is further development of renewable energy

19.01.2019
№ 48 Decision of the Cabinet of Ministers of the Republic of Uzbekistan “On approval of the concept of implementation of "smart city" technologies in the Republic of Uzbekistan”

28.03.2019
№ IIII-4249 Resolution of the President of the Republic of Uzbekistan “On the Strategy for further development and reform of the electric power industry of the Republic of Uzbekistan”

18.04.2019
№ IIII-4291 Decree of the President of the Republic of Uzbekistan “On Approval of the Strategy for Solid Waste Management in the Republic of Uzbekistan for the period 2019-2028”

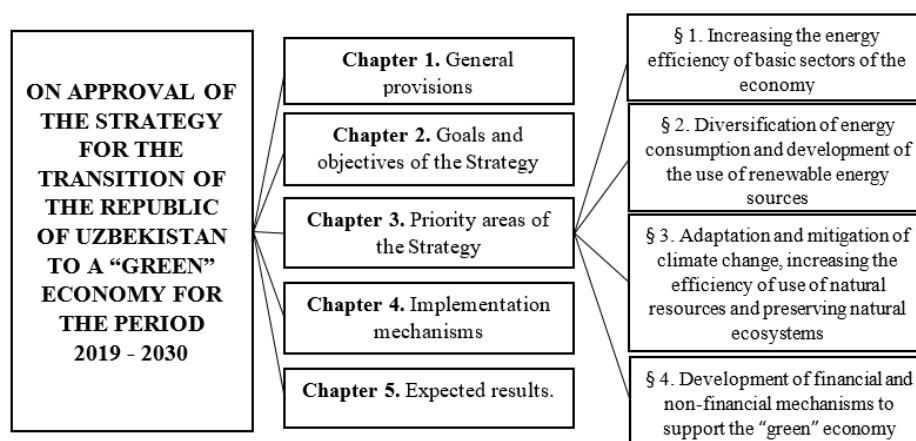
22.07.2019
№ 610 Decision of the Cabinet of Ministers of the Republic of Uzbekistan “On approval of the regulations on connection to the unified electric power system of business entities producing electric energy, including from renewable energy sources”

23.08.2019
№ IIII-4422 Decree of the President of the Republic of Uzbekistan “On accelerated measures to improve energy efficiency in economic and social sectors, introduction of energy-saving technologies and development of renewable energy sources”

05.10.2019 № III-4477	Decree of the President of the Republic of Uzbekistan “On Approval of the Strategy for the Transition of the Republic of Uzbekistan to a Green Economy for the Period 2019-2030”	The main objective of the Strategy is to achieve sustainable economic progress that contributes to social development, reduction of greenhouse gas emissions, climate and environmental sustainability by integrating green economy principles into the structural reforms being implemented.
24.10.2019 № YII-5853	Decree of the President of the Republic of Uzbekistan “On Approval of the Strategy of Development of Agriculture of the Republic of Uzbekistan for 2020-2030 years”	The main objective of this Strategy is to radically improve the state policy aimed at deepening the ongoing reforms aimed at improving the competitiveness of the agri-food sector, and covers the following strategic priorities: Ensuring food security of the population; creating a favorable agribusiness climate and value chains; reducing the role of the state in the management of the sector and increasing its investment attractiveness; ensuring rational use of natural resources and environmental protection; development of modern public administration systems; phased diversification of public expenditures in support of the sector; development of science, education, information and consulting services in agriculture; development of rural areas; development of a transparent system of sectoral statistics.
31.10.2019 № YII-5863	Decree of the President of the Republic of Uzbekistan “On Approval of the Concept of Environmental Protection of the Republic of Uzbekistan until 2030”	The purpose is ensuring environmentally safe use of toxic chemical and radioactive substances
10.07.2020 № III-4779	Decree of the President of the Republic of Uzbekistan “On additional measures to reduce the dependence of economic sectors on fuel and energy products by increasing the energy efficiency of the economy and utilizing available resources”	The document is aimed at stimulating efficient and rational use of fuel and energy resources, broad introduction of renewable energy sources in the country's economy and ensuring stable supply of electricity and oil and gas products to economic sectors and the population.
24.07.2020 № 452	Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On measures to keep state records of renewable energy installations and the energy produced by them”	The purpose is further development of renewable energy
30.09.2020 № III-4845	Decree of the President of the Republic of Uzbekistan “On measures to further improve the system of management of activities in the sphere of household and construction waste management”	The purpose is improving the system of management of activities in the sphere of household and construction waste management
30.07.2021 № III-5202	Decree of the President of the Republic of Uzbekistan “On measures to implement the special resolution of the United Nations General Assembly of 18 May 2021 "on declaring the Aral Sea region as a zone of environmental innovation and technology"	The purpose is development of the Aral Sea region
10.09.2022 № YII-220	Decree of the President of the Republic of Uzbekistan “On additional measures on introduction of energy-saving technologies and development of renewable energy sources of small capacity”	The purpose is further development of renewable energy
03.12.2022 III-436	Decree of the President of the Republic of Uzbekistan “On measures to improve the effectiveness of reforms aimed at transitioning the Republic of Uzbekistan to a green economy by 2023”	The purpose is further development of Green Economy

