BIENNIAL REPORT ON TRANSPARENCY OF THE REPUBLIC OF UZBEKISTAN UNDER THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE

Tashkent 2024

GEF/UNEP Project Uzbekistan: First and Second Biennial Transparency Report of Uzbekistan and Fifth National Communication

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INTRODUCTION

The climate agenda is currently a priority of Uzbekistan's state policy. Recognizing that addressing global climate change is one of the key conditions for ensuring sustainable development of the country, Uzbekistan signed the United Nations Framework Convention on Climate Change (UNFCCC) on June 20, 1993, as a non-Annex 1 country, and in 2017 signed the Paris Agreement (PA), which governs measures to reduce greenhouse gases (GHGs) in the atmosphere. The goal of the Paris Agreement (Article 2) is to enhance implementation of the UN Framework Convention on Climate Change, specifically to keep the increase in global average air temperature well below 2°C and to endeavor to limit the temperature increase to 1.5°C.

The 2023 Global Analysis (GST) found that the world is falling short of the ambitious 1.5°C temperature reduction target set out in the Paris Agreement. Continuing challenges impede progress on climate change mitigation, and significant efforts will be required to reduce global GHG emissions to the required levels- 43% by 2030 and 60% by 2035 of 2019 levels as proposed by Intergovernmental Panel on Climate Change (IPCC). In addition, the stocktaking also highlighted the urgent need to intensify action on climate adaptation.

Under the Paris Agreement, each country is required to make quantitative commitments to reduce GHG emissions- the Nationally Determined Contribution (NDC)- and review the commitments every five years to increase ambition.

The Republic of Uzbekistan signed the COP on April 19, 2017, ratified it on October 2, 2018 (Law of the Republic of Uzbekistan No. 491 dated 10.12.2018) and submitted to the UNFCCC Secretariat its first nationally determined contribution (NDC1) - to reduce specific GHG emissions per unit of GDP by 10% by 2030 from 2010 levels.

In 2021, in compliance with the UNFCCC decisions and in accordance with national conditions, Uzbekistan prepared and submitted an updated ambitious commitment (NDC2), confirming its intentions to continue efforts to reduce specific GHG emissions per unit of GDP by 35% by 2030 from the 2010 level, instead of the previously adopted 10%.

As a Party to the UNFCCC, in accordance with Articles 4.1 and 12, Uzbekistan is obliged to prepare and submit National Communications with information on the progress of implementation of the Convention, including the results of the inventory of GHG emissions.

To date, four National Communications (NCs) have been prepared:

- The first NC (1NC) was carried out in 1999 under the Global Environment Facility (GEF), United Nations Environment Program (UNEP) project “Uzbekistan-Country Study on Climate Change” and included GHG inventory data for the period 1990-1994.
- The Second National Communication (2NC) was prepared in 2008. It provides information on GHG emissions and removals for 2000-2005.
- The Third National Communication (3NC) was prepared in 2016. The GHG inventory prepared under the 3NC covered the period 1990-2012.
- As part of the preparation of the Fourth National Communication (4NC), the First Biennial Update Report (1BUR) was prepared in accordance with UNFCCC Decision 2/CP.17 2021, containing, among other things, information on the implementation of NDC and GHG emissions/removals for the period 1990-2017.
- A GHG National Inventory Report (NIR) for 1990-2021 was also prepared.

With the adoption of the NDCs and the need to track progress, the role and requirements for transparency in the preparation of national climate reports are increasing. With this document

Uzbekistan presents its First Biennial Transparency Report (1BTR), prepared in accordance with the requirements of Article 13 of the Paris Agreement and Decisions 18/CMA.1, 5/CMA3, 4/CMA.1 on the transition to an enhanced transparency framework for climate reporting (ETF). Biannual Transparency Reports (BTRs) serve as a tool to assess the work done. They contain key information on GHG emissions, as well as on progress in implementing and achieving the targets set out in NDC1 and NDC2.

The report has been developed in accordance with the IPCC Technical Guidelines (MPGs), common CRT and CTF tabular formats, ensuring compliance with the Paris Agreement requirements and generally accepted approaches.

The report provides an updated overview of national circumstances, including information on climate vulnerability, inventory of anthropogenic emissions and GHG sources, mitigation and adaptation measures, highlights financial support, technology development and transfer, and capacity building measures implemented in accordance with the provisions of the Paris Agreement and UNFCCC requirements.

The report was prepared by the Hydrometeorological Service Agency (Uzhydromet) of the Ministry of Ecology, Environmental Protection and Climate Change, with financial and technical support under the GEF/UNEP/Uzbekistan Project “Preparation of the First and Second Biennial Transparency Reports of the Republic of Uzbekistan and the Fifth National Communication to UNFCCC”.

Uzbekistan's transition to an enhanced transparency framework for BTR preparation is supported by several regional and national organizations and initiatives, to whom we express our gratitude and appreciation. The GEF/FAO/Uzbekistan project “Capacity Building for an Integrated and Enhanced Transparency Framework in Uzbekistan for Tracking National Climate Change Actions and Support Measures (CBIT) Received” plays an important role.

Significant technical support for the preparation of the report was provided by:

- Initiative for Climate Action Transparency (ICAT), in particular the Regional Project ReCAT and the project's knowledge platform, which supports Central Asian countries in developing expertise for transparency (ETF) actions.
- United Nations Environment Program. Office in Copenhagen.
- Capacity Building Initiative for Transparency- Global Support Program (CBIT-GSP)
- French Development Agency- CITEPA.

SUMMARY

This document presents the First Biennial Transparency Report (1BTR) of the Republic of Uzbekistan, prepared in accordance with Article 13 of the Paris Agreement and Decision 18/CMA.1., 5/CMA3, 4/CMA.1.

This document is an important milestone in the realization of the country's international climate commitments, demonstrating Uzbekistan's commitment to transparency in climate change issues. Uzbekistan's 1BTR not only provides a detailed analysis of the current situation but also serves as a platform for presenting the country's climate policy efforts. The document reviews detailed data on the national GHG inventory, progress in the implementation of the NDC, climate change adaptation measures, as well as information on international support needed and received.

Chapter 1: The chapter provides a summary of the GHG inventory for the period 1990-2022. The GHG inventory has been prepared in accordance with the transparency requirements of the Paris Agreement.

GHG emissions/removals were estimated using the methodologies of the IPCC Guidelines for National GHG Inventories, 2006 using IPCC software version 2.93 and ETF Tools.

The chapter presents emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and hydrofluorocarbons (HFCs) calculated using the Global Warming Potentials of the IPCC Fifth Assessment Report.

The inventory covers the following sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Land Use, Land Use Change and Forestry (LULUCF), and Waste.

The chapter includes an overview of institutional arrangements for inventory preparation and a description of overall emission trends as well as GHG emission trends by sector.

The information presented in Chapter 1 is detailed in the National Report “Inventory of Anthropogenic GHG Emissions and Removals in the Republic of Uzbekistan for 1990–2022”, which is Part II of the 1BTR, as well as in the electronic annex to the report (a set of tables in CRT format).

Chapter 2 contains key information necessary for tracking the NDC of the Republic of Uzbekistan in accordance with Article 4 of the Paris Agreement and Decision 18/CMA.1. This section presents national specifics, including socio-economic, geographic and climatic conditions that determine the country's approach to meeting climate commitments.

The chapter describes the institutional arrangements and legal framework that ensure coordination and monitoring of mitigation measures and actions.

Key indicators and information used to track progress towards achieving the NDC are presented, including information on the current level of GHG emissions, the dynamics of their reduction, and the results achieved. Standardized assessment and monitoring methods are applied that ensure transparency and comparability of data at the international level (18/CMA.1).

In addition, the climate change mitigation policy, implemented measures, as well as strategic plans and programs developed to achieve the goals of the NDCs are detailed. Specific actions aimed at reducing GHG emissions in key sectors of the economy, including energy, industry, agriculture, forestry and waste management are described.

Special attention is paid to innovative approaches such as energy efficiency, renewable energy and climate change adaptation projects.

GHG emission reduction potential up to 2030 is estimated based on the data analysis of development programs and active investment projects, consultations with national experts. Considering the GHG emission reduction potential, forecasts of GHG emissions and removals were calculated for the period up to 2035. The forecasts are presented based on three scenarios- inertial, realistic, ambitious. The GHG Abatement Cost Model (GACMO) adapted to the national conditions of Uzbekistan[1] was used for calculations. The model uses a "bottom-up" approach to estimating GHG emissions and allows estimating projected GHG emissions by major IPCC sectors and categories.

