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Infrastructure Projects in Uzbekistan

Analysing opportunities & risks in the context of the 2030 Strategy

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Contents

Abstract

The present thesis is developed to explore the landscape of infrastructure projects in Uzbekistan, focusing on the opportunities and risks associated with the nation's 2030 Strategy. As Uzbekistan embarks on an ambitious path to modernize its infrastructure, this study aims to provide an analysis of the potential benefits and challenges that lie ahead.

In Section I it is provided a brief introduction to the world of Uzbekistan's economy, what the strategic view of the government consists of and main aspects of correlation to the chosen path of development, surfacing the potential issues.

The economic overview delves into description and statistical data in Section II. It visualizes clearly how the industry is structured, and how the foreign trade affairs are organized. Finally, this section will introduce the main framework of construction rules and norms in the country as well as opportunities for foreign investments.

Sections III and IV are the deep dive in detail of the Uzbekistan – 2030 Strategy and Infrastructure projects planned and implemented, respectively. The following Sections V and VI are the core of the study, aimed to evaluate risks, constraints, opportunities, and viable solutions of the subject – infrastructure projects, containing recommendations for policymakers and stakeholders to mitigate these risks and maximize the benefits of infrastructure development in Uzbekistan. More generally it will reflect my effort in analysis across various sectors, including transportation, energy, and urban development, to assess how these projects align with the strategic goals set forth by the government. Through a combination of qualitative and quantitative methods, I will individualize the economic, social, and environmental impacts of these initiatives.

Key findings throughout the body of the thesis will highlight the aspects of financial sustainability, regulatory hurdles, and geopolitical factors. The thesis concludes with the statement of research limitations and possible ways to improve the study in Section VII. The last Section VIII will summarize the work performed and conclusions.

I. Introduction

Uzbekistan is situated in the heart of Central Asia and has borders with all other countries of region – Kazakhstan, Kyrgyzstan, Tajikistan, Afghanistan, and Turkmenistan. The country positions itself economically as the **interconnecting hub**, by continuing the best traditions of ancient **Silk Road**. In the last years Uzbekistan promotes the tourism as well, incrementing drastically the tourist flow in the country. But as time goes by, 33 years have passed since the independence from Soviet Union, and many structures require significant renovation. In the present thesis the study will mainly **concentrate on the efforts of the government to modernize the infrastructure system of the state**.

a. Strategic Vision

What is devised now to systemize the nation's development goals and push toward their achievement – is the Uzbekistan's 2030 Strategy – which represents a bold and comprehensive plan aimed at transforming the infrastructure landscape, foster economic growth and enhance the quality of life for its citizens. This strategic vision is not merely a collection of isolated projects, but a cohesive framework designed to modernize key sectors, improve regional connectivity, and position Uzbekistan as a pivotal player in Central Asia. The strategy underscores the importance of infrastructure as the backbone of sustainable development, recognizing that robust infrastructure is essential for economic diversification, social inclusion, and environmental sustainability.

b. Projects Landscape

The scope of infrastructure projects currently underway in Uzbekistan is vast and varied, encompassing multiple sectors such as transportation, energy, and urban development. As of the latest reports, there are over 100 major infrastructure projects in progress, each contributing to the overarching aim of sustainable development and modernization. These projects include the construction of new highways and railways to enhance domestic and international connectivity, the development of renewable energy sources to reduce dependence on fossil fuels, and the modernization of urban centres to improve living standards and attract investment.

For instance, the Tashkent-Samarkand, 40 km shorter distance than Turin to Bologna, is a **high-speed railway** project that aims to significantly reduce travel time between the two major cities, fostering economic integration and tourism. Similarly, the **development of solar and wind energy farms** is set to diversify the energy mix and promote environmental sustainability. Urban development projects, such as the Tashkent City International Business Centre, are designed to create modern, liveable urban spaces that can attract both domestic and foreign investment. Water distribution supply is also in focus of the government to ensure renovation and sustainable development of the infrastructure.

c. Execution risks

Despite the promising outlook, several risks could potentially hinder the successful implementation of these infrastructure projects. The main risks can be summarized in the following way: **financial sustainability, regulatory challenges, know-how and implementation obstacles.** Ensuring that these projects are financially viable in the long term is a critical concern. Many of these initiatives require substantial upfront investment, and the return on investment may not be immediate. This necessitates careful financial planning and the establishment of sustainable funding mechanisms, such as public-private partnerships and international financing.

Regulatory challenges also pose significant risks. The regulatory environment in Uzbekistan is evolving, and navigating this complex landscape can be challenging for both domestic and international stakeholders. Issues such as bureaucratic red tape, inconsistent enforcement of regulations, and the need for transparent and efficient governance mechanisms are critical factors that need to be addressed. Additionally, geopolitical factors, such as regional stability and international relations, can also impact the feasibility and success of these projects.

As per capabilities- Uzbekistan enjoys the presence of relatively well-trained workforce, capable of quick learning. Moreover, the cost of labour helps implementing projects more smoothly, while anyway the involvement of foreign know-how and specialists would play a key role. Anyway, as in any project, especially of this scale, implementation obstacles could arise on each stage.

Needless to say, in Central Asia a shortage of **hydrological resources** is not a favourable aspect for fast and sustainable development.

d. Exploring Solutions

This thesis invites readers to explore the potential solutions to these challenges within the context of Uzbekistan's 2030 Strategy. After a detailed study of inner layers of infrastructure projects and economic mechanisms of the state, an actionable recommendation for policymakers, investors, and other stakeholders may be provided. The goal is to offer insights that will help mitigate risks and maximize the benefits of infrastructure development, ultimately contributing to the nation's strategic objectives.

The research methodology includes a combination of qualitative and quantitative approaches. Case studies of successful infrastructure projects in similar contexts will be analysed to draw lessons and best practices. Quantitative data analysis will be used to assess the economic, social, and environmental impacts of the projects.

The findings of this thesis will not only shed light on the current state of infrastructure projects in Uzbekistan but also provide a roadmap for future initiatives. By identifying the key risks and proposing viable solutions, this research aims to contribute to the **successful implementation of the 2030 Strategy**, ensuring that infrastructure development serves as a catalyst for sustainable growth and regional integration.

In conclusion, Uzbekistan's ambitious infrastructure development agenda presents both significant opportunities and formidable challenges. By adopting a strategic and holistic approach, leveraging international best practices, and fostering collaboration among stakeholders, Uzbekistan can navigate these challenges and realize the full potential of its Strategy. This thesis aims to contribute to this endeavour by providing a comprehensive analysis and actionable recommendations that can guide policymakers and stakeholders in their efforts to build a modern, resilient, and inclusive infrastructure network.

II. Uzbekistan's Economic review

a. General information

A country famous for its natural landscapes, architectural monuments, traditional handicraft workshops, cultural events and gastronomic delights, Uzbekistan is now primed for growth, with a rapid shift towards a free market economy. Geographically situated in the heart of Central Asia, the country plays a vital role as a crossroads between Europe and the emerging economies of East, South, and Southeast Asia. The country is the gateway not just to 35,6 million domestic consumers but to a region of Central Asia of 77 million. Note that Uzbekistan's population is almost a half of the whole Central Asia's population, with half of its population below the age of 25 and boasts a high general educational level. Uzbekistan has held a **BB- sovereign credit rating since 2018**[1] (Italy is 4 positions ahead having BBB rating), and its robust external and fiscal buffers, diversified commodity export base and access to external official financing has made it more resilient to the economic impact of current global crisis. Being one of the fastest growing economies in the world according to the World Bank, Uzbekistan is becoming part of the global economic shift towards Asia. A number of significant multinational companies—including Veon, Nestlé, Samsung, Rieter, General Motors, MAN, Isuzu, Claas and Coca-Cola—have established a long-term presence in the country and have benefited from the skilled and relatively inexpensive workforce. Noteworthy, there are over 50 Italian companies, operating successfully in Uzbekistan, among them **Danieli s.p.a**., supporting metal industry of the country and **Pietro Fiorentini s.p.a.** with efforts to modernize

Figure 1. Contours of Uzbekistan and main cities

[1] (S&P Global Uzbekistan Credit Rating, 2024)

internal natural gas infrastructures to potentialize the distribution for domestic population. Uzbekistan has also introduced a wide range of reforms to encourage foreign investment, including liberalization of the foreign exchange system, reduction and optimization of taxes and mandatory contributions and other structural reforms. The country now offers more than 20 free economic zones, inviting investors into pharmaceutical, agricultural, tourist and other industrial sectors.

Table 1. Statistical information of Uzbekistan[2]

Capital	Tashkent
Population	36,08 million
Area	447.400 sq. km.
Government type	Presidential republic
Legal system	Civil law system
Currency	Uzbek Som (UZS)
GDP	$80,4 billion (2022)
GDP per capita (PPP)	$8.497,40 (2021)
FDI(foreign direct investment) inflow	$9,8 billion (2021)
Inflation rate	10,0% (2021); 12,25% (2022)
Benchmark interest rate	15%
Exports	$16,61 billion (2021); $19,31 billion (2022)—energy products, food products, chemical products, ferrous and non-ferrous metals, textiles, cotton fibre vehicles and equipment
Export partners	China, Russia, Kazakhstan, Turkey, Republic of Korea, Germany
Imports	$25,46 billion (2021); US$30,67 billion (2022)—vehicles and equipment, chemical products, ferrous and non-ferrous metals, food products
Import partners	Russia, Kazakhstan, Turkey, Afghanistan, Kyrgyzstan

[2] (Statistics Agency under the President of the Republic of Uzbekistan, 2024)

Table 2. Foreign trade turnover[3]

Countries	Foreign Trade Turnover 2021 ($ million)	Countries	Foreign Trade Turnover Q1 2022 ($million)
China	7.440,9	China	2.186,3
Russian Federation	7.517,0	Russian Federation	1.865,2
Kazakhstan	3.910,5	Kazakhstan	992,8
Turkey	3.388,3	Turkey	776,4
Republic of Korea	1.889,5	Republic of Korea	630,8

b. Currency and salaries

The ISO 4217 code for Uzbek currency is UZS and its' name is sum. The banknote shown in Figure 2. Is **100.000 UZS which is nearly equal to 7,10€** in March 2025 as exchange rate EUR/UZS equals to 14.086,35. Paying this banknote in Bazaar (open market of groceries and clothes, similar to Italian "mercato aperto" but much more popular and larger), a customer may buy 1 kg of fresh beef or have a lunch for three persons.

Figure 2. 100.000 UZS banknote

Otherwise, it is possible to buy 10 litres of benzine or buy a 250-gr pack of roasted Italian coffee like **Lavazza® or Bialetti®**. Although, in cities other than the capital – Tashkent city, the purchasing power of this unit is almost 15% greater as prices are lower.

The average monthly salary in 2024[4] is 6.761.000 UZS (nearly 487€) which doesn't reflect the full reality as unfortunately some sectors are still affected by the presence of grey economy. Numbers change drastically by sector – the banking, insurance and leasing company employees have an official average salary of 14,3 M UZS (1030€), while who work in Healthcare and Education pull through with 3,3 M UZS (237€).

[3] (Statistics Agency under the President of the Republic of Uzbekistan, 2024)
[4] (Statistics Agency under the President of the Republic of Uzbekistan, 2024)

The dynamics below show that average salary is increased by 128% (from 2,96 M UZS to 6,76 M UZS) since 2020, and considering the following inflation rates: 2020—11,1%, 2021—10%, 2022—12,3%, 2023—8,8%, 2024—10,5%, or overall inflation in last 5 years to be equal 65% $\left(\left(\prod_{i=1}^{5} 1 + \frac{\%}{100}\right) - 1\right)$, we see that growth rate of the salaries overtake significantly the inflation, indicating the development and correct policies of the government.

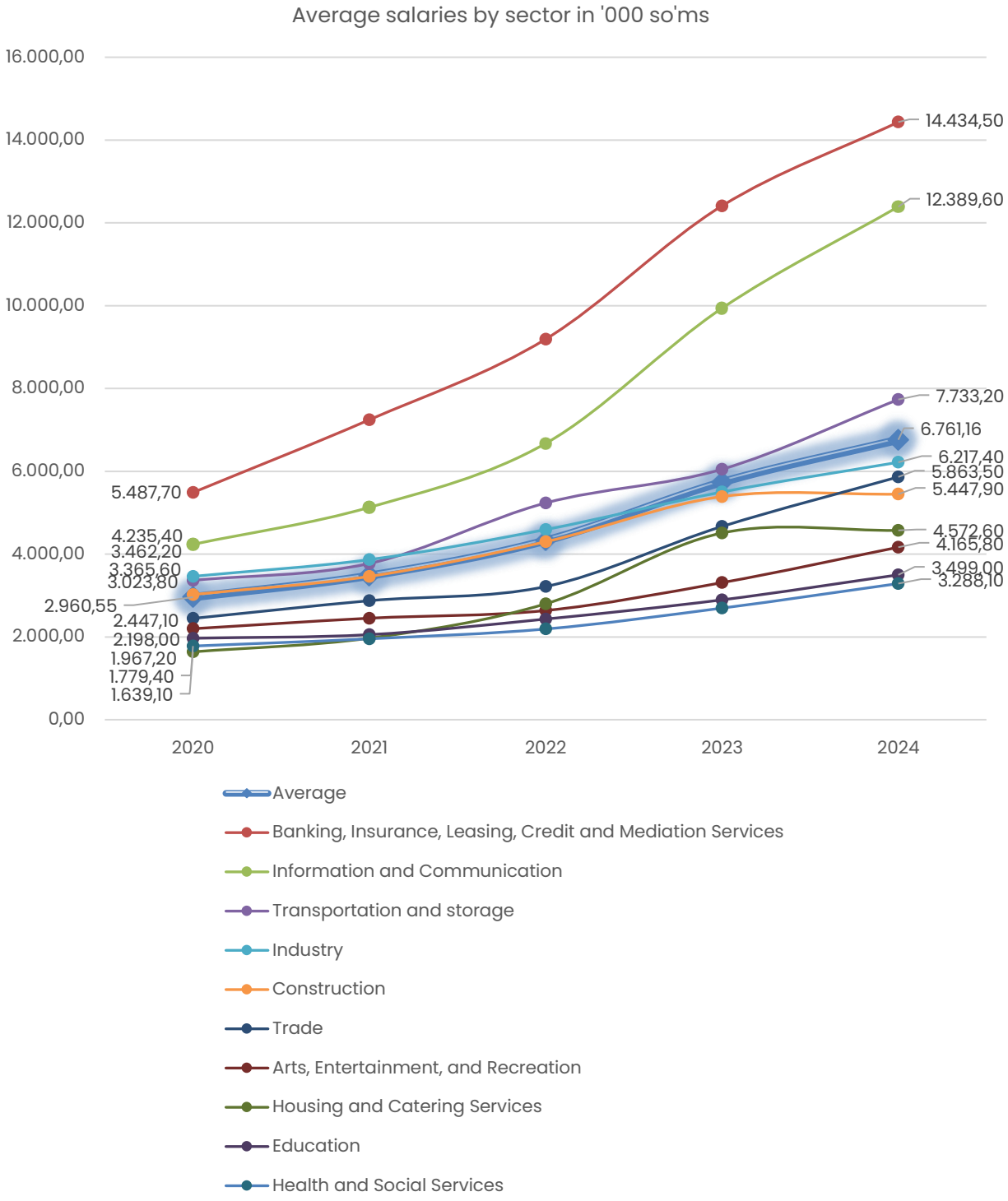


Figure 3. Average salaries by sector[5]

[5] (Statistics Agency under the President of the Republic of Uzbekistan, 2024)

c. Sectors with highest potential

Among the most advanced sectors are **Textile, Agriculture, Construction materials, Mining, mineral resources, and Metallurgy**. Textile is one of the most advanced sectors in the republic. It is famous in the world the precious silk materials and significant volumes of quality cotton production.

d. Construction and Real Estate

Title to land: Historically, **land** in Uzbekistan has been **considered a national asset** that belongs to the state. Uzbekistan is taking its first steps to introduce private ownership of land, which is an important milestone in the liberalization of the economy and promotion of sustainable urbanization in Uzbekistan. Privatization of land plots can be carried out in two main ways:

• A buyout by legal entities and individuals of land plots that are under permanent use (possession), leasehold or inherited for lifetime possession; or

• Purchased through an electronic auction. Only citizens and legal entities of Uzbekistan (except for enterprises with foreign investments) are entitled to privatize land plots. The most recent land reforms envisage the following changes:

• Land to be transferred to the private sector will be provided either for leasehold or ownership, and to public entities (i.e., government bodies, institutions, enterprises, and self-governing bodies) for permanent use

• Lifetime inheritable possession, permanent possession and temporary use rights in land will no longer be granted

• Leasehold rights transfer with the ownership of a legitimately constructed immovable property.

Land allotment: **Land rights can be obtained together with the title to existing buildings (premises)**. And as of 1 August 2021:

• Agricultural land plots are allotted for leasehold only through open electronic competitive bidding

• Non-agricultural land plots are allotted for ownership or leasehold only through electronic online auctions

• Land plots to public entities are allotted for public and community needs through orders of the Council of Ministers of Karakalpakistan, khokims (governors) of regions and (the mayor) of Tashkent city for leasehold; and

• By way of exception, the Cabinet of Ministers is authorized to directly lease land:

-for major investment projects, designated through a competitive selection process, with a value of no less than the equivalent of US$10 million (increases with reference to the size of the land plot)—subject to depositing in a special account no less than 10 percent of the project's value,

-to companies with foreign investment, international unions and organizations, foreign entities, and individuals—subject to payment on arm's length terms for obtaining lease rights (except for international unions and organizations).

Design documentation: Design documentation includes construction drawings, cost estimates and detailed designs**. It must be developed by an engineering company holding an applicable license**. Design documentation may be based on designated international or foreign planning rules and standards provided that they have been adapted by a local engineering contractor to comply with national planning rules and standards. The owner (investor) is obliged to cover the costs associated with engaging the independent foreign specialists and consultants for review of the adapted design documentation, where applicable. Design documentation is subject to expert appraisal and endorsement by public health services, fire safety, environmental and other authorized bodies.

Summarizing these rules, it is evident that the government pays significant attention to the normative of construction procedure, to favour the **implementation of most developed countries' experience**, while keeping the internal standards respected. This may lead to improvement of the quality of construction "operas" (and infrastructure ones - especially) by the support of international leading companies in the sector.