Source: Created by authors based on <https://lex.uz/en/>

The Fig. 1 presents a schematic representation of the structure of the adopted strategy. What challenges does Uzbekistan face in transitioning to a green economy?



Source: own study based on Resolution President of The Republic of Uzbekistan on approval of The Strategy for the transition of The Republic of Uzbekistan to a "Green" Economy for The Period 2019 - 2030

Fig. 1. The structure of the adopted strategy.

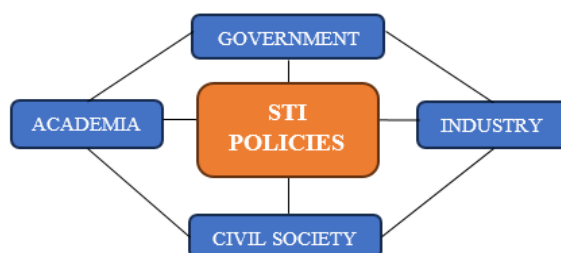
It is important to note that the lack of financing can slow down the process of transition. Furthermore, Uzbekistan may face the challenge of imperfect legislation and a lack of mechanisms to regulate environmental activities, which could hinder progress towards a greener economy. It is possible that some Uzbek citizens may not be fully aware of environmental issues and may not be willing to participate in environmental protection measures. The implementation of green economy transition program may face challenges due to insufficient control over environmental protection. This may be attributed to issues related to public awareness and difficulties in retraining the labor force. Furthermore, the development of green technologies and industries may require the retraining of the labor force. It is possible that an underdeveloped education and training system could hinder this process. It is important to consider that the transition to a green economy may have an adverse effect on the profits of some sectors and the economic situation of certain population groups. Therefore, it is necessary to carefully analyze the consequences of the transition and develop measures to mitigate any negative impacts.

The transition to a green economy depends on the implementation of a well-defined strategy and effective legislative instruments. A green economy

strategy usually involves measures to promote investment in renewable energy, enhance energy efficiency, decrease greenhouse gas emissions, and reduce the use of fossil fuels. The strategy and legislation are closely intertwined, and without a clear action plan, legislation may not achieve its intended goals. Legislative documents establish the legal framework and obligations for businesses and governments to achieve environmentally sustainable development.

An experimental approach to policymaking also entails policy goals being established in interaction with the affected stakeholders, and that they have a significant degree of autonomy in pursuing different programs or projects - ideally through a portfolio of projects or programs. This is linked with the well-established notion of a quadruple helix framework, whereby STI policies are shaped not just by public actors, but by close and repeated interactions between government, industry, academia and civil society (Figure 2).

To improve cooperation across different stakeholders in the broad ecosystem, however, public authorities should get their governance right with various ministries, agencies and implementation bodies exchanging information and coordinating their policy approach, ideally through formal mechanisms.