Overall, the chapter reflects Uzbekistan's comprehensive and consistent approach to fulfilling its NDC commitments, demonstrating significant progress and readiness for further action to combat climate change and contribute to global climate goals.

Chapter 3 of this report focuses on adaptation to the impacts of climate change in accordance with Article 7 of the Paris Agreement. To assess progress on adaptation, the 1BTR uses the UNFCCC Guidelines for the preparation of 1BTR for non-Annex I countries, as well as FAO's guidance on the Tracking Adaptation in Agricultural Sectors (TAAS).

The chapter includes a detailed analysis of Uzbekistan's national characteristics, such as institutional arrangements, legal frameworks and socio-economic conditions that facilitate the development and implementation of adaptation measures.

The paper provides a detailed assessment of the vulnerability of biodiversity, water resources and agriculture to climate change, and considers the impact of climate change on increasing the frequency and intensity of natural hazards.

It analyzes barriers to the implementation of adaptation measures based on the strategy of the National Adaptation Plan (NAP) and the National Program for Adaptation of Agriculture to Climate Change. Recommendations and guidelines of international organizations including IPCC, UNFCCC, UNDP, GCF and FAO are used in the work.

Special attention is paid to national adaptation strategies and action plans, which highlight priorities and targets for economic sectors such as agriculture, water and forestry.

The chapter presents mechanisms for monitoring and evaluating adaptation measures and tools to prevent loss and damage from climate impacts, including developing and analyzing indicators of adaptation progress, assessing economic loss and damage, analyzing institutional and legal frameworks, implementing international and regional treaties, and monitoring and tracking financial support for adaptation.

The presented framework allows assessing the current progress and identifying further steps to strengthen Uzbekistan's adaptive capacity, contributing to sustainable development and minimizing climate risks in key sectors of the economy.

Chapter 4 of this report provides a comprehensive overview of the financing, technology development and transfer, and capacity-building support needed and already received to fulfill commitments under Article 13 of the Paris Agreement. The chapter has been prepared based on the UNFCCC Guidelines for BTR of Non-Annex I Countries and considering the provisions of Decisions 18/CMA.1 and 5/CMA.3.

[1] The Greenhouse Gas Abatement Cost Model has been developed through more than 20 years of research by the UNEP Climate Center in Copenhagen and is used by several countries to calculate emission projections https://unepccc.org/.

This chapter presents an analysis of financial support, including climate budgeting, international climate finance and assistance received through public-private partnerships. Information is provided on mobilized resources from carbon trading and carbon tax revenues.

The importance of international support and interagency coordination for achieving Uzbekistan's climate goals was emphasized. These mechanisms of financing, technology transfer and capacity building are an integral part of effective implementation of national and international climate commitments.

It also provides an overview of the financial support needs identified by the World Bank in 2023. Information on the support provided and required in the areas of technology development and transfer, and capacity building, based on the results of recent national and international assessments, is presented.

In addition, the chapter discusses the existing challenges and identified gaps related to report preparation, providing directions for improving future reporting and enhancing the implementation of climate actions.

1 SUMMARY OF THE NATIONAL GHG INVENTORY REPORT FOR 1990-2022 IN ACCORDANCE WITH MODALITIES, PROCEDURES AND GUIDELINES (MPGs)

1.1 General information

This section includes a summary of GHG emissions for 2022, as well as updated emissions estimates for the period 1990-2021. This GHG Inventory has been prepared in accordance with the requirements of the Enhanced Transparency Framework (ETF) using transparency principles (MPGs) and the document structure requirements of Decisions 5/CMA.3 and 18/CMA.1. The paper provides estimates of anthropogenic emissions and removals of GHG not controlled by the Montreal Protocol, calculated in accordance with the 2006 IPCC Guidelines for National GHG Inventories.

The inventory contains revised emission estimates for the period 1990-2021, as well as new GHG emission estimates for 2022. The inventory includes information on the following GHGs: CO_2, CH_4, N_2O, and HFCs. The calculations of GHG emissions used the global warming potential of the IPCC Fifth Assessment Report as recommended by Decision 5/CMA.3.

This inventory has been carried out for the following sectors:

- Energy (CRT Sector 1).
- Industrial Processes and Product Use (IPPU, CRT Sector 2).
- Agriculture (CRT Sector 3).
- Land use, Land Use Change and Forestry (LULUCF, CRT Sector 4).
- Waste (CRT Sector 5).

GHG emissions/removals were calculated using 2006 IPCC Software (Version 2.93). CRT tables were prepared using ETF Reporting Tools. Detailed information on GHG emissions/removals for 1990-2022, as well as a set of necessary annexes, are presented in the National GHG inventory report of the Republic of Uzbekistan for 1990-2022 (Part II of the Biennial Transparency Report).

1.2 Institutional arrangements

Since 2023, coordination of activities in the Republic of Uzbekistan on the implementation of the UNFCCC and the Paris Agreement has been carried out by the Ministry of Ecology, Environmental Protection and Climate Change. Until 2023, these duties were performed by the Agency of Hydrometeorological Service.

The Agency of Hydrometeorological Service (Uzhydromet) is an organization within the Ministry of Ecology, Environmental Protection and Climate Change. Uzhydromet is responsible for the preparation of GHG inventories, including collection and analysis of activity data, carrying out calculations of GHG emissions, preparation of reporting tables, maintenance and archiving of documentation, preparation of regular national reports on GHG emissions/removals. The Agency of Statistics under the President of the Republic of Uzbekistan, key ministries, departments of the country, research institutes, public-private companies and individual industrial enterprises are actively involved in the preparation of the inventory.

The MRV system is currently being developed in Uzbekistan to implement the preparation of GHG inventory on a continuous basis.

1.3 Trends in GHG emissions

Total GHG emissions of the Republic of Uzbekistan, excluding sink in the LULUCF sector in 2022, were 209.61 Mt CO_2-eq. Including the LULUCF sector, net emissions were 201.15 Mt CO_2-eq.

Total GHG emissions increase by 32.1% between 1990 and 2022, including an increase of 20.9% between 2010 and 2022. The largest emission increases were observed in the agriculture and IPPU sectors.

The contribution of GHGs to total emissions in 2022 was (Mt CO_2-eq):

- CO_2- 135.55 (64.7%).
- CH_4- 60.20 (28.7%).
- N_2O- 12.74 (6.1%).
- HFCs- 1.13 (0.5%).

Table 1.1 GHG emissions, Mt CO_2-eq (excluding LULUCF)

GHG	1990	1995	2000	2005	2010	2015	2019	2020	2021	2022	$\Delta_{(1990\text{-}2022)}$
CO_2	118.721	105.207	115.537	109.561	109.468	102.501	115.397	118.378	139.235	135.547	+14.17%
CH_4	33.401	44.416	47.987	49.908	54.973	53.806	60.437	57.053	59.843	60.199	+80.24%
N_2O	6.540	5.887	5.893	6.816	8.027	10.588	11.780	11.671	12.171	12.742	+94.84 %
HFC	-	-	0.001	0.009	0.018	0.085	0.701	0.844	0.929	1.126	1.124-fold increase
Total	**158.661**	**155.510**	**169.417**	**166.294**	**172.487**	**166.979**	**188.316**	**187.946**	**212.178**	**209.614**	**+32.11%**

GHG emission trends for the period 1990-2022 are shown in Figure 1.1. During this period, CO_2 emissions increased by 14.17%, CH_4 by 80.24%, N_2O by 94.84%. HFCs emissions experienced a dramatic rise, increasing 1,124 times from 2000 to 2022.

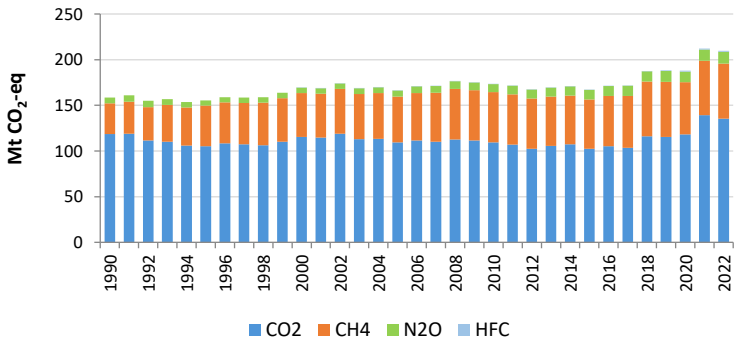


Figure 1.1 GHG emissions by individual gases

Changes in the contributions of individual GHGs to total emission over the period 1990-2022 are shown in Figures 1.2 and 1.3.