Commencement of construction: The owner (investor) must formally notify the regional inspectorate of the Ministry of Construction, Housing and Utilities at the commencement of construction. Construction is subjected to oversight through the following means to ensure that stakeholders comply with construction regulations as well as planning rules and standards prior to mobilization, carrying out engineering, construction, installation work, commissioning, and acceptance of the buildings (premises):

- State supervision by the territorial inspectorate of the Ministry of Construction, Housing and Utilities,
- Technical supervision by the owner (investor),
- Engineering supervision by the engineering contractor,
- Internal control by the contractor

Licensing: Generally, construction work is not subject to licensing, except where it involves high risk or hazards

Delivery methods: By default, construction can only commence once the design documentation is fully completed, has successfully undergone an expert appraisal and has been endorsed by authorized bodies. Yet, this might be impractical for large scale turnkey projects where the engineering phase takes many months or years. In consideration of the foregoing, in exceptional circumstances, EPC contractors might be allowed to carry out engineering and construction work concurrently (the "fast-track"

method) by special decisions of the president or Cabinet of Ministers. Such circumstances include projects associated with national defence capabilities and security, safety and health of people, emergency and environmental disaster response or discharging international obligations of Uzbekistan. EPC and EPCM contracts are commonly used, as they offer maximum risk transfer from owner to contractor. Due to frequent involvement of international financial institutions, standard forms based on FIDIC contracts have become increasingly widespread in Uzbekistan.

Purchasing real estate: Foreign companies have the right to purchase real estate in Uzbekistan. A special electronic trading platform, E-IJRO AUKSION, has been set up in Uzbekistan for the purchase of public property.

e. Fiscal Incentives for Foreign Direct Investments (FDI's)

FDI policy: For the last six years Uzbekistan has been introducing a wide range of reforms to encourage foreign investment, including reducing the minimum charter capital sizes for enterprises with foreign investment, liberalizing the foreign exchange system, reducing taxes and mandatory contributions and other reforms. Moreover, the new administration's masterplan, the New Uzbekistan Development Strategy 2022–2026, also encourages an active investment policy, aimed at modernization, technical and technological renewal of production, implementation of projects of production, transportation, and communication, as well as social infrastructure. To achieve this, the government recognizes the importance of improving the investment and overall business climate, and of attracting FDI into the various regions and sectors of the economy.
Bilateral investment treaties: Uzbekistan has signed more than 50 bilateral investment treaties (BITs) with countries such as the Netherlands, the United Kingdom, Singapore, China, Russia and others. Some BITs—for example, those with Bahrain, the United States and Belarus—have not yet entered into force.

Sectoral tax exemptions for FDI: Companies with foreign investments of at least US$300.000 in the following targeted industries are exempt from specific taxes:
• Food
• Chemicals
• Petrochemicals
• Machinery and tools
• Glass and porcelain
• Microbiology
• Waste management.
The effective time period for this exemption depends on the value of the FDI: • US$300.000 to US$3 million: three years • US$3 million to US$10 million: five years • More than US$10 million: seven years.

Special Economic Zones: Uzbekistan has thirteen Free Economic Zones (FEZs) in the industrial sector (Navoi, Angren, Jizzakh, Urgut, Gijduvan, Kokand, Khazarasp, Sirdaryo, Namangan, Termez, Nukus, Chirakchi, Andijan, Karakul), seven FEZs in the pharmaceutical industry (Zomin-farm, Kosonsoy-farm, Sirdaryo-farm, Boysun-farm, Bustonlik-farm, Parkent-farm, and Andijon-farm) and two FEZs in the agricultural sector (Bukhara-agro and Fish producer). In addition, there is also a special "Sport" economic zone, the "Charvak" free tourist zone and a FEZ for modern energy-efficient greenhouses (Karakalpak-agro). They provide substantial tax exemptions and privileges in terms of facility services to their members, as well as a number of special foreign exchange and customs privileges.

Guarantees against unfavourable changes in the law for investments: If a change in the law worsens certain investment conditions, investors may apply the law in force on the date of their investment, up to 10 years from the date of investment. At the same time, investors are entitled to apply those provisions of any new laws that improve the conditions for their investment, as they see fit.

This effort has already started to pay for itself – several multinational companies, leaders in their sector have started to modernize Uzbekistan's infrastructure, driven by fiscal incentives as well. Mentioned in the Introduction, Pietro Fiorentini s.p.a. now realizes a significant project of natural gas infrastructure modernization in the country. To understand the scale – the contract value of the last project is over €285 M.

The agreement involves the realization by **Pietro Fiorentini** of **5.434 smart gas regulation and control stations**. It is also planned to set up a training centre for engineers in Uzbekistan to train them in the operation and maintenance of the new network. Also participating in the project will be Pietro Fiorentini Group subsidiary **Terranova**, whose TSG software® (Terranova Smart Grid) will enable data collection, remote monitoring and real-time verification of flow rates and pressures. The second phase has already started in 2022 with a maintenance program of the existing stations and the integration of the national gas pipeline network with the construction of **381 km of new pipelines**. Four of Pietro Fiorentini's new smart stations have already been installed as part of a pilot project in the Shaykhantakhur district of the state capital Tashkent. The project will continue in the rest of the Tashkent area and then extend to neighbouring regions, with the goal of **digitalizing the entire national network by 2026.** The project is financed mostly by **SACE** – Italy's Export Credit Agency and insurance & finance group controlled directly by the Ministry of the Economy and Finance.

III. Strategy Uzbekistan 2030

The "Uzbekistan-2030" strategy, approved by Presidential Decree No. 158 on September 11, 2023[6], is a comprehensive plan designed to guide the country's development over the next decade. This strategy builds on the experiences and outcomes of the "New Uzbekistan" development strategy and reflects the aspirations of the Uzbek people for a prosperous and strong nation. It aims to address the key challenges facing Uzbekistan and leverage its unique strengths to achieve sustainable development. It includes 100 precise aims to be reached by 2030.

a. Objectives of the Strategy

-Joining the group of upper-middle-income states through sustainable economic development.

-create an education, health and social protection system that fully meets the needs of the population and international standards.

-create favourable environmental conditions for the population (protection of the environment and improvement of the ecology of the country).

-to build a just, equitable and modern state at the service of the people.

-guarantee the sovereignty and security of the country.

The implementation of the "Uzbekistan – 2030" Strategy and the achievement of its objectives are defined as **a priority target** of the activities of **all state bodies** and organizations, whose leaders are personally responsible for implementation.

Within the framework of the "Uzbekistan – 2030" Strategy, the achievement of all goals that have not lost their relevance is ensured, as well as the implementation of the urgent tasks defined by the Development Strategy of New Uzbekistan, the implementation of which continues.

The Republican Commission, responsible for implementing the strategy, is organized. A.N. Aripov (Prime Minister of the Republic) is appointed to the position of Chairman of the above-mentioned Commission.

The portal for the public control of the progress is organized: https://uzbekistan2030.uz/ru[7]

[6] (The Decree of the President of the Republic of Uzbekistan no. 158, 2023)
[7] (Strategy - Uzbekistan 2030, 2023)

The Information and Communications Agency, the National Society for Television and Radio of Uzbekistan, as well as the National News Agency of Uzbekistan, together with the media, shall ensure a continuous commentary on the aims and objectives of the "Uzbekistan – 2030" strategy, provide the explanation to people of its essence and content in the media, also through the global information network Internet and social networks. **The progress must be reported** to the President of the Republic **monthly**.

b. Structured contents of the Strategy and objectives

1. REALIZING THE POTENTIAL OF EACH PERSON

- 1.1 Educational system
- 1.2 Medical and health system
- 1.3 Social services and poverty reduction
- 1.4 Youth policy and sport
- 1.5 Mental growth and culture

2. SUSTAINABLE ECONOMIC GROWTH

- 2.1 Improvement of economic system of the country

3. ENVIRONMENTAL PROTECTION AND WATER CONSERVATION

- 3.1 Safeguarding water resources
- 3.2 Environmentl reforms

4. THE STATE OF LAW FOCUSED ON SERVICE TO THE PEOPLE

- 4.1 Public Administration reforms
- 4.2 Judicial reforms

5. SECURE AND PEACEFUL STATE POLICY

- 5.1 Open, pragmatic and active foreign policy
- 5.2 Stregthening the country's security and defence potential

Figure 4. Uzbekistan - 2030 Strategy contents

To adhere to the main topic, we will consider a few sections concerning our theme (highlighted in green in the previous chart).

To describe the essence of the subject, below a synthetic description of key objectives is provided by area:

c. Economic Development

The economic development goals of the "Uzbekistan-2030" strategy are ambitious and multifaceted. **The strategy aims to achieve an average annual GDP growth rate of 7-8%,** which is essential for elevating Uzbekistan into the ranks of upper-middle-income countries. To achieve this, the strategy focuses on several key areas:

Industrialization: **Increasing the share of industry in GDP to 40% by 2030** is a central goal. This involves modernizing existing industries, promoting the development of new sectors, and encouraging innovation and technological advancement. The strategy emphasizes the importance of creating a diversified economy that is resilient to external shocks and capable of sustained growth.

Export Growth: **Doubling the volume of exports** is another critical objective. The strategy aims to shift the focus from low-value-added products to high-value-added goods and services. This includes promoting sectors such as manufacturing, information technology, and services, which have significant potential for export growth. Enhancing the competitiveness of Uzbek products in international markets is a key priority.

Investment Climate: Improving the investment climate is essential for attracting both domestic and foreign investment. The strategy outlines measures to **simplify regulatory procedures**, protect investor rights, and provide incentives for investment in priority sectors. Creating a business-friendly environment is crucial for fostering entrepreneurship and stimulating economic growth.

d. Education and Healthcare

The "Uzbekistan-2030" strategy places a strong emphasis on education and healthcare, recognizing their critical role in human development and economic progress.

Education: The strategy aims **to ensure that at least 90% of schools meet international standards by 2030**. This involves comprehensive reforms in the education system, including curriculum modernization, teacher training, and infrastructure development. The goal is to provide high-quality education that equips students with the skills and knowledge needed for the 21st century. Special attention is given to promoting STEM (Science, Technology, Engineering, and Mathematics) education and fostering innovation and creativity among students.

Healthcare: Improving healthcare services and infrastructure is a top priority. The strategy aims to **increase life expectancy to 78 years by 2030**. This involves expanding access to healthcare services, improving the quality of care, and addressing key health challenges such as non-communicable diseases and maternal and child health. The strategy also emphasizes the importance of preventive care and health education to promote healthy lifestyles and reduce the burden of disease.

e. Social Protection

Strengthening social protection mechanisms is a key component of the "Uzbekistan-2030" strategy. The goal is to create a more inclusive and equitable society where all citizens have the opportunity to thrive.

Poverty Reduction: **Reducing the poverty rate to below 5%** is a major objective. The strategy outlines measures to support vulnerable populations, including targeted social assistance programs, job creation initiatives, and access to affordable housing. Empowering individuals and communities to lift themselves out of poverty is a central focus.

Employment: **Creating 1,5 million new jobs** is essential for promoting economic inclusion and reducing unemployment. The strategy emphasizes the importance of providing opportunities for youth and women, who are often disproportionately affected by unemployment. This includes vocational training programs, entrepreneurship support, and measures to promote gender equality in the labour market.

f. Environmental Sustainability

The "Uzbekistan-2030" strategy recognizes the importance of environmental sustainability for the well-being of current and future generations.

Renewable Energy: Increasing **the share of renewable energy in the energy mix to 25%** is a key goal. This involves promoting the development of **solar, wind, and hydropower projects**, as well as improving energy efficiency across all sectors. The strategy aims to reduce dependence on fossil fuels and mitigate the impact of climate change.

Green Spaces: **Expanding green spaces in urban areas by 30%** is another important objective. This includes the development of parks, gardens, and recreational areas that enhance the quality of life for residents. The strategy also emphasizes the importance of protecting natural ecosystems and promoting sustainable land use practices.

Governance and Rule of Law: Building a modern, fair state that serves the people is a central theme of the "Uzbekistan-2030" strategy.

Judicial Reforms: Implementing comprehensive judicial reforms is essential for ensuring fairness and transparency in the legal system. The strategy outlines measures to strengthen the independence of the judiciary, improve access to justice, and enhance the efficiency of legal processes. Ensuring that all citizens have equal access to justice is a key priority.

Public Services: **Digitizing 80% of public services is a major objective**. This involves leveraging technology to improve the accessibility, efficiency, and transparency of government services. The strategy aims to create a more responsive and citizen-centric government that meets the needs of the population. It should be fairly mentioned that already over 60% of public services are already digitized [8]– a Centralized portal for Public Services (my.gov.uz) is organised.

g.Implementation and Monitoring

The successful implementation of the "Uzbekistan-2030" strategy requires effective coordination and oversight. The strategy outlines a robust framework for implementation and monitoring:

Republican Commission: Led by the Prime Minister of the Republic—Abdulla Aripov, this commission is responsible for overseeing the strategy's implementation. The commission ensures that all state bodies and organizations are aligned with the strategy's goals and are held accountable for their performance. Regular progress reviews and evaluations are conducted to ensure timely and quality execution of annual programs.

Accountability: Top leaders of state bodies and organizations are held personally accountable for the strategy's execution. This includes setting clear performance targets, monitoring progress, and taking corrective actions as needed. Ensuring transparency and accountability in the implementation process is crucial for achieving the strategy's objectives.

In the appendix, the contents of the concerning sections of the Uzbekistan 2030 Strategy are provided.

[8] (Обзор Центра экономических исследований и реформ: развитие цифровой экономики в Узбекистане за четыре года, 2023)

IV. Infrastructure projects of Uzbekistan

As the main purpose of the present thesis is the infrastructure, we will mainly concentrate on the aspects and plans of the state, indicated in the 2030 Strategy, concerning the energetics and water supply over the future 6 years' time horizon.

a. Energetics

The Ministry of Energetics of the Republic of Uzbekistan, after detailed research has elaborated the **Concept Note**[9] for ensuring electricity supply in Uzbekistan in 2020-2030. This document represents the efforts of the government to build infrastructure projects aimed to implement the Strategy 2030.

It poses an **objective** to meet the **growing electricity demand** in Uzbekistan and ensure **balanced development** of the power sector using international know-how.

The document has been elaborated through an analysis of the current power sector, its' demand trends, while taking into account relevant government policies and development outlook and finally providing an action plan.

Current Situation:

Generating Capacity: **Total capacity is 12,9 GW as per 2020**, with Thermal Power Plants (TPPs) contributing 84,7%, Hydro Power Plants (HPPs)—14,3%, and other sources—1%.

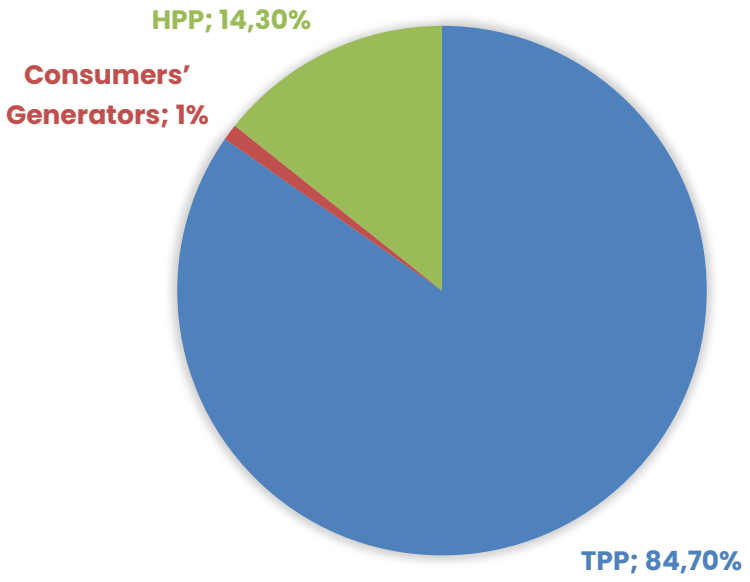


Figure 5. Energy generation mix, current

[9] (CONCEPT NOTE for ensuring electricity supply in Uzbekistan in 2020-2030, 2020)

Infrastructure: Significant portions of the power sector assets are over 40 years old, leading to **high technical losses** (2,72% in transmission, 12,47% in distribution).

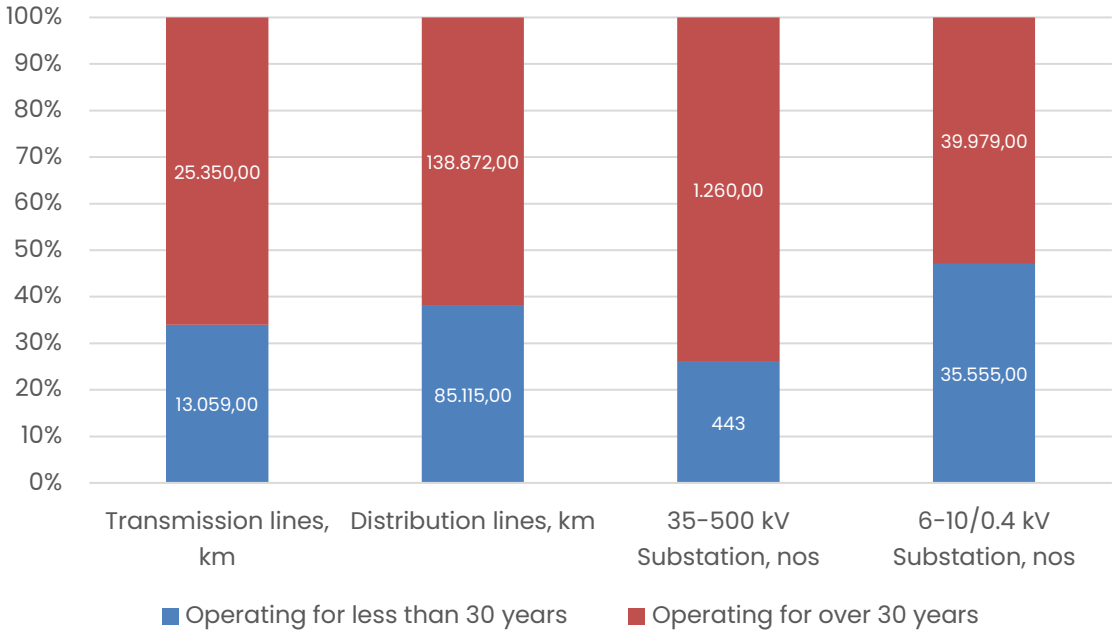


Figure 6. Infrastructure conditions, current

Demand dynamics and structure outlook by 2030 is estimated as follows: annual power consumption is expected to **grow by 6-7%,** reaching 120,8 billion kWh by 2030 and per Capita Consumption is expected to increase from 1,903 kWh in 2018 to 2,665 kWh by 2030.