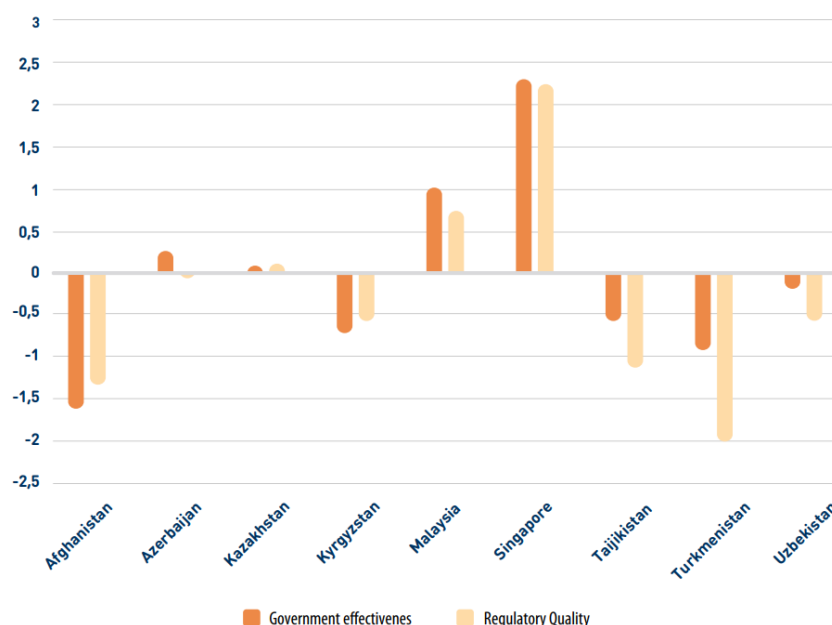
Source: <https://unece.org/info/publications/pub/387452>

Fig. 2. Quadruple helix of innovation policy- the new innovation policy approach.

Often, innovation policy in developing economies is entrusted to a dedicated ministry which, due to the limited resources at its disposal, has only limited political weight, and therefore adopts a linear, research-driven approach to innovation in relative isolation from other policies and other public bodies that have an impact on innovation ecosystems. Effective governance and policy coordination should ensure that ministries, agencies and implementation bodies exchange information and coordinate their policy approaches. This crucially includes public initiatives at the regional and local levels of government. Governments at the subnational level often have a better understanding of the local business community and innovation ecosystem, which may have idiosyncratic characteristics. As a result, they may be better able to interact with innovation partners and address needs that are specific to the region. As one example, they may be better able to identify firms with growth potential, and well placed to set up experimental schemes that, in case of success, could be scaled up across the country and even beyond.

By embracing innovation and establishing a robust management mechanism, Uzbekistan can unlock the full potential of its agricultural sector. This will not only guarantee food security for its growing population but also propel the nation towards a future defined by sustainable and competitive agriculture. The journey requires a collective effort from all stakeholders. With unwavering commitment and collaborative action, Uzbekistan can transform its agricultural landscape, cultivating a future brimming with prosperity and innovation.

Decisions about specific policy instruments are more successful when they are based on a careful assessment of institutional capacities for their design, implementation, monitoring and evaluation. It is important to ensure that only those actions with a good match between policy intention and policy implementation capacity are promoted. There is a risk of policy overreach when adopting policies from high-income countries, whose performance may crucially depend on advanced implementation capabilities, including human and financial resources.



Source: World Development Indicators. 2020.

*Note: -2.5 weak; 2.5 strong. Malaysia is included as an upper-middle-income comparator and Singapore as a high-income best practice case.

Fig. 3. Government effectiveness and regulatory quality in SPECA and comparator countries, 2021.

The SPECA subregion is not characterized by strong implementation capacities as reflected, for example, in the government effectiveness index¹ and the regulatory quality index (Figure 3). As a case in point, countries in the subregion have established business incubators, accelerators and science and technology

parks in recent years to promote innovative businesses, but these institutions have not seen the same success as their peers in Europe and the United States. Decisions about specific policy instruments are more successful when they are based on a careful assessment of institutional capacities for their design, implementation, monitoring and evaluation.

Table 3 collates and presents a synopsis of potential solutions to the issues that have been identified.

Table 3. Proposals for the resolution of the identified issues.