The Energy sector is the largest contributor to CO_2 emissions, accounting for 79.8%, while the IPPU sector contributes 20.2%.

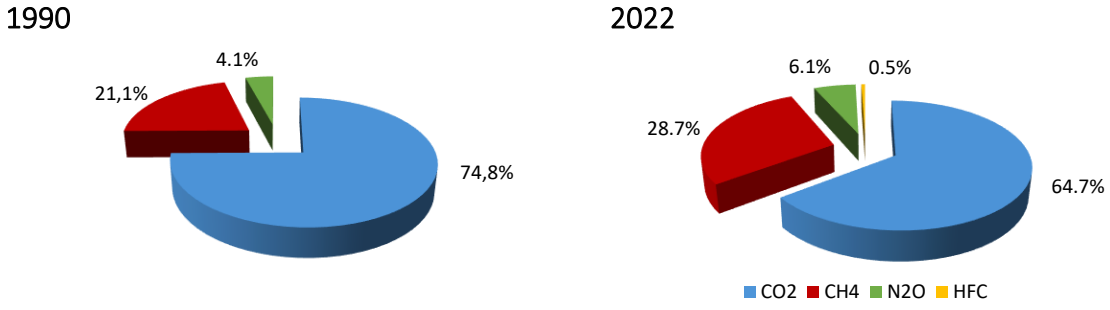


Figure 1.2 Change in the structure of GHG emissions for 1990 and 2022

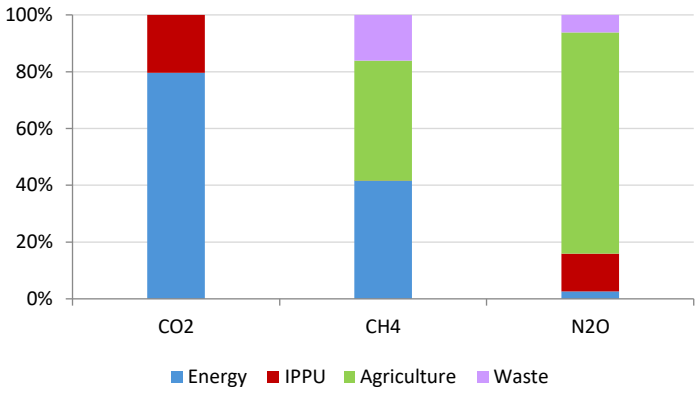


Figure 1.3 GHG contribution by sector in 2022 (excluding LULUCF)

CH_4 emissions are distributed among the inventory sectors as follows: 41.6% from the Energy sector, 42.2% from the Agriculture sector, 16.1% from the Waste sector, and less than 0.1% from the IPPU sector.

The main contributor to N_2O emissions is the Agriculture sector, accounting for 77.9%, 13.3% originates from the IPPU sector, 6.2% from the Waste sector, and 2.6% from the Energy sector.

HFCs emissions occur exclusively in the IPPU sector and are associated with the use of refrigerants in air conditioning and refrigeration systems.

1.4 Distribution of GHG emissions by sector

Figure 1.4 and Table 1.2 show trends in GHG emissions by inventory sector over the period 1990-2022.

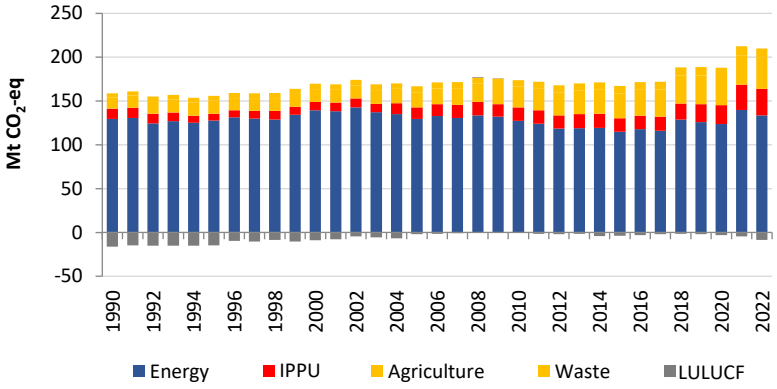


Figure 1.4 GHG emissions by sector

All sectors except LULUCF experienced an increase in GHG emissions over the period, including:

- Energy by 3.15%.
- IPPU by 159.46%.
- Agriculture by 178.21%.
- Waste by 116.21%.

In contrast, CO_2 uptake in the LULUCF sector decreased by 47.3%.

The most intense growth in GHG emissions occurred between 2018 and 2022.

Changes in the contributions of individual sectors to total GHG emissions from 1990 to 2022 are shown

in Figure 1.5. Over this period:

- The Energy sector's share of total GHG emissions decreased from 82% to 64%.
- The IPPU sector's share increased from 7% to 14%.
- The Agriculture sector's share rose from 8% to 17%.
- The Waste sector's share grew from 3% to 5%.

Table 1.2 GHG emissions by sectors, Mt CO_2-eq.

Years	Energy	IPPU	Agriculture	Waste	Total emissions	LULUCF	Net emissions
1990	129.440	11.659	12.707	4.855	**158.661**	-16.060	**142.601**
1995	127.829	7.421	14.762	5.497	**155.509**	-14.659	**140.850**
2000	139.387	9.251	14.784	5.996	**169.418**	-8.790	**160.628**
2005	129.464	12.929	17.275	6.625	**166.293**	-1.972	**164.321**
2010	127.226	14.243	23.502	7.516	**172.487**	-0.167	**172.320**
2015	114.998	14.993	28.384	8.604	**166.979**	-3.896	**163.083**
2016	117.748	15.154	29.612	8.835	**171.349**	-3.049	**168.300**
2017	116.134	15.631	30.923	9.055	**171.743**	-1.880	**169.863**
2018	128.792	17.967	31.868	9.224	**187.851**	-1.316	**186.535**
2019	125.844	20.309	32.680	9.482	**188.315**	-1.960	**186.355**
2020	123.858	21.003	33.294	9.791	**187.946**	-2.989	**184.957**
2021	139.606	28.676	33.740	10.156	**212.178**	-4.530	**207.648**
2022	133.513	30.252	35.352	10.497	**209.614**	-8.460	**201.154**
$\Delta_{(1990\text{-}2022)}$	**+3.15%**	**+159.46%**	**+178.21%**	**+116.21%**	**+32.11%**	**-47.32%**	**+41.06%**
%, 2022	**66.37%**	**15.04%**	**17.57%**	**5.22%**	**104.21%**		
Δ (2010-2022)	**4.94%**	**99.14%**	**50.42%**	**39.67%**	**20.86%**	**50-fold increase**	**16.09%**

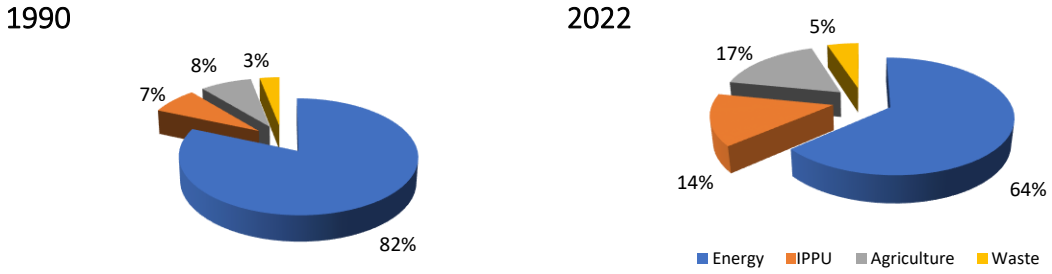


Figure 1.5 Change in the structure of GHG emissions for 1990 and 2022 by sector

1.5 Energy sector

The Energy sector occupies a special place in the economy of the Republic. It is the largest consumer of fuel and energy and, accordingly, the main source of GHGs. In 2022, the share of the Energy sector in total GHG emissions (excluding LULUCF) amounted to 63.62% (a decrease from 81.0% in 1990).