All projects are developed with an aim to:

- Satisfy domestic demand — ensure full domestic generation without reliance on importation of energy.
- Improve energy efficiency — reduce energy intensity and **improve efficiency** in generation, transmission, and distribution on internal market.
- Develop renewable energy — increase the share of renewables by incrementing to **3 GW wind** and **5 GW solar** capacity by 2030.
- Develop the market — transition to a competitive wholesale electricity market by 2023. This aim is reached partially by 2024 passing the HPP generated power to **Veolia** company to distribute on internal market.

Uzbekistan is aimed to improve renewables-based generation significantly in following manner:

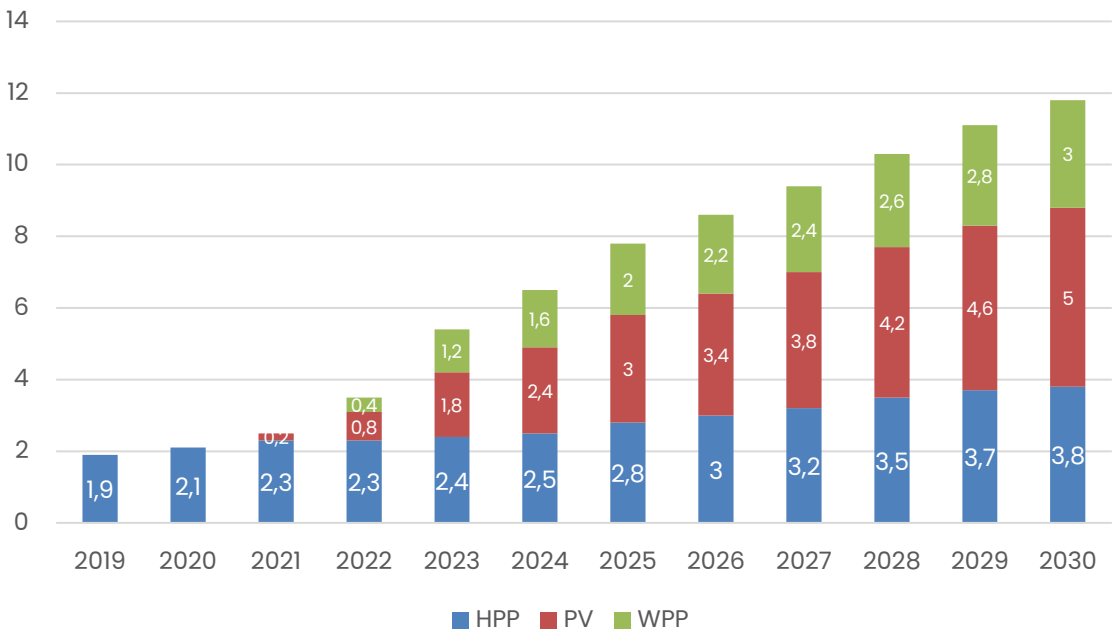
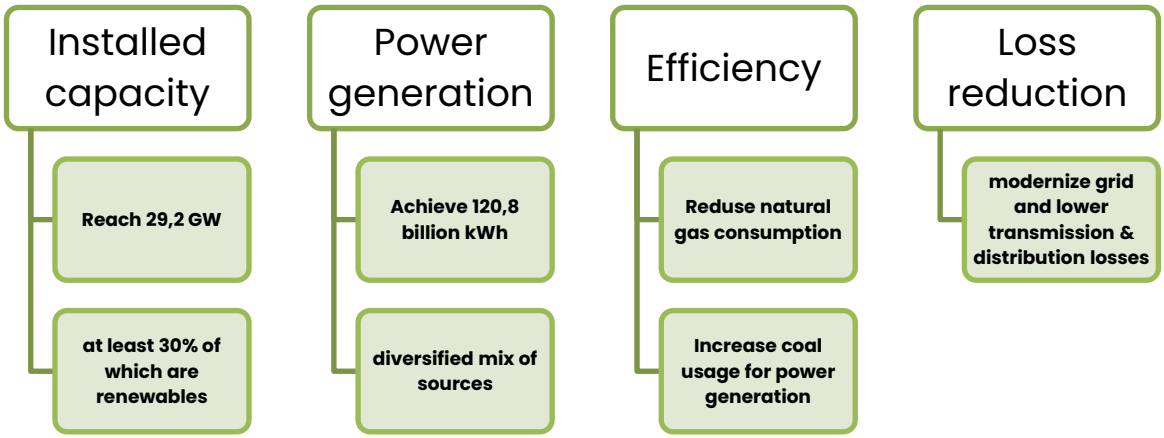


Figure 7. Renewables-based generation structure by 2030, GW

Among priorities implementation: modernize and construct new TPPs, aiming for 14,7 GW capacity by 2030. Renewable energy should be focused on large-scale solar and wind projects, with significant investments in solar PV and wind farms. What is profoundly important—to **develop a robust transmission network**, integrating new generation sources and improving reliability through modernization of distribution networks to reduce losses and improve supply quality. Hydropower development concerns implementation of 62 projects to increase HPP capacity to 3,785 GW by 2030 as mentioned in fig. 6.

Expected Results by 2030:



Development scheme of main electrical networks in 2022-2030

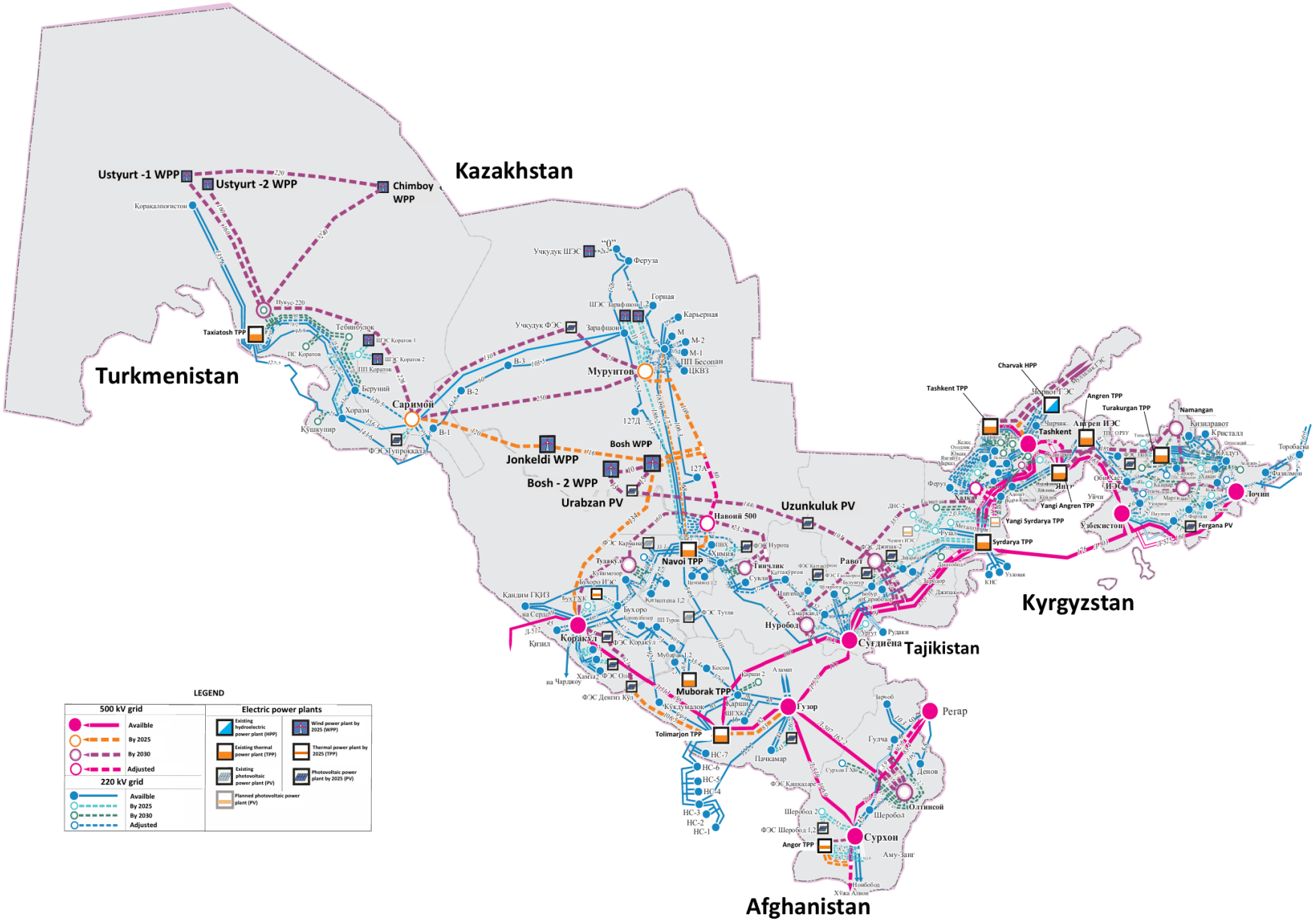


Figure 8. Planned & existing PP and grid of Uzbekistan according to Concept Note of MOE

With the support of international consultants and to bring further research, while keeping main course to reach Uzbekistan's 2030 targets in energy sector, the **energy mix study**[10] has been carried out under the supervision of the Ministry of Energy by **ACWA POWER** company, based in UAE, supported by consulting company **GOPA-International Energy Consultants GmbH** from Germany. The study delves deeply into renewable integration and grid planning, presenting a strategic pathway to obtain a more efficient and resilient energy. The report provides an information on the economic benefits of Uzbekistan's renewable energy investments, projecting substantial cost savings in coming years. The methodology used is presented by forecasts for energy demand, power flow modelling and a detailed look at resource potentials across geographic and technical factors of the country. Demand forecasts are split into two scenarios—extreme and moderate, where growth is driven by Uzbekistan's economic expansion in parallel with population increase, and accelerated urbanization.

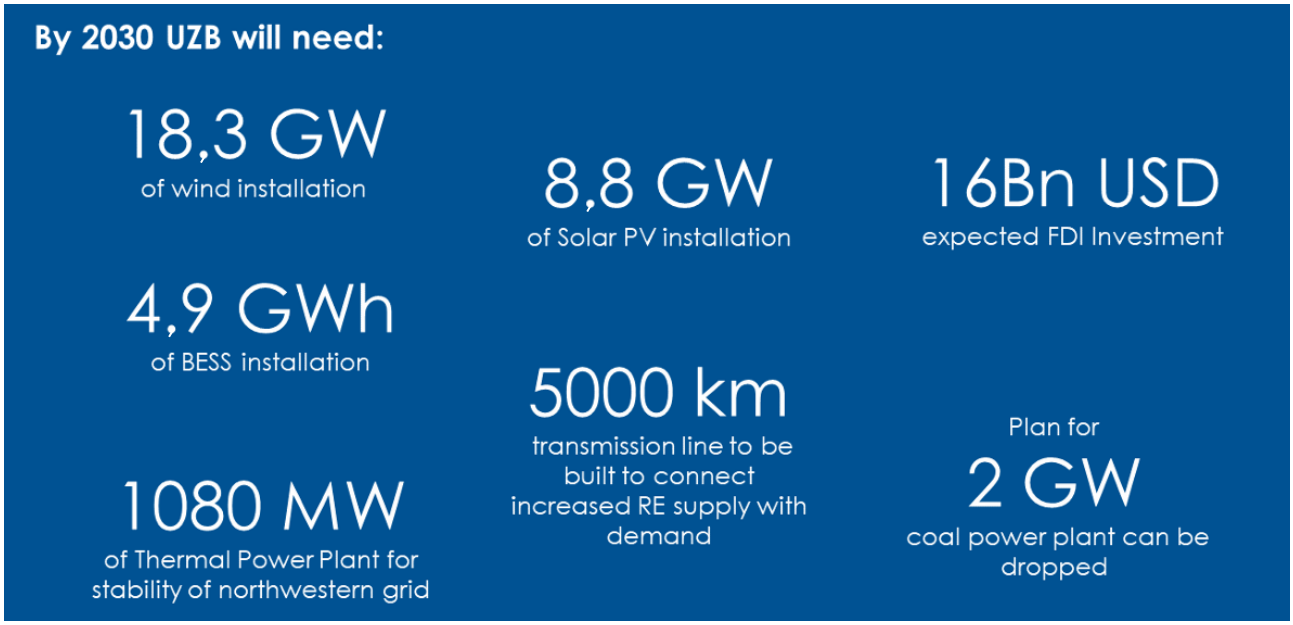


Figure 9. Requirements of energy sector of Uzbekistan according to ACWA Power study

In the extreme scenario demand should **grow by an ambitious 7% annually**, requiring substantial investments in renewable and thermal capacities to maintain a balanced and continuous supply. In the moderate scenario, with demand growth at a conservative 5,5% per year, the investment requirements are evidently lower, but the aim for renewable integration remains essential. Both scenarios highlight the necessity of **phasing out coal** and prioritizing renewable sources to achieve cost effective and environmentally sustainable energy production.

[10] (Energy Mix in Uzbekistan for 2026, 2030 and 2036, 2023)

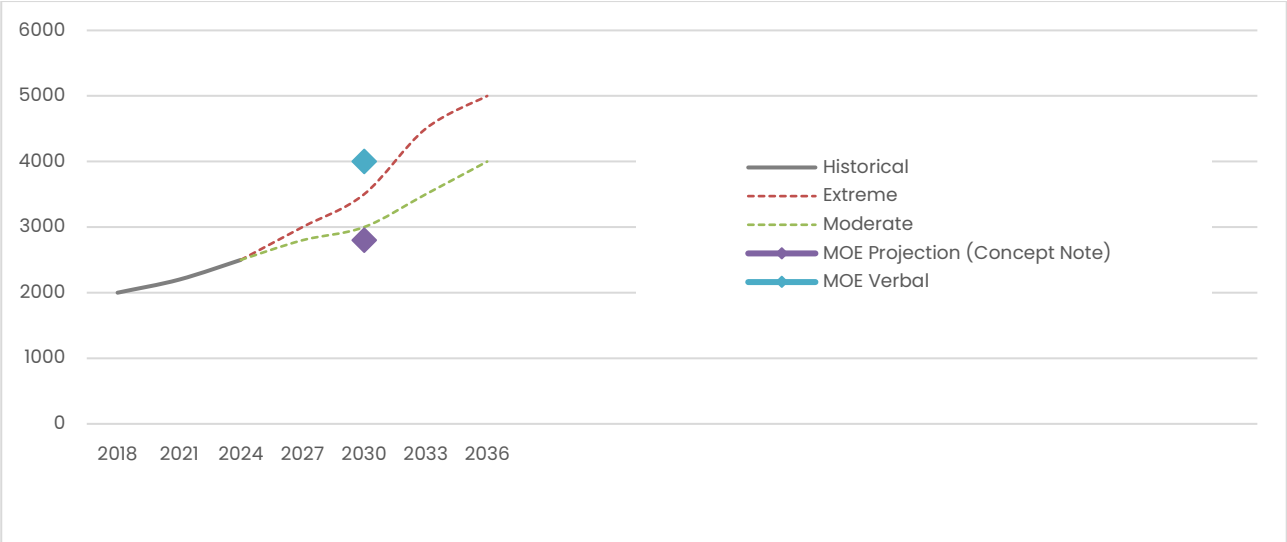


Figure 10. Per capita demand in kWh for Uzbekistan. Differences in studies of Ministry of Energy (MOE) and ACWA Power

Resource Mapping and Cluster Identification

The study's Geographic Information System (GIS) mapping identifies prime locations for solar and wind projects based on a range of factors, such as solar irradiation levels, wind speeds, land use, and proximity to transmission infrastructure. For solar, **areas with irradiation between 1.650 and 1.800 kWh are designated as optimal clusters**. These areas provide high energy yields, and with an expected efficiency rate of approximately 75 MW/km², solar potential is significant across these zones. Similarly, wind clusters with speeds of 8,5 to 10 m/s are mapped, particularly in regions with minimal environmental restrictions and proximity to the existing grid, helping to keep transmission costs manageable.

Clusters	Wind Speed (Avg): 8.5-9 m/s	Wind Speed (Avg): 9-10 m/s
Cluster 1	810 MW	Negligible
Cluster 2	4.9 GW	4.9 GW
Cluster 3	3.3 GW	None
Cluster 4	1 GW	Negligible
Cluster 5	2.4MW	318MW
Cluster 6	633 MW	None
Cluster 7	711 MW	216MW
Cluster 8	8.7 GW	5.6 GW
Cluster 9	101GW	548 MW + 2.8 GW + 4 GW

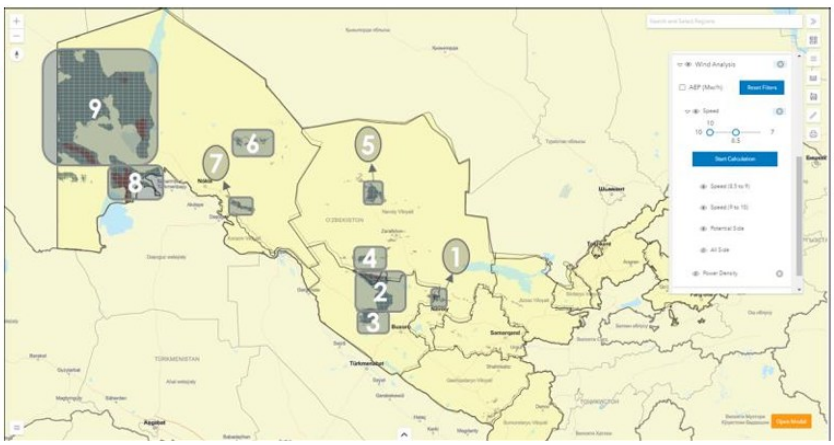


Figure 11. Wind Generation Capacity Mapping and Cluster Segregation

The GIS mapping and clustering method used in this study represents an advanced approach to resource assessment, allowing for an optimized selection of locations for renewable installations. In each cluster, theoretical energy capacities are calculated based on land area and site conditions, with adjustments for practical constraints like shading, spacing, and accessibility. This leads to the identification of high-yield locations that maximize renewable output while adhering to environmental standards.