No	CHALLENGES	POSSIBLE SOLUTIONS
1	A lack of coordination of STI policy design and implementation Assess areas where different responsibilities overlap to simplify and rationalize innovation governance	Consider establishing national innovation councils to strategically coordinate innovation policymaking.
2	The culture of monitoring and evaluation is weak	Establish a dedicated unit responsible for M&E that would also provide a critical mass of expertise to ensure more evidence-based policymaking. Conduct RIAs on a regular basis and following international guidelines. Boost capacities for M&E through international donor support.
3	Insufficient private sector involvement in the identification of policy priorities, and the design and implementation of public initiatives	Consider setting up online consultation platforms or other mechanisms (e.g., councils, committees) to facilitate exchange between the public and private sectors. Engage with international donor initiatives focused on strengthening the capacities of intermediary structures and organizations, such as chambers of commerce and business associations, to better advocate and raise concerns.
4	A lack of data to underpin robust, evidence-based innovation policies tailored to regional strengths	Conduct a data collection exercise to gather statistical data at a sufficient level of disaggregation through a task force involving national and international experts, potentially with international donor support. Conduct a mapping exercise including an assessment of the potential for economic and innovative development of different subnational entities.
5	The business environment requires improvement, especially in terms of public sector transparency and accountability	Ensure a transparent system of public administration and governance through efforts on e-Government and digitalization. Ensure expert support and overall assistance from international organizations for the design and implementation stages of e-Government strategies.
6	Access to finance, especially to equity-type finance, is a major barrier to the set-up and scale up of innovative firms, and to innovation in established firms	Design additional measures to facilitate access to finance for innovation, including through introduction of equity-type instruments, innovation vouchers, and tax instruments for equity investors. Use pilots to identify what works for potential scale up.
7	Global value chains are insufficiently exploited to drive innovation and knowledge imports into the SPECA subregion	Continue efforts to align trade practices with international standards, including in the areas of metrology, standardization, and conformity assessment to allow for better integration into GVCs. Enable export promotion agencies to provide sophisticated services to boost exports, including matchmaking services between local and foreign companies, export credits, export insurance products, etc. Incentivize foreign companies to involve local suppliers in their value chains or otherwise establish links with the local business community to ensure knowledge and innovation spillovers for the entire economy.
8	Managerial capabilities of innovative business owners are weak, with limited policies to enhance adult education and training	Strengthen programs to foster adult training and education (both vocational and non-vocational) and monitor skills needs, e.g. through a National Skills Council. Provide management training programs to increase private sector absorptive capacity
9	A disconnect between publicly funded research and the market	Incentivize industry-science linkages through innovation vouchers. Ensure voucher schemes are accompanied by support services, such as match-making, information and guidance to companies and research organizations.

Source: Created by author based on report <https://unece.org/info/publications/pub/387452>

While there is considerable potential to adapt existing technologies and practices, unlocking this potential requires significant investment in human capital and the development of robust innovation systems.

CONCLUSIONS AND RECOMMENDATIONS

Uzbekistan, with its significant potential in the agricultural sector and natural resources, is actively moving to-ward sustainable development, aiming to transition to a green economy. Through the adoption of several legisla-tive acts and strategies, such as the

Agricultural Development Strategy for 2020–2030 and the Green Economy Transition Strategy for 2019–2030, the country has laid the foundation for environmentally sustainable growth. A notable step was also the ratification of the Paris Agreement, underscoring Uzbekistan’s commitment to meeting international environmental standards and contributing to greenhouse gas reduction.

The main challenges to achieving these goals include limited funding, insufficient public awareness, and limited opportunities for using innovative technologies,

especially in rural areas. Further improvements in the legal and institutional environment, strengthened interaction between government bodies and the private sector, as well as the development of monitoring and evaluation systems, are also required.

Agriculture plays a crucial role in transitioning to a sustainable economic model. By 2030, Uzbekistan plans to reduce water use in agriculture by 10% through the introduction of precision farming technologies and drip irrigation, which will help mitigate the consequences of water scarcity. Given the increasing threats posed by climate change, sustainable agricultural practices can reduce risks and help mitigate crop yield losses, which is especially important for the country's agricultural sector.

To achieve sustainable progress in the green economy, it is recommended to continue efforts to improve energy efficiency, implement renewable energy sources, and develop educational programs aimed at training specialists in sustainable agriculture. Strengthening partnerships with international organizations and investing in R&D can also help overcome existing barriers and enhance the country's innovation potential.

Thus, Uzbekistan is on the path to a sustainable future, but further successful advancement requires not only political will but also targeted efforts to develop institutional support, improve coordination among various sectors, and adapt to climate change challenges.

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