The Energy sector includes emissions of carbon dioxide, methane and nitrous oxide. Figure 1.6 shows emission trends for individual GHGs for 1990-2022.

In the Energy sector, the breakdown of GHG emissions in 2022 was as follows: CO_2 emissions: 81.0%, CH_4 emissions: 18.8%, and N_2O emissions: 0.3%.

Between 1990 and 2022, total GHG emissions from the Energy sector increased by 3.1%, including: CH_4 emissions increased by 26%; CO_2 and N_2O emissions decreased by 0.9% and 26.4%, respectively.

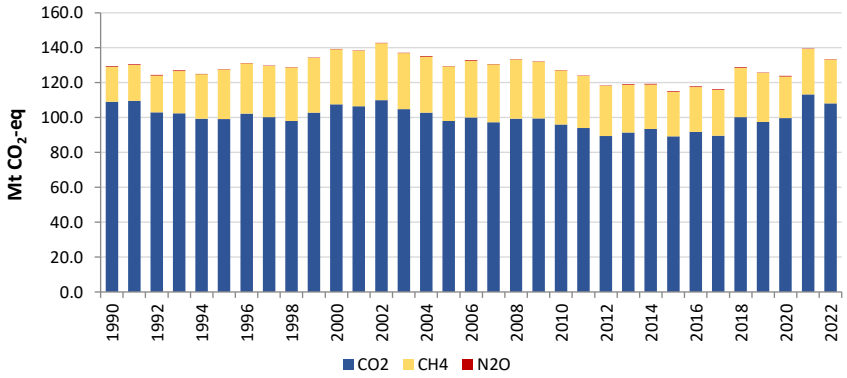


Figure 1.6 GHG emission trends in the Energy sector

Sources of GHG emissions in the Energy sector are:

- For CO_2 mainly fuel combustion processes in energy production, manufacturing industries and the residential sector, and emissions from oil and gas systems.
- For CH_4 mainly fugitive emissions from gas systems, as well as emissions from fuel combustion.
- For N_2O fugitive emissions in the oil and gas systems and fuel combustion processes.

In this sector, GHG emissions are divided into 2 main categories:

- Fuel Combustion Activities.
- Fugitive Emissions from Fuels.

GHG emissions by major category of the Energy sector for 1990-2022 are presented in Table 1.3.

Table 1.3 GHG emissions in the energy sector by main categories, Mt CO_2-eq.

Years	Fuel combustion	Fugitive emissions	Total	Years	Fuel combustion	Fugitive emissions	Total
1990	109.283	20.157	**129.440**	2018	100.080	28.711	**128.792**
1995	98.301	29.528	**127.829**	2019	97.349	28.451	**125.800**
2000	106.556	32.831	**139.387**	2020	99.605	24.208	**123.814**
2005	97.146	32.318	**129.464**	2021	113.364	26.223	**139.588**
2010	95.274	31.952	**127.226**	2022	108.382	25.131	**133.513**
2015	88.877	26.122	**114.998**				
2016	91.361	26.388	**117.748**	$\Delta_{(1990\text{-}2022)}$	**-0.8%**	**+24.7%**	**+3.1%**
2017	89.379	26.755	**116.134**	**%, 2022**	**81.2%**	**18.8%**	**100.0%**

Between 1990 and 2022, the contribution of the Fuel Combustion Activities category decreased from 84% to 81.2%. Correspondingly, the contribution of the fugitive emissions from Fugitive Emissions from Fuels category increased from 16% to 18.8%.

The largest contributors to the Fuel Combustion Activities category in 2022 were the subcategories of Power and heat production (39.2%), Residential (23.3%), and Transportation (16.7%) as shown in Figure 1.7.

The category Fugitive Emissions from Fuels includes the subcategories Coal, Oil and Natural gas. The dynamics of GHG emissions in the category Fugitive emissions from fuels is mainly determined by the dynamics of methane emissions from gas systems, which account for 85.6% (Figure 1.8). The contribution of the subcategory Oil to the total GHG emissions in this category was 13.5%, and the contribution of the subcategory Coal was 0.9%.

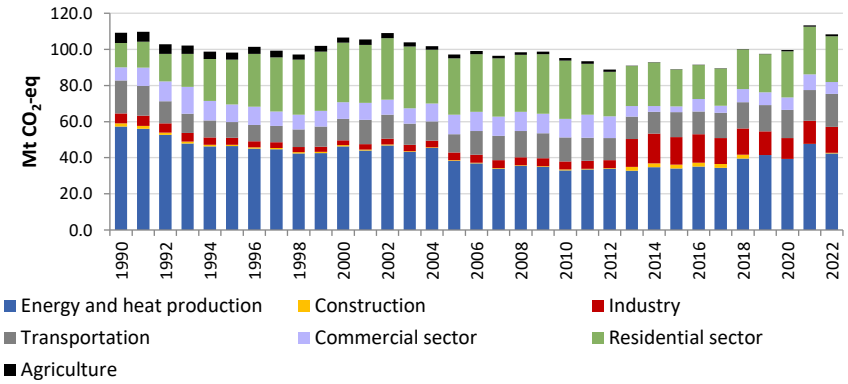


Figure 1.7 GHG emission trends by subcategory of the category Fuel Combustion Activities

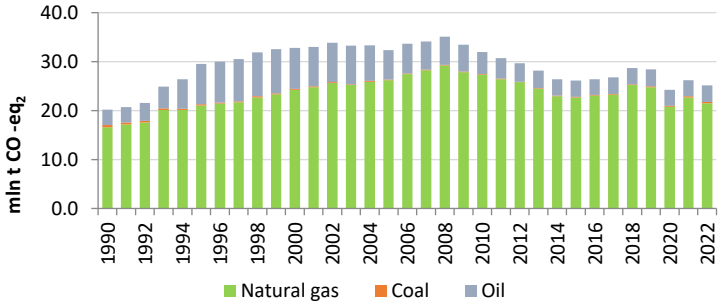


Figure 1.8 GHG emissions trends
in the category Fugitive Emissions from Fuels

The increase in fugitive emissions between 1990 and 2008 was due to increased natural gas and oil production. After 2008, there was a gradual decrease in fugitive emissions from oil and gas systems due to lower oil production, reduced natural gas transportation, and measures taken to reduce leakage in the Oil and Gas Industry.

1.6 Industrial Processes and Product Use Sector (IPPU)

The IPPU sector considers GHG emissions associated with industrial processes, the use of GHGs in products, and the non-energy use of fossil fuel carbon.

In Uzbekistan industry releases GHGs (CO_2, CH_4, N_2O) during chemical and physical transformation of materials. The use of freons for cooling and air conditioning purposes results in the emission of HFCs.

GHG emissions from the following categories have been estimated in the IPPU sector:

- Mineral industry.
- Chemical industry.
- Metal industry.
- Non-energy products from fuels (Lubricant Use).
- Product Uses as Substitutes for Ozone-depleting Substances (Refrigeration and Air Conditioning).
- Other (Food Industry).

In 2022, the IPPU sector contributed 14.53% of total GHG emissions, which is down from 8% in 1990. In the IPPU sector, CO_2 emissions account for 90.8%, N_2O for 5.5%, HFCs for 3.7%, and CH_4 contributes 0.01%.

Sources of CO_2 emissions in the IPPU sector include the production of cement, glass, ceramics, lime, ammonia, calcium carbide, methanol, acrylonitrile, steel, ferroalloys, lead, zinc, consumption of

lubricants.

The only source of N_2O emissions in the sector is nitric acid production. Sources of CH_4 emissions are calcium carbide, acrylonitrile, methanol, and ferroalloys production. The estimated source of HFCs emissions is refrigeration equipment.

Figure 1.9 shows emission trends for individual GHGs in the IPPU sector.

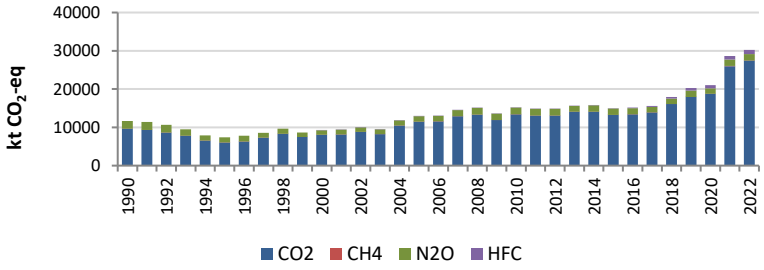


Figure 1.9 GHG trends in the IPPU sector

Table 1.4 summarizes GHG emissions by individual category in the IPPU sector for the period 1990-2022.