Clusters	Solar PV 1650 – 1700 (kWh/kWp)	Solar PV 1700 – 1750 (kWh/kWp)
Cluster 1	79 GW	-
Cluster 2	29 GW	-
Cluster 3	27 GW	-
Cluster 4	72 GW	-
Cluster 5	57 GW	-
Cluster 6	106 GW	-
Cluster 7	67 GW	-
Cluster 8	302 GW	29 GW
Cluster 9	176 GW	-

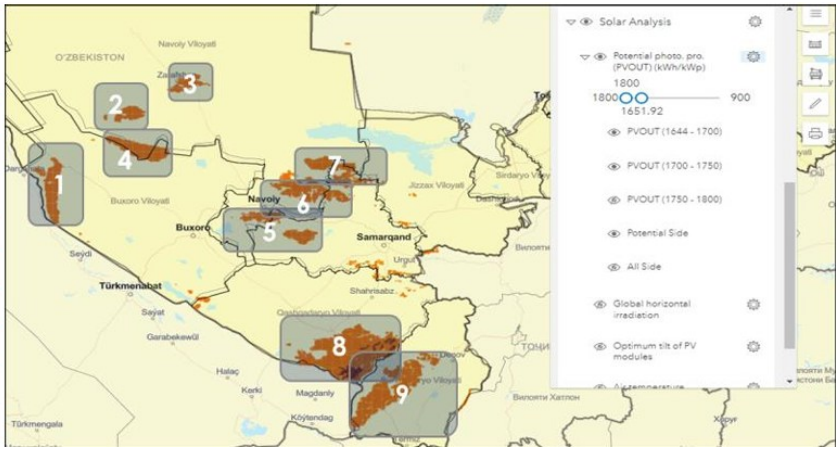


Figure 12. Solar Generation Capacity Mapping and Cluster Segregation

Investment in Transmission and Storage Infrastructure

To integrate the planned renewable capacity effectively, the study stresses the need for robust transmission infrastructure. A **projected investment in 500 kV overhead lines**, along with the establishment of new substations, is required to support the energy flow from resource-rich western regions to central and demand-heavy areas. The report suggests that the national grid must undergo **extensive upgrades** to accommodate an additional 14 GW of renewable capacity by 2030, with further upgrades needed to reach the planned 19 GW by 2036.

Battery Energy Storage Systems (BESS) play a **critical role** in maintaining grid stability, especially during peak load hours and when renewable generation fluctuates. The report **recommends an initial BESS capacity of 1,350 MWh by 2025**, which should expand to meet increasing storage needs as renewable capacity grows. These systems are essential for load balancing, providing ancillary services, and mitigating the intermittency challenges inherent in solar and wind energy.

The addition of Static VAR Compensators (SVCs – bank of capacitors, or reactors for grid stability) in substations such as Nukus, Muruntov, and Tebinbulok is advised to manage voltage profiles and reduce transient instability. This investment in power quality improvements helps to offset the impact of inverter-based renewable generation, which, unlike traditional synchronous generators, does not contribute rotational inertia to the grid.

Nuclear Power Plant (NPP) is not included in the PLEXOS as it is not expected to be commissioned during the main time horizon of focus, i.e. 2030. Results presented in Figure 5 and Figure 6 below are for cases when a new Coal plant with a capacity of 2GW (5 units of 400MW) is treated as a candidate. Optimization shows that this new plant should not be built in both extreme and moderate demand cases.

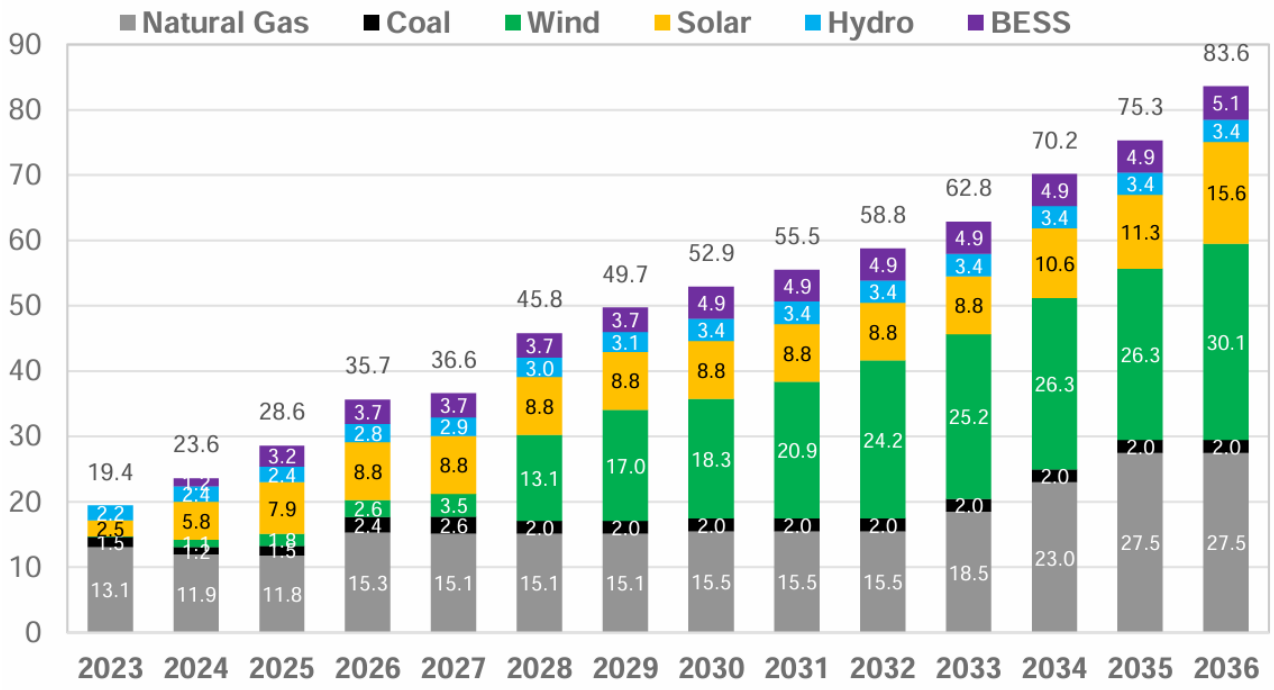


Figure 13. Cumulative installed capacity of various technologies for extreme demand, GW

Phase-wise Approach and Energy Mix Scenarios

The phased approach mentioned in the study offers a comprehensive view of Uzbekistan's energy transition. **Phase 1 should cover the development of an optimal energy mix** by analysing various technology options, their installation timelines, and capacity factors. It is found that a mix with a higher share of wind is favourable due to its seasonal alignment with Uzbekistan's winter peak demand, making it a valuable resource alongside solar.

Phase 2 focuses on power flow studies and grid stability. Using the PLEXOS software, power flow models simulate grid performance under different demand scenarios, incorporating real-world constraints like ramp rates, reserve requirements, and spinning/non-spinning reserves. The study finds that as renewable penetration increases, reliance on TPPs for base load diminishes. Instead, TPPs will be reserved for backup and ancillary services. The transition implies a notable reduction in fuel consumption, as renewables become the primary energy source, conserving natural gas for export and industrial uses, enhancing Uzbekistan's economic position.

One of the study's main results is that the contribution of renewables in the energy mix of Uzbekistan must be increased to achieve optimal energy cost. The technology-wise % contribution in energy supply corresponding to the optimum energy mix for the extreme demand scenario is shown below:

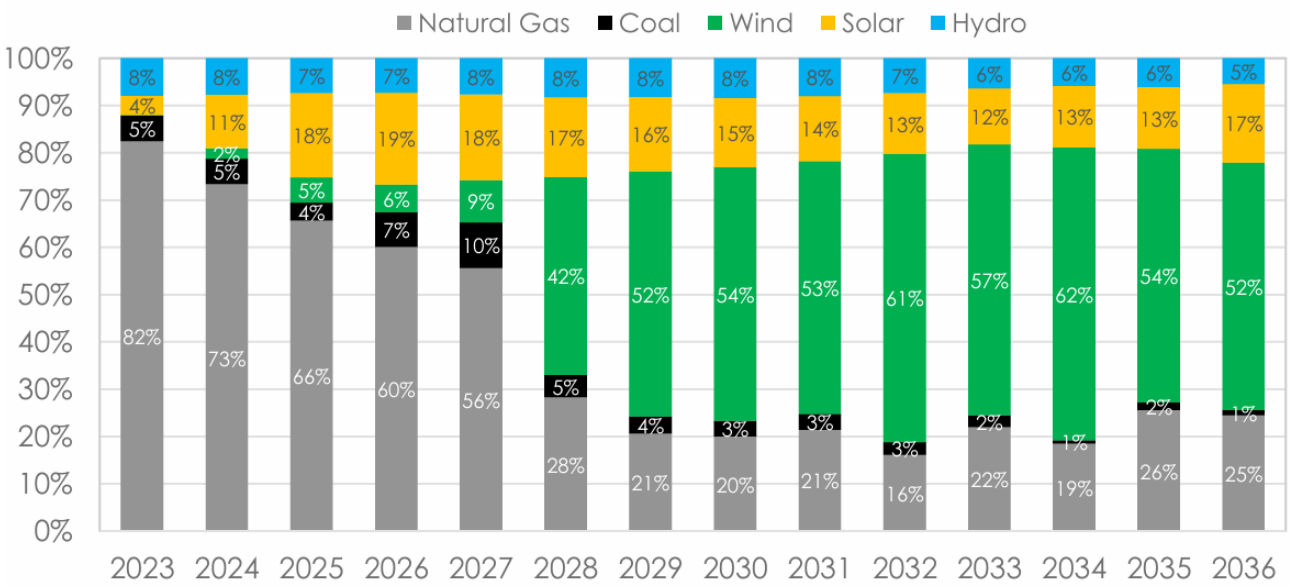


Figure 14. Technology-wise % contribution in the energy mix (extreme demand scenario)

Carbon Emissions and Environmental Impact

One of the demonstrated in study significant outcomes is the projected decline in Uzbekistan's carbon emissions**. In 2023, the carbon intensity stands at approximately 535 gCO2/kWh, but by 2036, it is projected to drop to 130 gCO2/kWh under the optimal energy mix scenario**. This reduction aligns with Uzbekistan's international commitments to climate change mitigation and sustainable development. The shift away from coal and natural gas, coupled with an increased reliance on wind, solar, and hydro, contributes to these emissions reductions. Additionally, improved energy efficiency across generation, transmission, and distribution is expected to further decrease the carbon footprint.

The environmental benefits of this shift are underscored by the role of modern TPPs and energy storage in reducing reliance on fossil fuels. The retirement of outdated coal plants and the reduced capacity factors of existing TPPs highlight a structural shift towards cleaner energy sources. By optimizing fuel use and reducing emissions, Uzbekistan positions itself as a regional leader in sustainable energy.

Key Recommendations for Energy Policy and Infrastructure Development

Several recommendations emerge as a result of the study, aimed at fostering a secure and sustainable energy future. **First, it recommends accelerating wind capacity deployment**, with an emphasis on high-capacity factor sites that can consistently contribute to the grid, especially in peak demand seasons. In contrast, no additional solar capacity is suggested until 2034 due to existing contracts that already meet projected solar needs. This selective approach to renewable expansion ensures economic efficiency and optimal resource allocation.

The authors of the report also **suggest halting the planned 2 GW coal power plant for 2028**, as it would increase costs without adding substantial value to the energy mix. By 2030, an additional 1,1 GW of natural gas-based plants (OCGT and CCGT) will be

necessary to fulfil spinning reserve requirements, especially in the northwestern region. **Existing TPPs should be upgraded to provide ancillary services**; otherwise, further expansion of energy storage solutions will be essential to meet stability requirements.
Uzbekistan's policy and regulatory framework must adapt to accommodate increased renewable generation. The report points up the need for advanced grid dispatch systems, incorporating **smart grid technologies and automation**. This would improve grid flexibility, enabling a swift response to demand fluctuations and facilitating the integration of renewables. Additionally, partnerships with international institutions, such as the World Bank and Asian Development Bank, are stimulated to support technical expertise and funding for large-scale renewable projects.

Demand Forecasts and Future Grid Enhancements

The study's forecasts show a substantial rise in electricity demand per capita, reflecting economic growth and urbanization. By 2050, demand is projected to increase significantly, necessitating continuous expansion of the generation and transmission infrastructure. Uzbekistan's per capita demand, calculated at 6,5 MWh by 2036 under the extreme scenario, requires a grid capable of handling high peak loads while maintaining resilience.
To achieve this, the study **recommends 13 new overhead lines spanning a cumulative distance of approximately 5.000 km by 2030**, along with additional substations to support renewable integration and maintain voltage stability. Specific infrastructure projects are identified, such as a proposed station between Muruntov and Navoi TPP, intended to facilitate power flow from western renewable clusters to central demand centres. Similarly, a new substation near Tahtakopir and Beruniy will support Karakalpakistan's renewable projects, strengthening transmission links to the main grid.

Overhead Line Name	Active Power (MW)	Loading (%)
L_Nurobod-Sogdiana	415	27
L_Lide-Nurobod	588	33
L_Sarimay-Dzankeldy	176	14
L_Sarimay-Muruntov	200	15
L_Navoi TPP-Khimiya 1	186	76
L_Navoi TPP-Khimiya 2	171	70
L_Sogdiana-Ch.Ota 1	126	63
L_Sogdiana-Ch.Ota 2	113	61
L_Syrdarya-Jizzakh	157	86
L_Khimiya-K.kurgan 1	182	74
L_Khimiya-K.kurgan 2	182	74
L_Turon-Muborak	149	76
L_Muborak CHP-Khasan	157	71
L_Nurobod-Ishtikhon	203	84

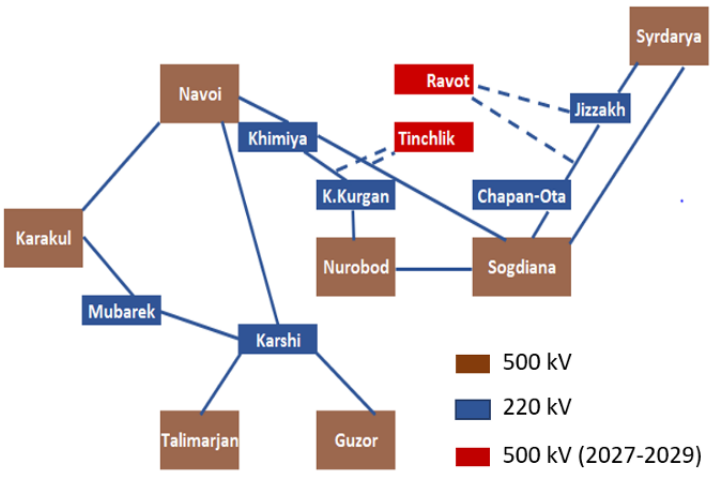


Figure 15. Future expansion of the power system

Technological and Regulatory Advances

With increasing renewable integration, Uzbekistan faces challenges associated with reduced grid inertia and frequency control. This transition requires technologies such as

BESS and advanced inverters that can simulate traditional synchronous inertia. Frequency response is a key focus, as the grid will experience wider fluctuations with higher shares of wind and solar power. By 2030, additional storage and flexible generation sources, like gas turbines capable of rapid dispatch, will become integral to maintaining grid stability.

Policy adjustments, including incentives for grid-stabilizing technologies, are crucial. The report advocates for "grid-aware" incentives that reward renewable projects contributing to stability through ancillary services or enhanced inverters. The Ministry of Energy's regulatory framework should evolve to include requirements for energy storage and power-electronic-based renewables to participate in grid services, thereby increasing their value in the system.

The Uzbekistan energy mix and power system study thus provides a holistic roadmap for transitioning to a sustainable, resilient, and economically viable energy future. With targeted investments in renewables, transmission, and storage, alongside supportive policies and grid modernization, Uzbekistan is poised to meet its long-term goals of energy security, reduced emissions, and economic growth.

b. Water supply and distribution[11]

Uzbekistan, like many other countries, faces challenges in the areas of water supply and sanitation. To provide the population with quality drinking water and sanitary living conditions, the government of Uzbekistan is actively implementing targeted programs aimed at improving water supply and sanitation infrastructure. This information will help to understand when and where water supply improvements are planned and focus attention on monitoring the quality of project implementation. **Water supply projects are funded either by budgetary funds or by loans**.

Budgetary Funds: Presidential Decree No. RP-343 of October 24, 2023, "On Additional Measures for Further Improvement of the Drinking Water Supply and Sanitation System," [12]outlines programs for improving water supply and sanitation systems in 2024-2026. According to the decree, 813 mahallas (neighbourhoods) in various regions with severe water supply issues have been identified. Of these, water supply will be improved in 590 mahallas under the targeted programs of JSC "Uzsuvta'minot," (the managing company of water distribution) in 130 mahallas under the state social order projects of the Ministry of Housing and Communal Services (MHCS), and in 93 mahallas under local and initiative budgets by local khokimiyats (administrations).

[11] (Agency For Strategic Reforms under the President of the Republic of Uzbekistan, 2023)
[12] (The Resolution of the President of the Republic of Uzbekistan No. RP 343, 2023)

As part of the JSC "Uzsuvta'minot" projects funded by the state budget, 76 projects (67 of which were meant to be finished in 2024) will be implemented in 83 mahallas and several settlements in 2025, with a total amount of 6,8 trillion sums (roughly $566 M).

Under the state social order projects of the MHCS, projects were implemented in 35 mahallas for drinking water supply in 2024. Specifically, desalination plants were installed in 26 mahallas across 8 regions for a total of 11,6 billion sums, and drinking water supply was provided in 9 mahallas across 6 regions for a total of 50 billion sums (≈$4 M).

Loan Funds: JSC "Uzsuvta'minot," with the participation of international financial institutions, is implementing projects in 1.656 mahallas in 63 districts and cities of the republic, with a total amount of $2,35 B, of which $1,98 B are loans from these international financial institutions. The completion of 4 projects is planned for this year.

Ensuring transparency and efficiency in the implementation of state projects plays a key role in protecting the interests of citizens. One of the powerful tools for achieving this goal is the active participation of the population in public control over the progress and results of project implementation. In this regard, every citizen may familiarize themselves with the drinking water supply and sanitation projects being implemented in their native districts, cities, and mahallas, study the instructions for public control, and report identified violations to the Telegram bot (most popular messenger in Uzbekistan). Additionally, through this Telegram bot, one can participate in a survey on the availability of drinking water. The collected data will be transmitted to the responsible authorities and will serve to improve the state of drinking water supply on the ground.

The Decree of the President No. DP 6024, issued on July 10, 2020, outlines the strategic plan for the **development of water resources in Uzbekistan from 2020 to 2030**. This comprehensive plan addresses the challenges posed by climate change, population growth, and increasing water demand, and sets forth a detailed approach to improve water management and infrastructure in the framework of the implementation of Uzbekistan 2030 Strategy.

Current Water Usage and Challenges

Uzbekistan faces significant challenges in water resource management due to global climate change, population growth, and increased economic activities. The average annual water consumption is **51-53 billion cubic meters**, with 97,2% sourced from rivers and streams, 1,9% from collector networks, and 0,9% from underground sources.

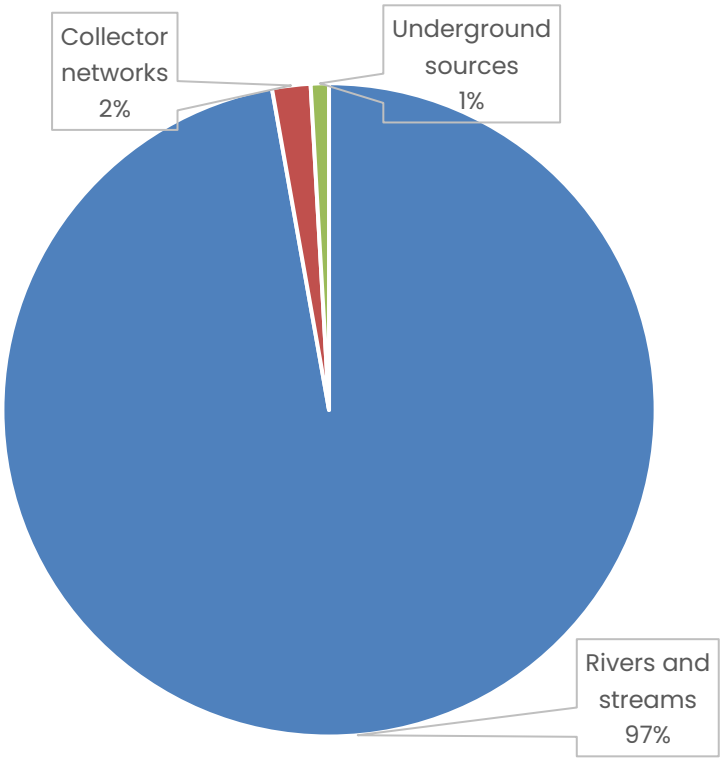


Figure 16. Water supply sources in Uzbekistan

Goals and Objectives

The primary goals of the decree[13] are to ensure stable water supply for the population and all industry sectors, improve the condition of irrigated lands, and implement market principles and digital technologies in water management. The decree aims to enhance the efficiency of water and land resource use and ensure the reliable operation of water infrastructure.

Where to implement the improvements?

Modernization & Development of water infrastructure:

- Automation of large water facilities using digital technologies.
- Introduction of water-saving irrigation technologies.
- Improvement of the meliorative state of irrigated lands.
- Development of public-private partnerships in water management.
- Strengthening inter-state cooperation on transboundary water resources.

Improvement of Water Resource Management:

- Ensuring stable water supply for the population and economic sectors.
- Reducing the area of poorly irrigated lands from 560.000 to 190.000 hectares.
- Decreasing the annual energy consumption of pumping stations by 25%.

Legislative and institutional reforms:

[13] (The Decree of the President of the Republic of Uzbekistan No. DP 6024, 2020)

- Development of a Water Code for Uzbekistan
- Enhancement of the legal framework for water use and management
- Continuous training and qualification improvement for water management professionals

What are the measures to be implemented?

- **Establishment of a Responsible Management Unit** – Creation of a management unit within the Ministry of Water Resources to oversee the implementation of the decree. To be implemented along with attraction of foreign investments and grants to support water infrastructure projects.
- **Regular Monitoring and Reporting –** annual reporting on the effectiveness of implemented projects with continuous monitoring of water resource usage and infrastructure current conditions.
- **Public-Private Partnerships** – encouragement of private sector involvement in water management through public-private partnerships and phased transfer of certain water management functions to private entities under specific conditions.
- **Energy Efficiency and Modernization** – modernization of irrigation systems and reduction of water loss through filtration. It will require replacement of outdated pumping equipment with energy-efficient alternatives.

How are water resources managed now?

Current State of Water Resources:

Uzbekistan is located in the Aral Sea basin, with **major water sources being the Amu Darya and Syr Darya rivers**, as well as internal rivers, streams, and underground waters. The average **annual flow** of all water sources in the Aral Sea basin **is 116,2 billion cubic meters**, with 67,4% formed in the Amu Darya basin and 32,6% in the Syr Darya basin. The total underground water reserves amount to 31,2 billion cubic meters, with 47,2% in the Amu Darya basin and 52,8% in the Syr Darya basin.

Water Consumption and Usage:

The average **annual water consumption in Uzbekistan is 51-53 billion cubic meters**, with 97,2% from rivers and streams, 1,9% from collector networks, and 0,9% from underground sources. The **irrigated land area** in Uzbekistan **is 4,3 million hectares**, with 90-91% of all water resources used in agriculture, 4,5% in communal services, 1,4% in industry, 1,2% in fish farming, 0,5% in thermal energy, and 1% in other economic sectors.

Challenges and Risks:

The country faces significant challenges due to **climate change**, population growth, and increased water demand. The area of glaciers in Central Asia has decreased by approximately 30% over the past 50-60 years. By 2050, water resources in the Syr Darya basin are expected to **decrease by 5%**, and in the Amu Darya **basin by 15%**. The **annual water deficit** in Uzbekistan could reach **7 billion cubic meters by 2030** and 15 billion cubic meters by 2050.

Infrastructure and Technical Condition:

Most **water infrastructure in Uzbekistan is over 50-60 years old** and in poor technical condition. **66% of irrigation canals have earthen beds**, resulting in high water loss through filtration. 77% of irrigation canals require repair and restoration, and 20% need reconstruction. **94% of pumping stations have exceeded their service life and require modernization and replacement**.

Meliorative State of Irrigated Lands:

45,3% of irrigated lands in Uzbekistan are saline to varying degrees. 31,1% are slightly saline, 12,2% moderately saline, and 2% highly saline. 24,4% of the area has groundwater levels at or above 2 meters. 298.500 hectares of irrigated land have been taken out of agricultural use due to poor water supply and meliorative conditions.

Water-Saving Technologies:

Traditional furrow irrigation is still widely used, with limited adoption of modern water-saving technologies. Since 2019, a new system of state support for water-saving irrigation technologies has been implemented. **Drip irrigation technology has been introduced on 77.470 hectares**, sprinkler irrigation on 1.123 hectares, and discrete irrigation on 2.000 hectares.

Material and Technical Base:

The material and technical base of water management organizations, especially district irrigation departments, remains low. 70% of allocated funds are spent on electricity costs, with **only 2,9% allocated for the repair and restoration** of irrigation systems.

Reforms and Legal Framework:

Coordination between agencies involved in water management needs improvement. The Law of the Republic of Uzbekistan "On Water and Water Use" requires updating, and a Water Code needs to be developed.

Transboundary Water Resources:

Relations between Central Asian states on water management have improved, but challenges remain. Construction of new large **hydropower facilities** and reservoirs **in the upper reaches of the Amu Darya** and Syr Darya rivers could **create water supply issues** for downstream countries, including **Uzbekistan**.

Qualified Personnel and Research:

42% of water management workers have higher education. There is a need for continuous professional development and integration of higher education, science, and production.

Expected Outcomes by 2023 (reached by 60%)

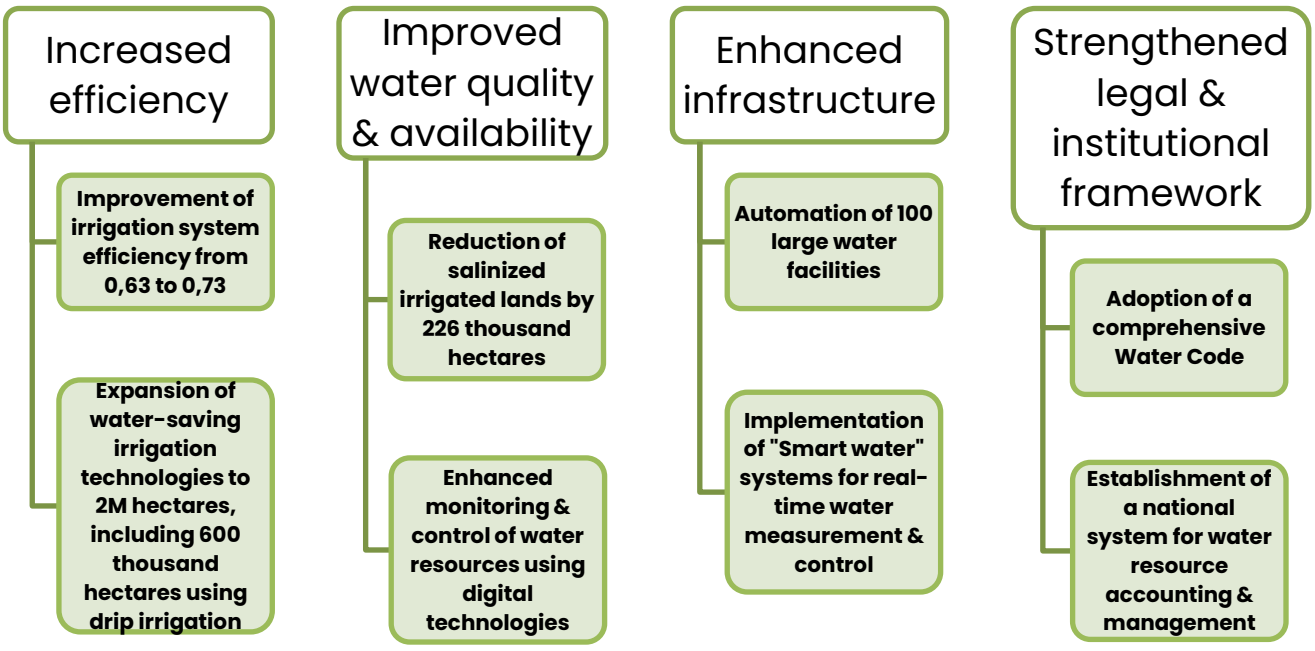
Increased Efficiency - Improvement of irrigation system efficiency from 0,63 to 0,65. Expansion of water-saving irrigation technologies to 532.000 hectares, including 17.000 hectares using drip irrigation.

Improved Water Quality and Availability – Reduction of salinized irrigated lands by 42,000 hectares. Enhanced monitoring and control of water resources using digital technologies.

Enhanced Infrastructure – Automation of 20 large water facilities. Implementation of "Smart Water" systems for real-time water measurement and control on 151 objects.

Strengthened Legal and Institutional Framework – Development of a comprehensive Water Code. Establishment of a national system for water resource accounting and management.

Expected Outcomes by 2030:



The decree emphasizes the importance of sustainable water management to support Uzbekistan's economic and social development. By implementing these measures, Uzbekistan aims to create a resilient water management system capable of adapting to future challenges and ensuring the efficient use of water resources.

c. The New Tashkent city project

The most emphasizing and great project in course is the construction of the new city next to the capital. The project is named "The New Tashkent" and includes the creation of the whole new city with its own infrastructure. It is planned to shift governmental entities from actual Tashkent to the new city and switch the capital into the "centre of business and tourism" – cit. Sh. Mirziyoyev.[14]

New Tashkent will accommodate 600.000[15] residents in the first phase, with the city's population planned to rise by 2,5 million. The new city will house administrative buildings, including the administration headquarters for the president, government ministries, as well as universities and other civic and cultural facilities. **The construction of New Tashkent will see almost 20.000 hectares of existing agricultural land** to the east of the city allocated to development.

The first 6.000 hectares are planned to be developed by 2045. For this territory, prospective areas for development and road schemes linking the capital with the new city district have been outlined. Tashkent is the largest city in Central Asia, and with this development, its population will double with developed infrastructure for business, media and science. Plans to improve the urban environment for Tashkent residents include the planting of 200.000 trees and the construction of several bridges.

The forecast growth rate for the Uzbekistan economy is around 5-6%. This is a substantial growth rate, indicating expansion and value creation in a range of industries, as well as the possibility of increases in labour market participation. Ongoing increases in the overall size and scale of the national economy will provide a strong basis for significant urban expansion of the Tashkent capital area.

The key challenge is to ensure that planned urban development does not exceed the capacity for economic growth and population demand in the region.

It seems unnecessary to concentrate on this project but just to mention, **how much of new infrastructure should be designed and realized**. Unfortunately, the engineers are supposing to connect the new Tashkent city whole system to the existing infrastructure of the Tashkent city.

[14] (Interview with the President of the Republic of Uzbekistan on the New Tashkent city project, 2023)
[15] (The New Tashkent City Project, 2023)

V. Risks & Constraints

a. Risks observations

After acquisition of Independence from former Soviet Union, Uzbekistan chose the path of growth, science, and open development on international arena. With effort of the new government, starting from 2017, Uzbekistan has shown a significant quality leap in developing its industry and in general, in improving the quality of life of the population. One of the reasons – active investment in international affairs. From year to year, ambitious projects to develop further and to grow the country are being implemented. At first sight it concerns the overload of projects in infrastructure sectors, influencing the financial and resource capacity of the country.

As it is visible from presented data, **different studies demonstrate different results (for example the Ministry of Energy Concept Note and Energy Mix Study by ACWA Power)**. But most of the studies show very ambitious prospectives and lead to an overrated expectation of the population. Literally, studies show that by 2030 (in 5 years) all demands in energy production will be satisfied. Moreover, it is projected that more than 60% of the infrastructures grid, currently deteriorated, will be renovated. Below, a brief and simple financial state overview will further introduce concerns about feasibility of the overall plan:

Total cost of ongoing projects in energy sector:	$21,8 B
Total amount of foreign investment implemented:	$2,1 B
Total budget income of Uzbekistan:	$33,5 B
Total budget expenditure projected in 2025:	$37,3 B[16]
Saldo:	-$3,8 B[17]
GDP: +6% growth respect to 2024	$126,6B

While $2 B of annual investments are needed in Central Asia to ensure drinking water supply as per EDB (Eurasian Development Bank)[18]

Uzbekistan is currently grappling with significant challenges in its energy and infrastructure sectors. Despite being rich in natural resources like natural gas, oil, and uranium, the country struggles with outdated infrastructure and frequent supply disruptions.

One of the significant issues is the unstable supply of natural gas. Although **Uzbekistan is one of the world's largest producers of natural gas**, the internal supply is often unreliable. This instability affects not only households and industries but also gas

[16] (Investments in water and energy infrastructure in Central Asia, 2021)
[17] (Budget of the Republic of Uzbekistan for 2025, 2024)
[18] (Investments in water and energy infrastructure in Central Asia, 2021)

stations, leading to frequent shortages of methane. The gas pipelines and related infrastructure are old and have exceeded their service life, causing frequent breakdowns and maintenance issues. The management of the natural gas resources internally is not the most effective currently – it may give some concerns about the management of the future produced energy, coming from renewable sources, from just realized projects. Will their exports prevail again over the satisfaction of the internal demand?

Electricity supply is another area of concern. The country experiences regular blackouts due to the aging power grid and insufficient generation capacity. These blackouts disrupt daily life and economic activities, making it difficult for people to rely on a consistent power supply. While there are efforts to invest in renewable energy projects like solar and wind power, these initiatives are still in the pilot stages and have not yet significantly alleviated the supply problems.
Overall, the current situation in Uzbekistan's energy sector is challenging, with frequent disruptions in both gas and electricity supplies affecting the daily lives of citizens and the overall economy.

While inspecting the budget conditions of the Republic of Uzbekistan[19], it is evident that financial sustainability is a target, that is difficult to reach in current conditions

Trade Balance

Exports: $24,5 billion (12% increase from 2022)
Imports: $42,1 billion (18% increase from 2022)
Trade Deficit: $17,6 billion

The significant increase in imports compared to exports has resulted in a substantial trade deficit. This indicates a higher dependency on foreign goods and services, which could be a concern for the country's economic stability.

Current Account

Deficit: $7,8 billion

The current account deficit is primarily **financed through external debt** and foreign investments. This reliance on external financing could pose risks if global financial conditions tighten or if there are disruptions in capital flows.

Financial Account

Deficit: $9,3 billion
Increase in Financial Obligations: $10,4 billion ⬆

[19] (The budget of the Republic of Uzbekistan 2023, 2024)

The financial account deficit reflects a higher increase in financial obligations compared to financial assets. This indicates that the country is borrowing more than it is investing abroad, which could lead to increased debt servicing costs in the future.