Table 1.4 GHG emissions by category in the IPPU sector, kt CO_2-eq

Years	Mineral industry	Chemical industry	Metal industry	Lubricant Use	Refrigeration and Air Conditioning	Total
1990	5676.885	5045.155	733.680	203.412	-	**11659.132**
1995	3078.854	3785.248	469.860	87.262	-	**7421.223**
2000	4972.450	3628.988	565.024	83.134	1.002	**9250.598**
2005	8099.806	3981.417	703.993	135.018	9.209	**12929.442**
2010	9833.977	3473.987	863.121	53.536	18.136	**14242.756**
2015	9892.046	4049.993	885.098	80.769	84.696	**14992.602**
2016	10071.968	4002.867	833.013	82.544	164.054	**15154.445**
2017	10576.816	3664.276	1053.724	84.313	252.021	**15631.150**
2018	12682.746	3674.895	1114.076	82.544	412.864	**17967.124**
2019	13841.313	4378.844	1296.539	91.270	701.353	**20309.319**
2020	14706.632	4084.609	1265.014	103.062	843.910	**21003.227**
2021	21427.192	4772.626	1354.574	191.856	929.272	**28675.520**
2022	23117.601	4264.784	1372.952	369.326	1125.965	**30252.392**
Δ (1990-2022)	**4-fold increase**	**-21.10%**	**+87.13%**	**+81.57%**	**1123-fold increase**	**+159.46%**
%, 2022	**76.42%**	**14.10%**	**4.54%**	**1.22%**	**3.72%**	**100.00%**

The largest contributors to the emissions in the IPPU sector are the categories Mineral industry (76.4%) and Chemical industry (14.1%).

Over the period 1990-2022, total emissions for the sector increased by 159.5%, most significantly in 2021-2022 due to growth in the building materials industry, especially the production of sheet glass and cement.

The growth of emissions from the use of HFCs is associated with a significant increase in the consumption of freons in the economic and social sectors.

1.7 Agriculture sector

The Agriculture sector is the second largest GHG emission sector in Uzbekistan after the Energy sector. GHG emissions in 2022 in the Agriculture sector amounted to 16.85% of the total emissions. The sector's contribution to total emissions increased by 8.85% compared to 1990.

The Agriculture sector provides information on CH_4 and N_2O emissions, as well as emissions of other gases (CO, NO_x) from biomass combustion.

The following categories have been evaluated in the sector:

- Livestock.
- Aggregate sources and sources and non-CO_2 emissions sources on lands.

In 2022, total emissions in the agriculture sector were 35.35 Mt CO_2-eq.

Figure 1.10 shows trends of emissions in the sector by individual GHGs.

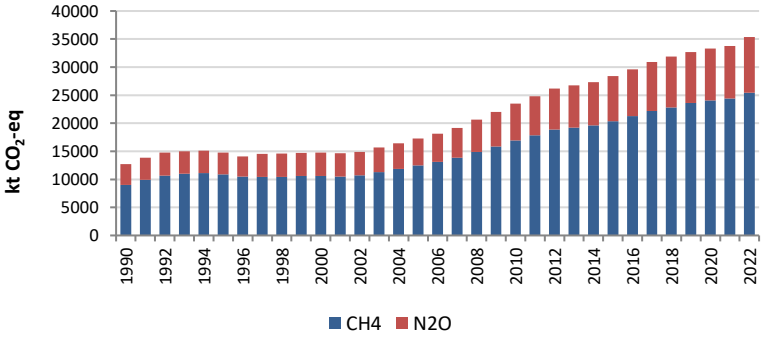


Figure 1.10 GHG emission trends in the Agriculture sector

Over the period 1990-2022, total GHG emissions in the Agriculture sector increased by 2.78 times, including CH_4 emissions by 2.82 times and N_2O emissions by 2.69 times.

Table 1.5 presents GHG emissions by individual categories and subcategories of the Agriculture sector for the period 1990-2022.

Table 1.5 GHG emissions by category in the Agriculture sector, kt CO_2-eq

Years	Enteral fermentation	Manure management	Biomass burning	N_2O emissions from managed soils	Indirect N_2O emissions from manure management	Rice cultivation	Total
1990	7846.198	1372.792	31.909	2855.607	211.160	389.319	**12706.985**
1995	9457.041	1605.879	47.252	2959.861	252.486	439.973	**14762.490**
2000	9315.586	1577.263	48.420	3243.416	249.402	349.538	**14783.625**
2005	11229.679	1893.167	-	3714.011	299.120	139.179	**17275.156**
2010	15308.002	2574.553	-	5030.382	405.790	183.396	**23502.123**
2015	18554.079	3058.741	-	6104.776	480.556	185.621	**28383.773**
2016	19364.455	3201.216	-	6357.675	498.271	190.398	**29612.015**
2017	20261.146	3335.498	-	6620.103	517.262	189.021	**30923.030**
2018	20941.585	3443.872	-	6836.965	533.568	111.760	**31867.750**
2019	21563.311	3567.113	-	6822.943	554.620	172.178	**32680.165**
2020	22024.939	3660.606	-	6911.968	570.675	125.773	**33293.961**

Continuation of Table 1.5

Years	Enteral fermentation	Manure management	Biomass burning	N_2O emissions from managed soils	Indirect N_2O emissions from manure management	Rice cultivation	Total
2021	22323.823	3708.957	-	6998.801	578.294	129.648	**33739.523**
2022	23329.653	3849.805	-	7451.488	597.727	122.848	**35351.521**
$\Delta_{(1990\text{-}2022)}$	7846.198	1372.792	31.909	2855.607	211.160	389.319	**12706.985**
%, 2022	**65.99%**	**10.89%**	**0.00%**	**21.08%**	**1.69%**	**0.35%**	**100.00%**

The largest contributors to GHG emissions from the Agriculture sector are the categories Enteral fermentation of livestock (65.99%) and N_2O emissions from managed soils (21.08%).

The growth of GHG emissions in the whole sector is due to the growth of emissions in the categories Enteric fermentation, Manure management, N_2O emissions from managed soils and is caused by the growing livestock population, as well as intensive use of nitrogen and organic fertilizers.

The decrease in emissions from rice cultivation is due to a reduction in the area under this crop relative to the 1990s and is associated with a shortage of irrigation water. In the category Biomass burning, since 2005 GHG emissions are not calculated due to the introduction of a legislative ban on stubble burning of grain crops in Uzbekistan.

1.8 Land Use, Land-Use Change and Forestry Sector (LULUCF)

In the LULUCF sector, only CO_2 emissions and removals have been estimated.

In 2022, the total GHG sinks in the LULUCF sector amounted to 8.46 Mt. This value is about 4% of the total GHG emissions in Uzbekistan. In general, over the period 1990-2022, the total CO_2 removals in the sector decreased by 1.9 times. Estimates of emissions/removals in the sector were made only for lands remaining in the same category due to lack of information on areas of land transferred from one category to another.

In the LULUCF sector, emissions/removals are estimated in the following categories:

- Forest land Remaining Forest land (change in carbon content in biomass and soils, and GHG emissions from forest fires).
- Cropland Remaining Cropland (change in carbon content of biomass and soils).
- Grassland Remaining Grassland (change in soil carbon content).

Estimates of emissions/removals from other categories of the sector, namely Wetlands, Settlements, Harvested Wood Products, have not been made in the current inventory. They are assumed to be small. The necessary information is being collected to include these categories in the inventory.

The main CO_2 sinks in the sector are the categories Forest land and Cropland, the main source of emissions is the category Grassland.

Removals in the sector are associated with a step-by-step increase in forest lands, mainly because of the targeted state policy of planting forest plantations on desert lands in the Aral Sea region and adjacent territories of Navoiy and Bukhara regions.

In the Cropland category, there is a decrease in CO_2 uptake relative to 1990 mainly due to the change in the structure of cropped areas, including rice crops, reclaimed lands and fallow lands.

The dynamics of CO_2 emissions from grassland is associated with a gradual decrease in land occupied by

grassland since the 1980s. The highest values of CO_2 emissions from grassland were observed in the period from 1996 to 2012.