International Investment Position

Net Position: $12,4 billion (as of January 1, 2024)
External Debt: $53 billion
Government Debt: $29,7 billion
Corporate Debt: $23,3 billion

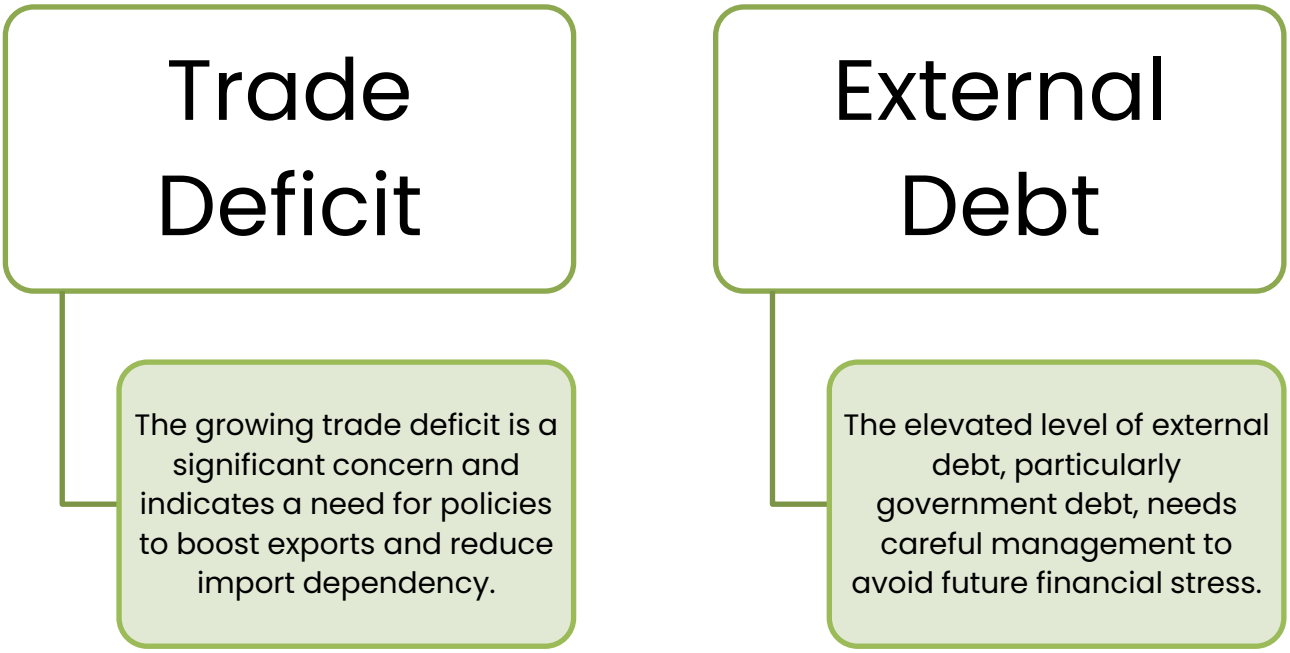
The net international investment position is positive, indicating that the country's external assets exceed its liabilities. However, the elevated level of external debt, particularly government debt, could be a concern if not managed properly.

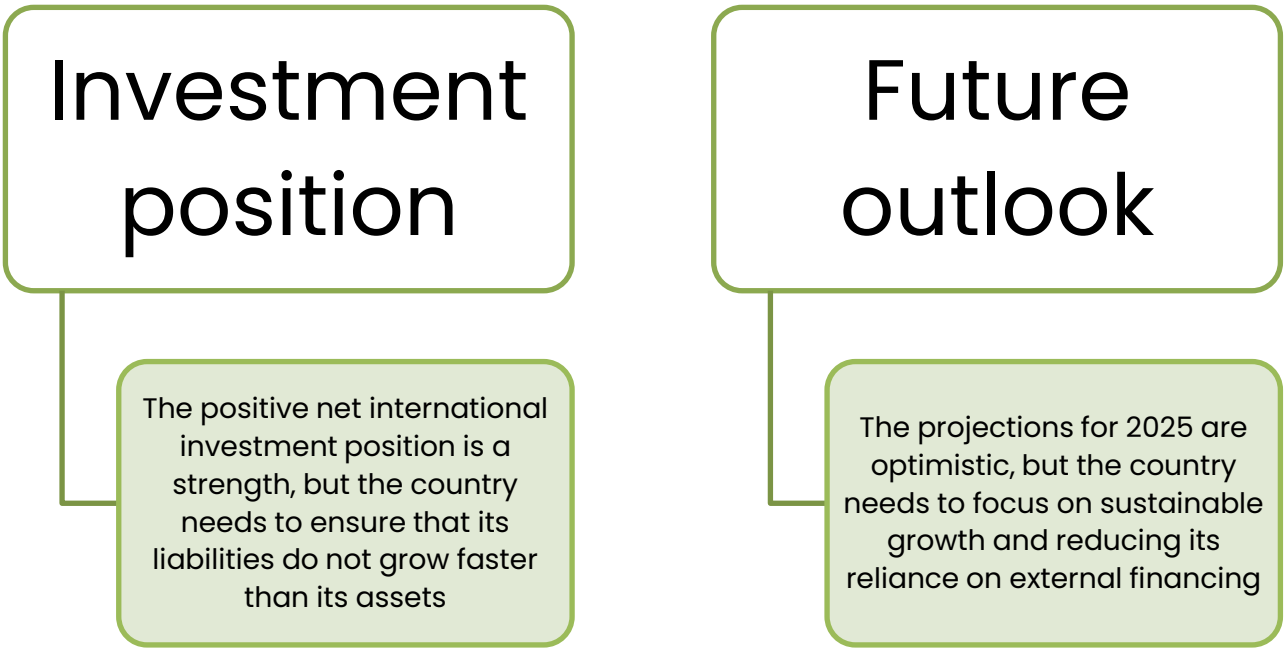
Projections for 2025

Exports: Expected to grow by 9-11%
Imports: Expected to increase by 7-9%
Primary and Secondary Income: Primary income expected to remain negative, while secondary income (remittances) is expected to grow by 5-10%

The projections for 2025 suggest a positive outlook for export growth, which could help reduce the trade deficit. However, the expected increase in imports and the negative primary income balance could offset some of these gains.

Key observations:





By reviewing again energy infrastructure projects we may determine other types of risks, lying in the **ambitious goals (as reaching 8 GW of power generation derived from wind and solar power plants for example). This aim is to be reached in 6 years from "scratch" while in 2024 the whole country is powered by TPP's and HPP's and its grid is deteriorated for more than 60%.** To be able to implement such projects in the projected period a massive financial inflow along with professional support should be realized.

Natural risks, ones that are rooted in Uzbekistan's geographical, economic, and political landscape should not be neglected too. For starters, Uzbekistan's extreme climate and varied terrain present a distinct challenge. **Temperatures swing from bitterly cold winters to scorching hot summers, particularly in desert regions where many solar and wind farms are likely to be set up.** This means that equipment, especially the more sensitive solar panels and wind turbines, will face wear and tear faster than in milder climates. **Managing such extreme temperature shifts might require custom-built equipment or specialized maintenance schedules, both of which increase operational costs and complexity**.

The country's location also poses a strategic risk due to its landlocked nature and limited transport options. Since Uzbekistan is surrounded by other Central Asian countries with challenging transit routes, importing the heavy equipment needed for large-scale energy projects can be costly and time-consuming. This point is already confirmed, every ongoing project, powered by important equipment that is needed to be imported from Europe or the USA, requires at least 4 weeks of transportation by ground and significant costs. There's a reliance on railways and roads that pass through multiple borders, making logistics a complicated puzzle and raising the chance of delays due to customs issues or geopolitical tensions. If relations with a neighbouring country were to

strain, Uzbekistan's ability to import necessary materials or equipment could be jeopardized, bringing project timelines to a halt.

Now, let's make a **point on Uzbekistan's power grid infrastructure**, which is another significant concern. **The national grid is outdated and primarily designed for a centralized, fossil-fuel-powered system**. Integrating renewable energy sources, especially on a large scale, can be problematic, as the grid may struggle to handle the variability and distribution required by sources like wind and solar. This integration challenge is unique to Uzbekistan's current grid setup, and it could require substantial grid upgrades and investment to stabilize electricity supply across the regions. Without modernization, there's a risk of outages or energy curtailments, which means the power generated from renewable sources would go unused, a costly inefficiency.

On the economic front, the transition to renewable energy could create strains within Uzbekistan's current energy markets. **For decades, Uzbekistan has relied heavily on natural gas, both for domestic energy needs and as an export**. The shift to renewable energy might initially **disrupt** this balance, potentially causing job displacement in fossil-fuel sectors or reducing revenue from natural gas exports if the country starts prioritizing renewable sources. Since the local economy is somewhat dependent on these energy exports, a sudden shift could have ripple effects, particularly if global energy markets fluctuate or if regional demand for Uzbekistan's natural gas decreases.

Cultural and social factors also add layers of risk specific to Uzbekistan. In rural areas, where some of the new renewable projects might be sited, communities are often more conservative and may be unfamiliar with large-scale energy projects, especially those involving solar or wind farms. The concept of renewable energy may still feel foreign or even intrusive to certain groups, potentially leading to resistance or concerns about land use, environmental impact, or **disruption to traditional ways of life**. Additionally, if community members don't see direct economic benefits or jobs stemming from these projects, there's a chance of local opposition, especially in regions where employment options are limited, and people are cautious about outside influence. This is true especially for regions where agricultural lands are in priority now and that will become used for renewable energy plants.

Lastly, there is a unique regulatory risk. Uzbekistan has been working on modernizing its legal and regulatory frameworks to encourage foreign investment, but this is an evolving process. **The regulatory environment is still relatively new, and bureaucratic delays or inconsistencies could pose challenges for international companies unfamiliar with Uzbekistan's legal landscape**. Navigating the regulatory system requires an understanding of both formal procedures and informal processes. If foreign developers are caught off-guard by unexpected delays or complications, projects could face

setbacks, not because of a lack of resources or expertise, but due to unfamiliarity with the intricacies of Uzbekistan's regulatory environment. To summarize:

b. General risks

1. Regulatory and Policy Risks—changes in energy policy, tariffs, and renewable energy incentives may impact investor confidence and project feasibility, especially if renewable energy incentives are reduced or if there are delays in implementing supportive regulations.

2. Financial Risks: Significant capital expenditure is needed for large-scale infrastructure, and Uzbekistan's dependency on foreign investments poses risks tied to exchange rates, financing availability, and economic stability. Delays or changes in financing terms could hinder project timelines.

3. Technical and Data Uncertainty—inaccuracies in demand forecasts or renewable potential data (e.g., wind and solar profiles) can lead to suboptimal project sizing and scheduling, impacting long-term energy security and system reliability.

4. Environmental and Social Risks—projects in ecologically or culturally sensitive areas may face opposition, leading to delays in obtaining environmental clearances or social acceptance, particularly if stakeholder engagement is insufficient.

c. Risks During Project Realization

1. Grid Integration Challenges: High renewable penetration (e.g., wind and solar) risks grid instability, particularly in regions with weak infrastructure. Voltage and frequency management issues may arise due to the variability of renewable energy sources.

2. Infrastructure Development Delays: Building the required substations, overhead lines, and storage systems (e.g., BESS) within planned timeframes may face logistical delays or cost overruns, especially in remote or challenging areas.

3. Supply Chain and Technology Risks: Reliance on advanced technology (e.g., smart grid, automation, and energy storage) entails risks if supply chains are disrupted or if there is insufficient technical expertise for proper installation and maintenance.

4. Operational and Maintenance Risks: As modern technologies are integrated, there are risks associated with higher maintenance requirements and the need for

specialized technical skills for continuous operation, particularly for wind farms and solar clusters.

Addressing these risks proactively would likely involve coordinated regulatory support, robust financial planning, and careful project phasing to ensure sustainable, timely, and secure energy project implementation in Uzbekistan.

Obviously, even well planned, peculiarly assessed projects intrinsically contain a high-risk rate, especially when it comes to a wide spanned undertakings as the ones described above with significant numbers of variables.

Water distribution system development will also meet the similar obstacles between regulatory challenges and potential lack of sustainable financing.

VI. Possible Solutions

a. Solutions observations

To support Uzbekistan's energy transition effectively, it's crucial to lay a strong foundation through **steady regulations, supportive financing, technical upgrades, and local workforce development**. Uzbekistan's energy sector, heavily reliant on natural gas and coal, is setting ambitious targets to expand renewables, particularly solar and wind. Achieving these goals requires a comprehensive approach to each of the abovementioned frameworks.

Nowadays the attraction of foreign specialists in Uzbekistan, unfortunately, is limited to invitation of technical experts only. At the same time, international experience shows that support of financial and operative consultants with profound experience may provide more consistent results. **So, this is the first observation**.

The second general observation is to keep the volume and timing of massive projects under control. It is important to Implement wise project management and to start them with reliable environmental study. While many of the projects are proposed and initiated by local entities, during last years it becomes almost tangible the lack of control of construction projects in the capital. The city has become a huge construction site as reported by 57% of interviewed people with negative consequences on air quality. In fact, around 36% (the highest fraction) of air pollution in Tashkent is caused by the wind-blown dust, contributed by unmanaged construction sites[20].

[20] (Air Quality Assessment for Tashkent and the Roadmap for Air Quality Management Improvement in Uzbekistan, 2024)

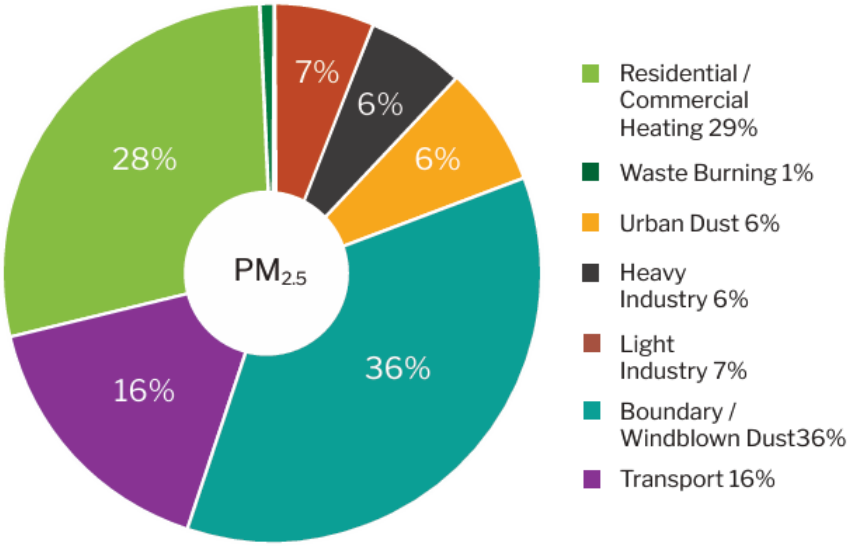


Figure 17. Source contributions to annual average PM2.5 concentrations in Tashkent

This quantity is in constant growth from 2018, when the quantity of construction projects has started its' boom. Professionally managed control and environmental studies before implementation of the projects could favourably influence this issue, based on the urban planning and infrastructure design[21].

All further observations are already included in provided above researches, but here I'm to introduce a wider considerations, based on the findings and risks discovered.

b. Ensuring Regulatory and Financial Stability

One of the main obstacles in attracting investment for large-scale renewable projects is regulatory uncertainty. For investors, the security of their funds is as important as the profitability of the project itself. In Uzbekistan, establishing long-term policies with fixed tariffs and transparent tax incentives specific to renewable energy could make a significant difference. These policies should be clear and remain consistent over the lifespan of energy projects to provide a stable environment where investors feel their assets are safeguarded. Stable policies are especially valuable in attracting international funds, as they reduce the perceived risks associated with political or economic fluctuations.

In addition to regulatory stability, financial support for renewable projects is essential. Renewable energy projects, particularly those utilizing recent technologies like solar PV and wind power, are often capital-intensive. Given the scale of investment required, Uzbekistan could benefit from collaborating with international development banks and other financial institutions that specialize in infrastructure financing. These institutions not only provide capital but also lend credibility to projects, making them more attractive to private investors. Multi-lateral partnerships could help buffer against currency risks and global market fluctuations, which are always concerns when dealing with large

[21] (Poggi, Amado, & Amado, 2016)

infrastructure projects. Furthermore, financing options tailored to Uzbekistan's economic environment—such as loans with flexible interest rates or currency protections—would align better with long-term infrastructure investments, ensuring projects can continue without financial disruptions. A strategic approach to project financing that includes a mix of grants, low-interest loans, and private investments would set Uzbekistan on a path toward financial sustainability in the energy sector.

c. Leveraging Advanced Forecasting and Technical Solutions

Accurate demand forecasting is critical for any successful energy project, especially when integrating renewables, which are inherently variable. The fluctuating nature of resources like wind and sunlight demands a precise understanding of both short-term and long-term electricity demand. By investing in advanced data assessment tools and forecasting models, Uzbekistan could improve its ability to predict energy needs and renewable generation potential. For instance, state-of-the-art software can analyse historical and real-time data, providing insights into demand spikes, seasonal trends, and even daily fluctuations. Accurate forecasting will enable planners to make better-informed decisions on project timelines, required generation capacity, and necessary grid upgrades.

Flexible project planning is another component that can save both time and resources in the long run. Renewable energy projects should incorporate flexibility into their designs, allowing adjustments based on emerging data or changing conditions. As projects progress and more data becomes available, this flexibility could prevent costly delays or the need for significant design modifications. For instance, if demand projections increase or decrease unexpectedly, or if renewable potential is higher or lower than initially estimated, having a flexible plan allows for seamless adjustments, optimizing resource allocation and maintaining project efficiency.

d. Engaging Local Communities to Address Environmental and Social Impacts

The social and environmental aspects of renewable projects should not be overlooked. For renewable projects to succeed, especially in areas where local communities may be directly impacted, it's essential to engage these communities from the outset. Transparent and frequent communication about the potential benefits, such as job creation, local economic growth, and environmental improvements, can foster positive relationships between developers and communities. Early involvement also helps developers gain insights into local concerns, reducing the risk of opposition that could delay or even derail projects.

Furthermore, conducting environmental impact assessments early in the project planning phase allows developers to identify any ecological or cultural issues. By being proactive in assessing these factors, project teams can make necessary adjustments to design or location before substantial investments are made. This might involve modifying the layout of a wind farm to avoid sensitive wildlife areas or relocating a solar

project to less ecologically vulnerable land. Addressing these factors early ensures that projects align with sustainable development goals and reduce the risk of environmental backlash or legal obstacles.

e. Modernizing Grid Infrastructure for Stability

As renewable energy resources are introduced, Uzbekistan's power grid will need to evolve to handle these new energy sources effectively. Wind and solar power, for example, are intermittent by nature—solar generation fluctuates based on sunlight, while wind generation depends on weather conditions. To handle these fluctuations, grid operators need to modernize their infrastructure. Smart grid systems, equipped with real-time data monitoring, allow operators to react quickly to changes in power supply and demand, balancing the grid more efficiently. Such systems could provide Uzbekistan with the technological edge needed to integrate renewables while ensuring a stable power supply.

Additionally, energy storage systems (ESS) could play a vital role in Uzbekistan's energy transition. By storing excess energy generated during periods of high production, ESS allows the grid to release this stored power during periods of low production or high demand, stabilizing the energy supply. In practical terms, this means that when the sun is shining or the wind is blowing strong, excess energy can be stored and then used later when production drops, such as during nighttime or periods of calm weather. Investing in ESS, especially in conjunction with renewable projects, will make Uzbekistan's grid more resilient, reduce dependence on fossil fuels, and allow for a smoother transition to a renewable-based energy system.

f. Building Local Expertise and Creating Jobs

A robust local workforce is crucial to maintaining and operating the new energy systems effectively. Uzbekistan can take steps to build local expertise by creating specialized training programs in collaboration with international experts or organizations experienced in renewable technology. For example, training programs focusing on solar panel installation, wind turbine maintenance, and grid management could equip local workers with the skills needed to support the country's energy projects.

Moreover, establishing apprenticeships and on-the-job training programs could open career paths for young engineers and technicians, ensuring a pipeline of skilled workers for the future. This approach not only enhances project sustainability but also generates economic benefits by creating jobs and retaining expertise within the country. By fostering a local workforce skilled in renewable energy, Uzbekistan will be better equipped to manage, expand, and maintain its energy infrastructure in the years to come, ultimately reducing dependency on foreign expertise and creating a self-sufficient energy industry.

g. Public-Private Partnership

Integrating the PPPs for realization of the infrastructure projects can help leveraging the financial and expertise of the private sector to benefit public programs in the sector. In fact, Uzbekistan have started to collaborate with private sector in small projects, but there is a huge work to do still. It is needed to improve the legislative groundings,

VII. Research Limitations

In conducting this research on infrastructure projects in Uzbekistan, several limitations have been identified that could impact the comprehensiveness and applicability of the findings. These limitations span various aspects of the research process, including scope, data availability, methodological constraints, economic fluctuations, cultural and social considerations, and time constraints. Acknowledging these limitations is crucial for interpreting the findings accurately and understanding the broader context within which this research was conducted.

One of the primary limitations is the scope and focus of the study. While the research aims to provide an overview of the opportunities and risks associated with Uzbekistan's 2030 Strategy, it inevitably excludes certain aspects due to the vastness of the topic. The selective focus means that some relevant areas might not be covered in as much detail as others. For instance, while the study delves deeply into energy infrastructure, it may not fully explore other critical sectors. This selective approach is necessary to maintain a manageable scope but also means that the findings may not be entirely comprehensive. To be clearer, **we have omitted deeper research on gas infrastructure, transportation infrastructure and all types of infrastructure related to the New Tashkent City project**.

Data availability and reliability present another significant challenge, especially when it comes to emerging economies. Accessing up-to-date and accurate data in Uzbekistan is difficult, and there are gaps in the available information. This limitation is particularly pertinent when dealing with economic and infrastructural statistics, which are crucial for a thorough analysis. The reliability of the data used can also vary, potentially affecting the accuracy of the conclusions drawn. For example, some data might be based on estimates rather than precise measurements, leading to potential inaccuracies in the analysis. Additionally, the lack of transparency in some reports and the limited availability of independent verification sources further complicate the data reliability issue.

Methodological constraints are inherent in any research project, and my study is no exception. The combination of qualitative and quantitative methods used has its own set of limitations. Qualitative methods, while providing depth and context, may lack the generalizability of quantitative approaches. Conversely, quantitative methods, though

useful for identifying patterns and trends, may not fully capture the nuanced realities on the ground. For instance, while statistical data can show trends in infrastructure development, it may not fully convey the social and cultural impacts of these projects on local communities. The reliance on case studies and interviews also introduces a degree of subjectivity, as the perspectives of the interviewees may not represent the broader population.

Geopolitical factors also play a role in shaping research outcomes. Uzbekistan's position in Central Asia means that regional stability and international relations can significantly influence infrastructure projects. These geopolitical dynamics are complex and can change rapidly, making it challenging to account for all possible scenarios in the research. For example, tensions with neighbouring countries or shifts in regional alliances (as addressing to BRICS) could impact the feasibility and success of cross-border infrastructure projects. The geopolitical landscape also affects foreign investment, as investors may be wary of committing to projects in regions with perceived instability.

Economic fluctuations and market volatility are additional factors that could impact on the findings. The economic environment in Uzbekistan, like in many developing countries, is subject to rapid changes. These fluctuations can affect the feasibility and sustainability of infrastructure projects, and any predictions made in the research are contingent on current economic conditions remaining relatively stable. For instance, a sudden economic downturn or a significant shift in global commodity prices could alter the financial viability of planned projects. The **reliance on foreign investment** also introduces vulnerability to global economic trends, which can be unpredictable.

Technological changes represent another area of uncertainty. The rapid pace of technological advancement means that the infrastructure solutions proposed today might become obsolete in the near future. This limitation underscores the need for flexible and adaptive planning in infrastructure development. For example, advancements in renewable energy technologies could render current plans for traditional energy infrastructure less relevant. Similarly, innovations in construction techniques or materials could change the cost and feasibility of large-scale projects. The challenge lies in anticipating these changes and incorporating flexibility into project designs and strategies.

Policy changes during the research period can also affect the results. Government policies and regulations are critical to the success of infrastructure projects, and any changes in these areas can have significant implications. The evolving nature of Uzbekistan's regulatory environment adds a layer of complexity to the research. New policies aimed at encouraging foreign investment or promoting sustainable development could alter the landscape for infrastructure projects. Conversely, regulatory hurdles or bureaucratic inefficiencies could delay project implementation

and increase costs. The dynamic policy environment requires continuous monitoring and adaptation, which can be challenging within the fixed timeframe of a research project.

Cultural and social factors are important considerations that might limit the generalizability of the findings. Uzbekistan's unique cultural and social context means that solutions effective in other regions might not be directly applicable. Understanding and integrating these local nuances is crucial.

Time constraints have inevitably limited the depth of the research. The need to complete the study within a specific timeframe means that some areas might not have been explored as thoroughly as desired. This limitation highlights the importance of ongoing research and continuous monitoring of infrastructure projects.

An additional point to consider is that at least 30% of the information presented in this thesis comes from my personal experience and interviews with key individuals involved in Uzbekistan's infrastructure sectors. These interviews provided invaluable insights and firsthand accounts that are not always available in official sources. While this enriches the research with practical perspectives and real data, it also means that some information is not referenced. This reliance on personal experience and interviews introduces a degree of subjectivity and may limit the ability to verify certain claims independently.

Finally, the research identifies several areas for future study. Addressing the limitations mentioned above requires further investigation and more detailed analysis. Future research could focus on specific sectors or regions within Uzbekistan, providing a more granular understanding of the opportunities and risks associated with infrastructure development. In-depth studies on the impact of infrastructure projects on rural communities or the effectiveness of public-private partnerships in the Uzbek context could provide valuable data. Additionally, longitudinal studies tracking the progress and outcomes of major infrastructure projects over time would help in understanding their long-term impacts and sustainability.

In summary, while this research provides insights into the infrastructure projects in Uzbekistan in the context of the 2030 Strategy, it is essential to acknowledge these limitations. Recognizing these constraints helps in interpreting underscores the need for continued research and adaptive strategies in the dynamic context of Uzbekistan's development. By addressing these limitations and building on the current research, future studies can contribute to a more comprehensive and nuanced understanding of the challenges and opportunities in Uzbekistan's infrastructure development.

VIII. Conclusions

This thesis has surfaced the multifaceted landscape of infrastructure projects in Uzbekistan, focusing on the opportunities and risks associated with the nation's ambitious 2030 Strategy. Through an analysis, the study has highlighted the critical role that infrastructure development plays in fostering economic growth, enhancing regional connectivity, and improving the quality of life for Uzbekistan's citizens.

The economic review provided an overview of Uzbekistan's current economic status, emphasizing the country's strategic position in Central Asia and its potential as a hub for trade and investment. It was shown the importance of modernizing infrastructure to support economic diversification and sustainable development. The 2030 Strategy, with its clear objectives and targeted initiatives, represents a bold vision for the future, aiming to transform Uzbekistan into a more prosperous and resilient nation.

The examination of specific infrastructure projects revealed the breadth and depth of ongoing and planned initiatives across various sectors, including energy, water distribution and urban development. These projects are designed to address critical needs, such as improving domestic and international connectivity, enhancing energy security, and creating modern urban spaces. The Tashkent-Samarkand high-speed railway and the development of renewable energy sources are prime examples of how infrastructure projects can drive economic integration and environmental sustainability. However, the research also identified several risks and constraints that could hinder the successful implementation of these projects. Financial sustainability, regulatory challenges, and geopolitical factors emerged as significant concerns. Ensuring that infrastructure projects are financially viable in the long term requires careful planning and the establishment of sustainable funding mechanisms. Navigating the evolving regulatory environment and addressing bureaucratic inefficiencies are also crucial for attracting and retaining investment. Additionally, the geopolitical landscape in Central Asia can impact the feasibility and success of cross-border projects, necessitating a strategic approach to regional cooperation and stability.

The study proposed a vision on the solutions to mitigate these risks and maximize the benefits of infrastructure development. These include fostering public-private partnerships, leveraging international best practices, and enhancing stakeholder engagement. By adopting a strategic and holistic approach, Uzbekistan can navigate the challenges and realize the full potential of its 2030 Strategy. The importance of sustainability was emphasized throughout the analysis, highlighting the need for environmentally friendly and socially inclusive infrastructure projects.

The research limitations section acknowledged the constraints faced during the study, including data availability, methodological challenges, and the dynamic nature of the

geopolitical and economic environment. Recognizing these limitations is essential for interpreting the findings accurately and underscores the need for continued research and adaptive strategies.

The relationship between the Uzbekistan 2030 Strategy, infrastructure projects, risks, and viable solutions is central to this thesis. The 2030 Strategy sets the overarching goals and vision for the country's development, emphasizing the need for robust infrastructure as a foundation for economic growth and social progress. Infrastructure projects are the tangible manifestations of this strategy, translating high-level objectives into concrete actions and developments. However, these projects are not without risks, which include financial, regulatory, and geopolitical challenges. The proposed solutions in this thesis aim to address these risks by recommending strategic planning, stakeholder engagement, and the adoption of best practices to ensure the successful implementation of infrastructure projects.

In summary, Uzbekistan's ambitious infrastructure development agenda presents both significant opportunities and formidable challenges. The 2030 Strategy provides a comprehensive framework for achieving sustainable growth and regional integration. By addressing the identified risks and leveraging the proposed solutions, Uzbekistan can build a modern, resilient, and inclusive infrastructure network that supports its long-term development goals. The findings of this research underscore the transformative potential of infrastructure projects in driving economic and social progress. As Uzbekistan continues to implement its 2030 Strategy, ongoing monitoring and evaluation will be crucial to ensure that the projects remain aligned with the strategic objectives and adapt to changing circumstances.

Acknowledgements

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A special acknowledgment goes to the individuals in Uzbekistan who generously shared their time and insights with me. At least 30% of the information presented in this thesis comes from my personal experience and interviews with key individuals involved in Uzbekistan's infrastructure sectors. Their firsthand accounts and practical perspectives have enriched this research and provided a deeper understanding of the subject matter.

To my family—my Father Anvar, who directed me always in life and advised to enter the Politecnico di Torino, my Mother Rosalia, who among other unvaluable things supported me by providing essential data regarding Uzbekistan legislation, and to my Wife Olga—who provided me with analytical and emotional support. Your belief in me and unwavering encouragement has been a constant source of strength, and I am deeply thankful for your patience and understanding during this demanding period.

Appendix

Contents of the Uzbekistan 2030 Strategy – only the part reviewed in thesis:

II. ENSURING THE WELL-BEING OF THE POPULATION THROUGH SUSTAINABLE ECONOMIC GROWTH	
To double the volume of the economy by 2030 and entry into a number of countries with above-average incomes.	Bringing GDP to **$160 billion** and per capita income **to $4,000**.
	Provision of energy, water, and infrastructure resources at the level necessary for macroeconomic stability and economic development.
	Ensure an annual inflation rate of 5-6% **by 2030** by continuing the implementation of structural reforms aimed at the mutual coordination of foreign monetary, fiscal and trade policies, as well as the improvement of the competitive environment in the market for goods and services.
	Consistently pursue **the transformation and institutional reforms of the economy,** ensuring **a favourable investment and business climate** in the country**, as well as the implementation of a balanced monetary policy.**
	Implement **a medium-term public debt management strategy** to ensure that public debt does not exceed **50%** of GDP.
	This ensures an average increase of 7 percent in the volume of annual investments in fixed assets.
Ensure fiscal stability and the effective management of public obligations.	Ensure that the **consolidated budget deficit** remains below **4% in** 2024 compared to GDP and **3%** thereafter.
	Shift to the practice **of "results-oriented budgeting".**
	Take advantage of the opportunity to further broaden the tax base by reducing **the "shadow economy".**
	Further improve the efficiency of the tax administration system by improving efficiency and expanding the labelling and digitalization system**.**
	Classification of projects implemented on the basis of a public-private partnership, taking into account **their profitability and the** burden on the State budget, as well as the introduction of a management system in the project areas.
Effective use of local raw material base and development of industry based on advanced technologies.	Bringing the share of industrial technology products **from 25% to 32%.**
	2-fold increase in labour productivity in the processing industry.
	An increase in copper production needed to obtain highly profitable products **by 3.5 times**, **gold by 1.5 times**, **silver by 3 times** and **uranium by 3 times**.

	Widespread introduction of advanced international standards **in the evaluation of field reserves**.
	Creation of large chemical and polymer clusters **in the regions of Karakalpakistan, Bukhara, Navoi, Tashkent and Fergana** and involvement of companies for the production of high value-added finished products.
	Create a competitive environment in the automotive industry and increase production to **1 million cars**.
	Increase **copper processing in** the electrical industry by **300 thousand tons** and attract **$1.5 billion** in investment to localize the production of all household appliances.
	Introduction of an industrial mortgage system, which provides mechanisms to provide entrepreneurs with **buildings in the form of "ready-made business".**
	Establishment of **the activities of higher engineering schools** in sectors such as mining and metallurgy, chemical, textile, electrical, organization of their own **vocational training centres in large companies**.
	Organization of **8 research and production districts** in the fields of metalworking, mechanics and electronics, transport and logistics, agricultural yields.
	Establishment **of 'research and development' (R&D) centres** in areas such as electrical engineering, mechanical engineering, textiles, chemical industry, building materials industry, metalworking, geology, energy, biotechnology, food processing, transport, and logistics.
Development of "lead" industries and full use of the industrial potential of the regions.	Bringing the volume of value added in industry to **$45 billion** and creating **2.5 million high-income jobs**.
	Production of import substitutes **by** large companies **and extension of cooperation links** with local companies, introduction of a system of active incentives for companies that have established industrial cooperation.
	Creation of modern technological industrial zones **in every neighbourhood**.
	Geological exploration works **on 60 thousand square meters** of area in the republic.
	Bringing the level of **yarn processing** in the textile industry **to 100 percent**, establishing the production **of 400 thousand tons of artificial and blended fibres** to meet the demand for high-quality fabrics.
	Increase the production of building materials **by 2 times** and expand the production of new types of **energy-saving materials**.

	Coverage of the pharmaceutical industry's pharmaceutical needs **by 70%** at the expense of domestic manufacturers.
	A **5-fold** increase in added value thanks to the attraction of over 30 prestigious foreign brands **in the leather and footwear sector.**
	A 3-fold **increase in** the production volume of **furniture products**.
Further increase in the country's investment attractiveness and accelerated development of the securities market.	Disbursement of **$250 billion** of investment in the country, in particular, which attracted **$110 billion** of foreign investment and **$30** billion of investment within the framework of public-private partnerships.
	Bringing the volume of the free float securities market to **$8 billion**.
	Implementation of more than **500** technology and infrastructure projects of strategic importance for a total value of **150 billion dollars**.
	Maintain **an investment rating of the** regions, further increasing **the attractiveness of each territory** to investors based on their capabilities.
	Increase **the volume of portfolio investments by** 2 times by establishing **mutual fund and risk fund assets.**
	Inclusion of shares **of 40 state-owned companies in** the **"Hulk IPO",** introduction of mechanisms to stimulate the population to participate in the IPO.
	Creation of an infrastructure for the participation **of foreign nominated depositors** and **custodian banks** in the local capital market.
	Create the possibility **of uninterrupted access to the necessary infrastructure** in all economic zones (roads, water and sewage networks, electricity).
Acceleration of reforms of the banking system, increase in the volume of the banking services market and development of competition in the sector.	Bringing the annual volume of loans in the banking and financial system **to $40 billion**, increasing the volume of bank deposits **by 4 times**.
	Privatization of the banks and maintenance of **3-4** banks at the disposal of the State, attraction of at least **4** large foreign banks authoritative on the banking market.
	Improvement of rules and control bases through the introduction **of internationally recognized minimum standards and requirements** in banks.
	Introduction of **criteria and procedures for Islamic financing** in at least **3** commercial banks, formation of the legislative framework for Islamic finance.
	Introduction of mechanisms for **suspending the accrual of interest and** penalties imposed on loans on the basis of claims submitted to court.

Transition to a green economy, a radical increase in the use of renewable energy as a basis.	Bringing renewable energy sources to **25 thousand** megawatts and a share of total consumption of up to **40 percent**.
	Development of the market **for "green certificates"** in industry and introduction of the practice **of "eco-labelling".**
	Reduction of natural gas consumption through the modernization **of 3 thermoelectric plants** with a capacity of 3 GW.
	Introduction of a system for the **evaluation of the energy efficiency (energy audit)** of apartments in multi-storey buildings.
	Conversion of urban public transport **into environmentally friendly fuel**.
	Establishment of a monitoring system for **all greenhouse gases** in the field of climate change (MRV).
	Reduce greenhouse gases per unit of GDP by **30%** compared to **the 2010** level.
Uninterrupted supply to sectors of the economy and the population of the necessary energy resources.	To increase the volume of electricity supply for the sectors of the economy and the needs of the population to **120 billion** kW.
	Bringing the volume of natural gas production to **62 billion** cubic meters.
	2-fold increase in the energy efficiency of economic sectors.
	Creation of an independent regulator to rationalize the energy market, separation **of functions for the purchase, sale, and supply of electricity.**
	Modernization of infrastructure for the distribution, generation and supply of electricity and natural gas to consumers.
	Attract foreign investors to geological exploration aimed at increasing **hydrocarbon reserves.**
	Complete digitization of the accounting of **all types of energy resources**.
	Achieve sustainable operation of Uzbekistan's energy system **with the energy systems of neighbouring states**.
Deepen the integration of the Republic of Uzbekistan into the global transport and logistics networks and increase the potential of the national transport system.	Bringing the volume of transport of goods in transit through the territory of the republic to **16 million tons**.
	40% reduction **in freight transport times northbound by rail**.
	Increase in the volume of passenger and freight services by **3 times**.
	Bringing the share of electrified railways to **65%.**
	Increased the number of flights by **4 times**.
	Construction and repair **of 56 thousand kilometres** of roads.
	Transition to market principles in the formation of tariffs for passenger and freight transport services by rail and air, as well as in attracting private and foreign operators to the field.