The resulting CO_2 emission/removals estimates for the LULUCF sector for 1990-2022 are presented in Table 1.6 and Figure 1.11.

Table 1.6 Emissions/removals in the LULUCF sector, kt CO_2

Years	Forest land	Cropland	Grassland	Total	Years	Forest land	Cropland	Grassland	Total
1990	-5569.303	-9150.959	-1339.481	**- 16059.743**	2017	-5198.429	-1707.115	5025.100	**-1880.348**
1995	-7096.762	-8132.389	570.093	**-14659.059**	2018	-4112.779	-2033.592	4829.718	**-1316.439**
2000	-10223.949	-5378.812	6812.313	**-8790.448**	2019	-4091.796	-2608.563	4740.209	**-1960.079**
2005	-9283.039	-2349.265	9659.834	**-1972.470**	2020	-4287.214	-2859.770	4151.270	**-2988.569**
2010	-9027.642	-2342.642	11202.459	**-167.481**	2021	-4431.713	-4062.685	3964.091	**-4529.693**
2015	-7441.702	-2121.195	5665.886	**-3896.203**	2022	-5010.367	-4074.153	624.225	**-8460.259**
2016	-6353.158	-1924.232	5228.103	**-3049.272**	$\Delta_{(1990\text{-}2022)}$	**10% removal decrease**	**2.3-fold removal decrease**	**1.06-fold emissions increase since 1991**	**1.9-fold removal decrease**

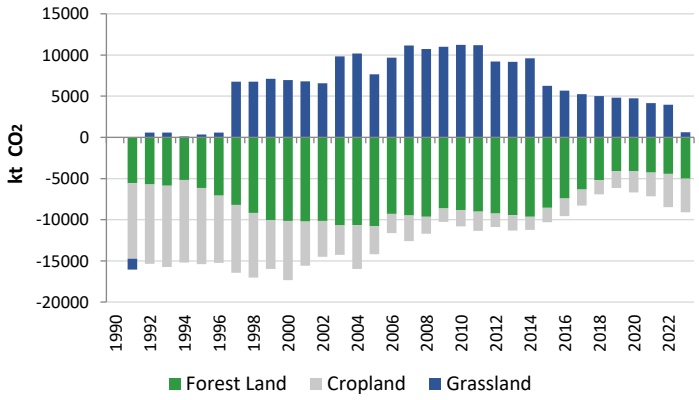


Figure 1.11 Emissions/removals in the LULUCF sector

1.9 Waste sector

In 2022, GHG emissions in the Waste sector amounted to 10.497 Mt CO_2-eq. The contribution of the Waste sector to the Total emissions in 2022 amounted to 5.0%.

The waste sector considers CH_4 and N_2O emissions in the following categories:

- Solid Waste Disposal (municipal and industrial).
- Domestic Wastewater Treatment and Discharge.
- Industrial Wastewater Treatment and Discharge.

Sectoral GHG emissions increased by 116.2% between 1990 and 2022, including:

- CH_4 emissions: +115.9%.
- N_2O emissions: +120.4%.

Figure 1.12 shows the dynamics of GHG emissions in the Waste sector for the period 1990-2022. Since many model data and assumptions were used in the calculations, the obtained trends of GHG emissions in the Waste sector are linear.

The main contribution to emissions in the Waste sector is CH_4, which accounts for 92.5% of the total emissions in the sector and 7.5% from N_2O. Sources of CH_4 emissions in the sector are solid waste landfills, as well as domestic and industrial wastewater. The source of N_2O emissions is domestic wastewater.

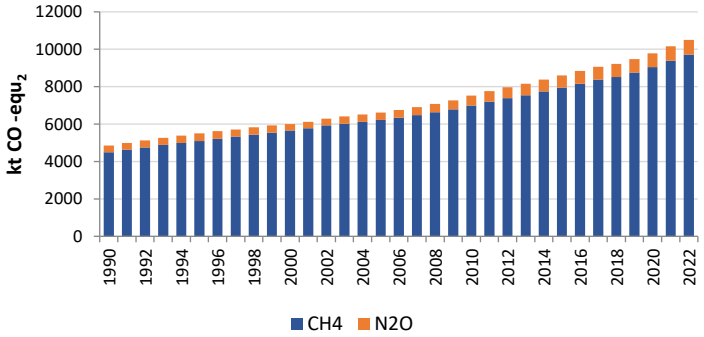


Figure 1.12 GHG trend in the Waste sector, kt CO_2-eq

Table 1.7 presents GHG emissions in the Waste sector by the main categories. The category Solid Waste Disposal accounts for 52% of sectoral emissions. The contribution to sectoral emissions of the categories of Domestic Wastewater Treatment and Discharge accounts for 46.2%, and the Industrial Wastewater Treatment and Discharge category accounts for 1.8%.

Table 1.7 GHG emissions by category in the Waste sector, kt CO_2-eq

Years	Solid waste disposal	Domestic wastewater	Industrial wastewater	Total	Years	Solid waste disposal	Domestic wastewater	Industrial wastewater	Total
1990	1975.141	2752.493	127.549	**4855.183**	2018	4673.772	4482.309	68.276	**9224.357**
1995	2355.680	3057.803	83.126	**5496.609**	2019	4844.849	4569.969	67.508	**9482.326**
2000	2707.330	3213.726	74.539	**5995.595**	2020	5035.832	4659.676	95.000	**9790.508**
2005	3075.794	3463.233	85.981	**6625.008**	2021	5235.251	4756.702	164.063	**10156.016**
2010	3544.150	3849.555	122.067	**7515.772**	2022	5457.822	4854.768	184.615	**10497.205**
2015	4199.583	4270.888	133.823	**8604.294**	$\Delta_{(1990\text{-}2022)}$	**+176.33%**	**+76.38%**	**+44.74%**	**+116.21%**
2016	4352.997	4340.845	141.001	**8834.843**	$\%_{2022}$	**51.99%**	**46.25%**	**1.76%**	**100.00%**
2017	4512.598	4408.665	134.140	**9055.403**					

Over the period 1990-2022, there is the following increase in emissions by category:

- Solid Waste Disposal by 176.3%.
- Domestic Wastewater Treatment and Discharge by 76.4%.
- Industrial Wastewater Treatment and Discharge by 44.7%.

The growth of emissions in the Waste sector is associated with population growth and the development of industrial production.

2 INFORMATION NECESSARY TO MONITOR PROGRESS MADE IN THE IMPLEMENTATION AND ACHIEVEMENT OF THE NDC UNDER ARTICLE 4 OF THE PARIS AGREEMENT

2.1 National circumstances and institutional arrangements

2.1.1. State structure

Uzbekistan is a sovereign, democratic, legal, social and secular State with a republican form of government, headed by a President, and is a full-fledged subject of international law. On March 2, 1992, Uzbekistan was admitted to the United Nations. The President is the highest official and supreme commander-in-chief of the armed forces of Uzbekistan. He is the guarantor of the rights and freedoms of citizens, the Constitution and the law, the country's sovereignty, security and territorial integrity. The system of State power is divided into the legislative, executive and judicial branches. The Oliy Majlis, the supreme body of legislative power, is a bicameral parliament consisting of the Legislative Chamber (lower house) and the Senate (upper house). Executive power is exercised by the Cabinet of Ministers, which includes the Prime Minister, his deputies, ministers, chairmen of State committees and the head of the Government of the Republic of Karakalpakstan. The system of state administration is organized according to functional-sectoral and territorial principles and includes sectoral ministries, committees, agencies and departments.

The Kengashes of People's Deputies are the local representatives of state power. The Khokims of regional, city, and district khokimiyats are in charge of the region's executive power. Local citizens' governments handle local issues. The administrative and territorial system of the Republic of Uzbekistan comprises 12 regions (viloyats), one autonomous republic, and one city of central subordination, as well as 177 administrative districts (Figure 2.1).