	Construction of a total of **5.5 thousand kilometres of roads with concrete pavement**, ranging from neighbourhood centres to rural settlements.
	Construction of **new roads** along the "Tashkent – Samarkand" and "Tashkent – Fergana Valley" routes on the basis of a public-private partnership.
	Complete coverage of cities and neighbourhoods by public transport, bringing the number of new buses to 5 thousand and **electric ones to 2 thousand**.
	The construction of new high-speed railways in the "Tashkent - Samarkand", "Samarkand - Navoi - Bukhara" directions, increases the number of passengers carried on high-speed trains by 2.5 times.
	Modernization of low-margin regional airports **on the basis of public-private partnerships** and their transfer to trust management.
	Modernization of **6** major airports in the republic, also on the basis of a public-private partnership, and bringing the number of private airlines to 10.
	Introduction **of the "Open Skies" mode** with strategic partners at all airports, bringing the republic's fleet to **100.**
A sharp increase in the level of yields and profitability in agriculture.	Bringing the average income per hectare to **5 thousand** dollars.
	Bringing the volume of exports in the field of agriculture **to 10 billion dollars** per year.
	Attracting only $15 billion **in investment** in the agricultural sector.
	Bringing the average yield of cotton to **45-50 quintals**, wheat to **80-85 quintals**.
	Development of an additional **300 thousand hectares of surface** through the use of water-saving technologies and the sowing of **fodder, medicinal, oil, leguminous crops, rice, wheat, vegetables, melons and pumpkins, creation** of intensive orchards and vineyards **on these lands.**
	Bringing the supply of local seeds of vegetables, melons, potatoes **to 50 percent**.
	Ensure the processing rate of **agricultural products at a level of more than 25%.**
	Organization of **100** new agriculture logistics centres with a capacity of **2.5 million tons** in the territories of the republic and bringing their export potential to **$1 billion**.
	Introduction of a mechanism for **pledging the right to rent land as** part of the reform of land relations.
	Maintenance **of a register of nursery companies** and introduction of a **certification system** for seedlings.

	Organization of centres in each district to promote the introduction of science and innovation, novel approaches in the agricultural sector and the implementation of modern **agrotechnical measures.**
	Provision of all subsidies to dekhkan (farmers), as well as clusters through a single **"Agrosubsidy"** platform based on **the principle of "walking distance" (very quick and convenient).**
	Reform the insurance system for agricultural and livestock products, create a separate insurance fund and attract **$100 million to this fund**, introducing a system **of subsidies of 50%** of the insurance remuneration to farmers and farmers.
	Strengthen **the forage base** in the field of animal husbandry, ensuring the effective use of pastureland.
	Creation **of 105 thousand hectares of new mulberry plantations based on the cluster system** in the field of silkworm breeding and the creation **of over 1 million** new jobs.
Strengthening the export potential of the national economy and a radical increase in the share of high value-added products in its composition.	Increasing the volume of exports **by 2 times** and bringing it to **45 billion** dollars, bringing the number of exporting companies from **6.5 thousand to 15 thousand**.
	A 3.3-fold **increase in the volume of exports of finished and semi-finished products**, and an expansion of exports of finished and technological products to European countries under **GSP+ and other systems**.
	Increase the number of companies **that have implemented international standards** by 10 times and bring them to **5 thousand**.
	Creation **of special economic zones** together with **50** prestigious brands from around the world.
	Full support for exporters promoting domestic brands in foreign markets based on the idea **that "New Uzbekistan is a country of competitive products".**
Consistent transfer of monopoly spheres to market principles, increasing the share of the private sector in the economy, creating the most favourable conditions for the free activity of entrepreneurs.	Bringing the share of the non-state sector in the economy to **85 percent**, reducing the number of **2.3 thousand** companies with state share by 6 times.
	The abolition of **17 types of state monopoly** in the republic, the broad involvement of the private sector in these sectors, the preservation of the **main energy and transport networks,** areas related **to the management and security of the state**.
	Transfer to the private sector of services for **rail transport, construction and management of roads, gas, and electricity supply**.
	Widespread introduction of private partnership mechanisms in areas of state monopoly such as **irrigation, waste treatment,**

	management of the energy and heat supply system at social facilities.
	Expand the practice of providing domestic trading entities with **strategic mineral deposits**, increasing **by 4 times** the number of permits granted **to deposits for the extraction of gold, silver, non-ferrous metals, tungsten, coal and non-metallic minerals.**
	In order to ensure the stability of the tax system, we guarantee that **companies will not increase** their value-added and profit tax rates for three years.
	Full digitalization, **simplification of the tax system** and creation of equal opportunities for all entrepreneurs, providing all the necessary conditions for the official sector to become preferable and profitable over illegal activities.
	Expanding opportunities for the promotion of small and medium-sized enterprises **on international markets**, developing **microfinance**, supporting innovations and startups, as well as introducing new tools for the development of cooperation with large companies.
	Transition from simple **"manual labour" to the industrial production phase** to guarantee employment on the basis of family entrepreneurship, increasing **the size of a subsidized loan for the purchase of equipment** to 100 million sums.
	Average 3-fold reduction in service time and provision of **all services to business entities** based on the **"one-stop-shop"** principle through the online portal.
Transformation of the country into a regional "IT-HUB" through the development of digital technologies.	Full coverage of all agreements with the Internet and a **10-fold** increase in its speed, bringing the speed of international Internet connection to **5,000 Gbit/s**, bringing the coverage of fibre optic communication lines and broadband data transmission networks to **100 percent**.
	Bringing the export volume of IT services and software products to **$5 billion**.
	To enter **the top 30** of the United Nations e-Government rating.
	Increase the number of IT Park residents by 10 times, bringing the share of the volume of services they provide in GDP to **2.2%** and the number of jobs created in them to **100 thousand**.
	To increase the number of representative offices of foreign companies **to 1.000** through the creation of an International Centre for Digital Technologies for Foreign Companies in the IT Park.
	Development of the first startup project (Unicorn) to capitalize the domestic market for **$1 billion** by supporting startup projects through the IT park acceleration (development) program.

	Launch of **300** priority projects under the **Digital Government** Program, coverage of the city of Tashkent, the Republic of Karakalpakistan and regional centres with fifth-generation communication networks.
	Complete supply of highways of international importance **with mobile Internet**.
Increase the number of tourists by creating ample conditions for the development of foreign and domestic tourism in Uzbekistan.	This brings the number of foreign tourists to **15 million**, domestic tourists to **25 million** and pilgrimage tourists to **3 million**.
	Creation of 30 large tourist clusters **in the republic**, at least **2-fold increase** in the number of places for guests, construction **of 25** cable cars in mountainous areas, bringing the number of tourist mahallas to **175**.
	Bringing the export of tourism services to **5 billion dollars**, medical and educational tourism to **1.5 billion dollars per year**.
	Introduction of the **"Tax free" system in all international airports** for the products of foreign tourists purchased and registered in the republic.
	The development of the national program **"Pearls of ancient history"** and the restoration of cultural heritage sites within its framework, the creation of **"open-air museums" on the territory of monuments**.
	Further incentive for the creation of companies that provide intercity bus routes on a national scale.
	Creation of more than **1,000** electric charging stations, refreshment and recreation points, trade, and services.
Accelerated development of the service sector in the regions.	Increase the volume of services by **3 times** through the development of service sectors in the regions.
	Development in medium and large cities, as well as in areas with a population of **more than 300 thousand modern markets for services, IT, educational, medical, legal, services in the field of art, tourism, hotel, catering and transport.**
	Development of **commercial, domestic, park and entertainment services** through the auctioning of **233 thousand empty plots of land** on busy roads with the availability of the necessary infrastructure based on urban development projects.
	Creation of **36 thousand commercial and service structures** by organizing central roads in the centres of medium and large cities, **specialized in the provision of services**.
	Construction of 6,000 commercial and service facilities **on the New Uzbekistan massifs and along international highways**.

	It attracts leading design organizations, transforming **markets into modern, cost-effective commercial complexes** that meet all safety requirements.
Integrated development of regions, implementation of the urbanization strategy, increasing the level of provision of affordable housing to the population.	Adopt measures to bring the level of urbanization from **51% to 60%,** transform the cities of Samarkand and Namangan into **"cities of over a million",** bring the number of cities and districts with a population of over **300 thousand** to 28, develop master plans for all settlements.
	Construction of residential buildings for **1 million apartments in the regions, bringing** the number of new districts in Uzbekistan **to 100,** the construction of additional housing for **200 thousand** families, the construction of social housing in the republic for at least **140 thousand families.**
	Introduction of the practice of developing master plans and master plans for districts (cities) divided into **3 categories** (renovation, reconstruction and conservation) in a simplified way, as well as **taking into account the proposals of the population and entrepreneurs**.
	In order to renovate end-of-life areas and dilapidated dwellings, the development **of renovation programs** based on the opinion of the general public, the construction of multi-storey buildings in densely populated areas based on the principle **of "growth development".**
	Implementation of the construction of **engineering, communication, and social infrastructures** on the ground, taking into account **the long-term socio-economic and demographic development of the** territory.
	Introduction of new developed country standards based on **safety standards for the construction of buildings and structures**.
	Extensive involvement of the private sector in the system **of evaluation, verification and acceptance of installation works** during construction.
	Revision of the **training system for mid-level specialists** in construction, training **of 20 thousand** professional craftsmen per year.
	Formation of **a legislative framework governing the** construction of condominiums and other real estate on a shared basis.
Provide infrastructure projects with stable, long-term sources of financing.	Establishment of the Fund for the Development of Public-Private Partnership Projects in Uzbekistan **in cooperation with international financial institutions.**
	Establishment of the practice of issuing **"infrastructure bonds".**
	Introduction of financial mechanisms to ensure the supply of clean drinking water and sewage services to all settlements.

	Equip the laboratories of water supply companies with modern laboratory equipment and reagents for monitoring the quality of drinking water.
	Ensure the establishment of local treatment plants in remote areas that do not have a centralized sewage system.
III. WATER CONSERVATION AND ENVIRONMENTAL PROTECTION	
3.1. Reforms to save water resources	
To improve the culture of rational use of water and the efficiency of water consumption in the republic.	Increase water use **efficiency by 25%,** bringing the total area of land covered by water-saving technologies for crop irrigation **to 2 million hectares**, including drip irrigation technologies, **up to 600 thousand hectares**.
	Bring the efficiency of the irrigation system and irrigation networks **to 0.73** as part **of a seven-year program** for the transfer of concrete earth channels and internal irrigation networks to closed-pipe irrigation systems.
	Development of a long-term balance **of** the republic's water resources and introduction of a system to establish permanent **monitoring**.
	Involvement **of the private sector** in the water treatment, supply and distribution system, transfer of water supply systems to the fields to the management **of entrepreneurs** (farms and clusters).
	Continuation of active and mutually beneficial bilateral cooperation **with neighbouring states** in the areas of integrated water management, mutual use of transboundary water resources and **inter-state water installations**.
	To bring **the annual capacity of national companies** for the production of water-saving technologies to **300 thousand hectares**.
	Ensure the installation of meters for all drinking water users.
	Introduction of indicators of drinking water quality, drinking water supply level, water supply efficiency and sewage companies.
Ensuring a rational use of water in the agricultural sector.	Bringing the share of concrete pavements **to 18.7 thousand kilometres,** equal **to 66 percent** of the main and interagricultural canals with an overland canal**, to 13.1 thousand kilometres,** equal **to 46 percent**.
	Reduction of saline areas **to 1.7 million hectares** on irrigated land following the construction and reconstruction of reclamation plants.
	Modernization of the irrigation system and increase in the share of canals with concrete coverage **to 46%** or **13.2 thousand kilometres**.
	Reduction of irrigated areas with a strong and medium salinity level to **430.0 thousand hectares**, land areas with a problematic groundwater status - to **773.4 thousand hectares**.

Development of irrigation systems and technologies for water saving diffusion of the private sector and public-private partnership mechanisms in the management sector.	Implementation of an automated control system **in at least** 100 **large water plants**.
	Expansion of the volume of the **Tuyamuyinsky reservoir** by an additional **billion cubic meters**, improvement of the water supply by **1.2 million hectares and** creation of a drinking water supply.
	Increasing the **flow of private investment** in the irrigation sector by attracting **the private sector**, widespread introduction of **public-private partnership mechanisms**.
Reduction of electricity consumption by pumping stations as part of the widespread introduction of green energy technologies.	Replacement of **1,069** worn pumps and **1,079** electric motors at pumping stations with energy-saving motors.
	Installation of energy-saving devices, modernization of pumping stations, reduction of annual electricity consumption by **30%.**
	Conversion of pumping stations to alternative energy **through the widespread introduction of modern technologies** that save electricity and other resources.
3.2. Environmental reforms	
Cardinal improvement of the environmental situation in the republic, elimination of environmental problems affecting human life.	Installation and modernization of existing high-performance **dust and gas purification equipment and local water treatment plants**, introduction of **an environmentally clean territorial regime** in 14 regions.
	When drawing up master plans of cities, ensuring the creation **of green areas on at least** 30 percent of **their territory**, in the construction of residential buildings - **the proportionality of "green areas" to the** population.
	Introduction of a system **for automatic sampling from sources of contamination of** objects with a prominent level **(category I) of risk of environmental impact.**
	Improvement of the mechanisms for **assessing the level of environmental pollution**, development of an environmental monitoring system, **prediction** of the level of pollution.
	Introduction of a system for **the identification** and **vaccination** of stray animals, organization of the activities of **14 nurseries** engaged in their maintenance.
	Introduction of the practice of permanent publication of data on the level and quality of industrial wastewater to the public on official websites and in the media.
Expansion of the national project "Yashil Makon", aimed at stabilizing the environmental situation.	Planting **200 million** tree seedlings a year and bringing the republic's green level to **30 percent**, creating a system of care and irrigation for each tree planted.
	Creation **of 1.984** green gardens, including **112** large industrial companies in its own territory and in the adjacent territory during three years **of "green belts"** of **30 million** seedlings.

	Creation of "green gardens" **on** the territory of all **state bodies, businesses, educational institutions**.
	5-fold increase in the territory of green areas in the city **of Tashkent, bringing it to 5 thousand hectares.**
	Organization of **an aerobiological monitoring system** in 10 regions **of the republic** in accordance with the initiatives of the national project "Yashil Makon".
	Creation of public parks in **urban and neighbourhood centres** for every **50-100 thousand inhabitants**.
Expansion of the forest area.	Creation **of 26,200 hectares** of protective forest plantations to preserve the soil from erosion and reclamation facilities from sand tracks.
	Bringing the area with forest plantations in the republic to **6.1 million hectares**, increasing the seed collection of trees and shrubs by **840 tons**.
	Creation of forest plantations **in mountain and foothill areas**, increase of plants in the steppe zone, creation **of protective forest plantations** in the territories.
	Development of **ecotourism, mountain, hunting, and safari tourism** in the territories of forestry and national natural parks, mountainous and steppe areas, as well as protected areas of water bodies.
Stabilization of the environmental situation in the Aral Sea region, mitigation of the negative impact of environmental problems that have arisen as a result of the drying up of the Aral Sea.	To bring forest plantations in the Aral Sea region to **2.3 million hectares**.
	Creation of an additional 600,000 hectares of green areas **at the bottom of the dried-up Aral Sea**, bringing their total volume to **2.6 million hectares** or up to **80 percent** of the territory.
	Implementation of **$300 million** Green Climate Fund and Global Environment Facility **projects** based on programs aimed at **preserving biodiversity, preventing climate change and soil erosion**.
	Implementation of the project **"Improvement of the conditions of land subject to degradation in the lower basin of the Aral Sea"** in collaboration with international partners.
Preventing the negative impacts of climate change.	Creation **of 600,000 hectares** of green spaces – protective forest plantations as a measure against desertification, drought, dust and sandstorms and rising temperatures.
	Bringing the level of early warning of dangerous hydrometeorological phenomena **to 100 percent,** the level of reliability of the flow forecasts of mountain rivers **to 98 percent**.
	To bring the level of reliability of agro-meteorological forecasts on the trend of agricultural crops and yields **to 96 percent**.

	Reclamation of **6.075 hectares** of land degraded due to mining activity.
	Creation **of high-yielding crop varieties, fruits, and grapes, resistant to scarce water and drought,** corresponding to the climate of each territory, increasing **yields by 30-35%.**
Ensuring the sustainable conservation of biodiversity.	Expansion of protected areas to **12 percent**, annual bio botanical inspection of plants from natural pastures and hay fields on **2 million hectares**.
	Creation of **plantations cultivated for the cultivation and breeding of medicinal and food plants** annually on 25 thousand hectares.
	Strengthening **control over the illegal use** of fauna and flora, increase environmental **culture and the level of public awareness of** biodiversity.
	Establishment of rehabilitation centres in the state zoos of Tashkent, Termez and Fergana **for the temporary custody, treatment and care** of confiscated wild animals.
Improvement of the quality of services for the collection and removal of domestic solid waste.	Increase the level of coverage of solid waste collection and removal services **by 100%, the** level of waste treatment by 65%.
	Bring the share of waste incinerated to **35 percent**, reducing landfills by at least **50 percent**.
	Introduction of a cluster system covering the **processes of removal from cities, the treatment of household waste and the production of green energy and other products** from them within the framework of the **"Zero Waste" system.**
Prevention of air pollution, taking decisive measures to preserve its natural composition.	A **10,5% reduction** in the number of pollutants emitted into the atmosphere.
	Complete modernization of polluting technologies in economic entities belonging to environmental impact categories I, II, construction and reconstruction of local drainage and treatment plants at **249 industrial companies**.

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