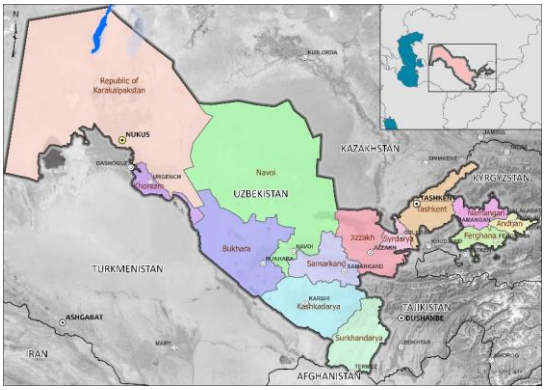


Figure 2.1 Map of the administrative division of Uzbekistan

The country has 120 cities, 1,058 urban communities, and 10,989 rural communities. Tashkent is the capital of the country. It has a population of 2.96 million (2023). It is a cultural, educational, political, and transport center. It is the largest city in Central Asia. Nukus is the capital of the autonomous Republic of Karakalpakstan. Its population is 335,500. Other major cities of Uzbekistan: Namangan (678,200 people), Samarkand (573,200 people), and Andijan (458,500 people).

Almost all key ministries and agencies of the country are involved in activities related to the transition to a green economy and fulfillment of commitments under the Paris Agreement.

2.2 Population characteristics

Uzbekistan is the most densely populated country in Central Asia with the number of 37.13 million people as of 01.07.2024 with approximately equal ratio of urban (50.1%) and rural (49.9%) inhabitants. The average population density across the country is 82.7 people/km^2, the highest density is characteristic of Andijan (796.4 people/km^2) and Fergana regions (606.3 people/km^2).

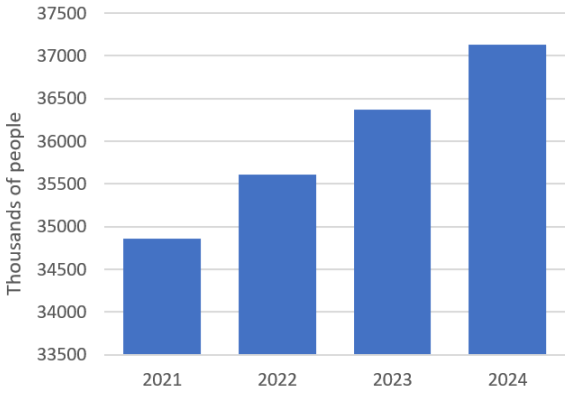
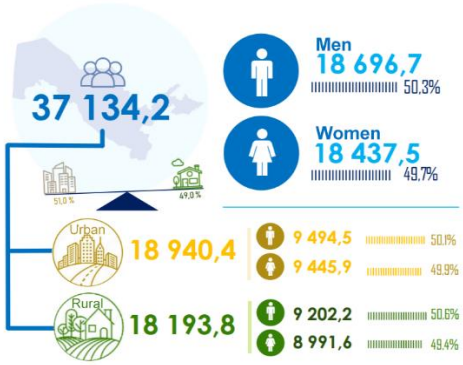


Figure 2.2 The dynamics of population change



Source: Statistics on Demography of the Republic of Uzbekistan, 2024 (Agency for Statistics)

Figure 2.3 Distribution of permanent population by gender

Statistical indicators of population and employment. The urban population is 18,940,400 people (50.1% of the total permanent population of the Republic), including 9,494,500 men (50.1% of the total urban population) and 9,445,900 women (49.9%). While the rural population is 18,193,800 people (49.0% of the total permanent population of the Republic), including 9,202,200 men (50.6% of the total rural population) and 8,991,600 women (49.4%).

In Uzbekistan, the average age of men is 28.5 years and of women 30.0 years. Annual population growth averages 1.9% (600-700 thousand people). The age structure is as follows: below working age- 32.0%, at working age - 56.4%, above working age - 11.6%. The number of labor resources in 2023 is 19,739.9 thousand people (54.8% of the total population). The share of women in the labor force is 47.8%, men- 52.2%. The number of unemployed at the level of 2023 is 1,024.1 thousand people (5.2%)[2].

Distribution of the permanent population by gender, into urban and rural population (as of July 1, 2024, thousand people) is illustrated in Figure 2.3.

An analysis of[3] surveys shows that an increase in the working-age population creates favorable preconditions for potential economic growth. The United Nations estimates that by 2040, about 70% of Uzbekistan's total population will be in the working-age cohort (United Nations, 2017) and projects that the labor force will exceed what Uzbekistan has ever seen over the next 20 years.

The national composition of the population includes more than 130 ethnic and linguistic groups, 80% of the indigenous population is Uzbek. The literacy rate of the adult population of the Republic is 99.99%, and that of young people is 100%.

According to UNDP estimates, almost 70% of the country's population lives in drought-affected areas. At the same time, the poorest segments of the population live in the driest regions of the country. Their livelihoods depend on agricultural activities and face increasing vulnerability to the impacts of climate change and the availability of natural resources. Under these conditions, the government has recognized the need to implement urgent climate adaptation measures and actions.

Education The total number of students enrolled in general secondary educational organizations in the 2023/2024 school year was 6,645.1 thousand people, of whom 3,233.4 girls (48.7%) and 3,411.7 boys (51.3%) (Table 2.1).

[2] https://daryo.uz/ru/2024/01/27/agentstvo-po-statistike.
[3] https://eabr.org/upload/EDB_2021_Report_Uzbekistan_and_the_EAEU_rus.pdf

Table 2.1 Number of students in general secondary educational institutions (thousand people)

School years	Girls	Boys	Total
2020/2021	3 052.9	3 235.0	6 287.90
2021/2022	3 068.9	3 235.7	6 304.60
2022/2023	3 149.2	3 312.5	6 461.70
2023/2024	3 233.4	3 411.7	6 645.10

The number of students in higher education organizations at the beginning of the 2023/2024 academic year increased significantly in relation to the beginning of the 2019/2020 academic year and amounted to 1,314.5 thousand people, of which boys 657.9 thousand people (50.05 %), girls 656.6 thousand people (49.95 %) (Figure 2.4).

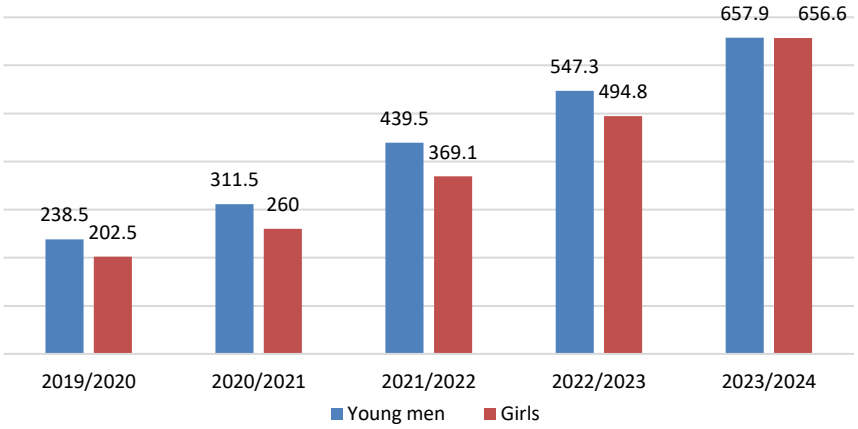


Figure 2.4 This number of students enrolled in higher education institutions from 2019 to 2024 The data is shown at the beginning of each academic year (thousand people)

Labor resources. The number of labor resources in 2023 amounted to 19,739.9 thousand people (54.8% of the total population in 2023). Women accounted for 47.8% of the labor force, while men represented 52.2%. The number of unemployed in 2023 amounted to 1,024.1 thousand people (5.2%).

The predominant position of women is observed in the following types of activities: health care and social services (74.8%), education (71.1%), provision of accommodation and food services (50.1%). The total number of the population employed in the respective types of activities is given in percentage terms.

2.3 Geographical characteristics

2.3.1. Location

The Republic of Uzbekistan, a country remote from oceans and seas, is located in the central part of the Eurasian continent in the Amudarya-Syrdarya interfluve and shares transboundary biomes in the Aral Sea basin. The Republic borders Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Afghanistan (Figure 2.5).

2.3.2. Landscape

The territory of Uzbekistan, with a total area of 448.92 thousand km^2, is characterized by a pronounced variety of relief (from flat terrain and plateaus in the north-west, to uplands in the foothills, spurs of mountains and mountain ranges in the east) with extreme elevation values from 16.5 m below sea level (Mingbulak depression) to 4,643 m above sea level (Khazret Sultan on the slopes of the Gissar range). A substantial portion of the territory, constituting approximately 78.8% of the total area, is characterized by semi-deserts and deserts. This includes the expansive Kyzylkum Desert, which spans an area of approximately 300,000 km^2 and is regarded as the largest desert in Central Asia. Additionally, the Aralkum Desert, which is situated on the dried bed of the Aral Sea, covers an area exceeding 5,000 km^2.

Figure 2.5 Physical map of Uzbekistan

The topography of the region is characterized by Quaternary sediments, with only minor incursions of mountain and foothill massifs, along with outcrops of stony and pre-Quaternary sediments. The Turan Plain's mountainous terrain and its lack of drainage have led to the formation of geochemical flows, which carry out easily soluble salts and accumulate them in closed depressions and drainless basins.

2.4 Socio-economic characteristics

2.4.1. General information

Uzbekistan is a developing country with a rapidly growing economy. The beginning of the government reforms was based on the implementation of the Strategy of Actions on five priority directions of development of the Republic of Uzbekistan in 2017-2021, which determined the vector of state policy for all sectors of the economy.

On average, Uzbekistan's economy exhibited growth of 6.6% during the period 2011-2019. According to estimates by the World Bank, Uzbekistan's GDP at purchasing power parity for 2019 was valued at $245.4 billion[4]. The GDP per capita (purchasing power parity-adjusted) in 2020 was $7,400[5] .

In 2022, Uzbekistan's economy demonstrated an overall growth of 5.7%, propelled by substantial enhancements in both external and domestic demand conditions[6]. Consequently, the poverty rate declined from 17.7% in 2010 to 11% in 2020. According to the World Poverty Clock, the proportion of the population living below the poverty line (defined as the World Bank's 1.9 USD per day criterion) decreased to 9% in 2023.

In the structure of Uzbekistan's GDP, the main role is played by the Services and Agriculture sectors. From 2015 to 2021, there is a gradual increase in the contribution of the industry sector. The services sector remains a key driver of the economy, with its share in GDP ranging from 38% to 43% in 2015-2023, reaching 43.3% in 2023. The sector provides over 40% of employment. Trends in the share of

[4] https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?end=2022
[5] https://eabr.org/upload/EDB_2021_Report_Uzbekistan_and_the_EAEU_rus.pdf
[6] https://stat.uz/images/uploads/docs/vvp_dek_2020_ru.pdf

agriculture and industry in total GDP are presented in Table 2.2.

Table 2.2 Changes in the structure of GDP for the period 2015-2023, %

Economic sectors	2015	2016	2017	2018	2019	2020	2021	2022	2023
Agriculture	32.1	32.1	32.2	30	26.9	27.1	26.9	25.1	24.3
Industry	19.1	19.5	21.1	25.3	28.1	27.5	27.8	26.7	26.1
Construction	5.7	5.6	5.4	5.8	6.3	6.7	6.7	6.7	6.2
Services	43.1	42.8	41.4	38.9	38.7	38.7	38.6	41.5	43.3

The country's economy has undergone significant structural transformation and economic reforms, resulting in notable economic developments. The economy has become open, with the liberalization of the business environment, prices, trade, and the foreign exchange market. Investment in fixed capital has increased, and a course has been set for increasing the production of high value-added goods and diversifying exports.

Notably, foreign direct investment in the Uzbekistan economy has witnessed a substantial surge, reaching $8 billion, marking an increase of 3.2 times compared to the figures recorded in 2017. The Republic is pursuing a low-carbon and climate-resilient model of green growth, characterized by inclusive, sustainable, and efficient use of natural resources, as well as the creation of new jobs in innovative areas.

2.4.2. Energy

The fuel and energy complex includes the power, heat and oil and gas sectors. The Energy sector represents the largest source of GHG emissions in the country, its contribution to the total GHG emissions amounted to 63.6% in 2022.

The national program documents—namely, the NDC, the Strategy for Transition to a Green Economy, the Green Growth Program, the Concept for the Development of the Electricity Sector, and the Water Sector Development Program for 2020-2030—emphasize the accelerated development of green energy as a strategic priority for action. The implementation of policies aimed at ensuring energy security has contributed to the observed increase in the total installed capacity of the electricity sector, which has grown by 40% (reaching 15 GW in 2019). An analysis of the primary energy resources utilized for electricity generation at TPPs reveals that gas fuel accounts for an overwhelming majority of 86.6%, followed by coal at 10.8%, fuel oil at 2.4%, and underground coal gasification at 0.2% [7].

The economy of Uzbekistan is marked by a high degree of energy intensity. The significant wear and tear of its infrastructure leads to power losses of up to 20% of net generation [8]. Consequently, modernization and diversification of the fuel and Energy sector are imperative for the country's development.

To conclude, the government has articulated ambitious plans to augment the share of renewable energy sources (RES) to 30% of total energy generation by 2030, to double the energy efficiency indicator by 2030 relative to 2018 levels, and to halve the energy intensity of GDP[9].

Oil and gas industry. Natural gas reserves became the basis for the creation and development of the oil and gas industry. Uzbekistan ranks 17th in the world in terms of natural gas production and 24th in terms

[7] IC SS CNG, 2020

[8] https://eabr.org/upload/EDB_2021_Report_Uzbekistan_and_the_EAEU_rus.pdf

[9] UNDP/AFD / Mineconomfin Public Expenditure Review and Institutional Assessment on Climate Change: “Uzbekistan” (CPEIR) 25/01/2024

of reserves. In 2021, natural gas production reached 53.82 billion m^3, consumption reached 46.06 billion m^3, and oil production amounted to 0.78 million tons.

By the year 2030, it is anticipated that natural gas production in Uzbekistan will reach 66.1 billion m^3, with consumption projected to reach 56.5 billion m^3. The proven coal reserves in Uzbekistan are estimated at approximately 1.9 billion tons, with lignite constituting most of this reserve, amounting to around 1.85 billion tons. The estimated forecast for coal reserves stands at approximately 4.7 billion tons. The development of natural reserves of potassium salts, phosphorites, kaolins, and various raw materials for construction materials has been actively undertaken.

Use of RES. Uzbekistan boasts considerable potential for renewable energy production due to its natural and geographical conditions. The gross potential of hydro, solar, wind, and biomass energy is 117,984 million toe. The level of modern technologies allows the use of 179 million toe, which is three times higher than the current annual consumption of fossil fuels. Of the total potential, solar energy accounts for the greatest share, with a total potential of 51 billion and a technical potential of 177 million toe. The total potential for hydropower is estimated at 9.2 million toe, with a technical potential of 1.8 million toe. The technical potential of wind energy is estimated at 520 GW of installed capacity.

The RES sector is mainly regulated by the Law of the Republic of Uzbekistan "On the Use of Renewable Energy Sources" (Law of the Republic of Uzbekistan No. ZRU-539 of 21.05.2019). According to the Law, the Ministry of Energy of the Republic of Uzbekistan is the main regulatory body in the field of renewable energy sources utilization. In 2022, the share of electricity produced from renewable sources was only 7.74%. However, the country's development plans for the future indicate an ambitious target of increasing the share of electricity generation using renewable energy sources to a minimum of 25% by the year 2026. To achieve this objective, it is projected that the construction of approximately 10 GW of new RES facilities will be undertaken, including 5 GW of solar, 3 GW of wind, and 1.9 GW of hydroelectric power plants.

2.4.3. Industry

Among the industries, the leader is metallurgy, which includes the mining of ores and production of metals[10] . The share of this industry in total industrial output increased from 8.1% in 2010 to 21.6% in 2020. The annual growth rate of the metallurgical industry amounted to 4.5%.

In the past six years, the volume of investment attracted to the country's industry has increased sevenfold. In the past three years, the country has imported equipment with a total value of $14 billion. The nation's economic agenda entails several strategic initiatives, including the augmentation of its participation in the value chain of non-ferrous metallurgy, construction materials production, and chemical and petrochemical industries. This agenda entails the modernization of production techniques and the implementation of energy-efficient technologies for extraction and processing.

2.4.4. Transportation

Uzbekistan has a developed transportation complex, which includes road, rail, air and pipeline modes. According to the Statistical Agency of the Republic of Uzbekistan, the share of pipeline transport amounted to 42.0%, railroad transport accounted for 33.3%, and road transport constituted 24.3%. The country boasts the highest density of road networks in Central Asia, with an average of 41 km per 100 km^2. Uzbekistan is also a stable leader among Central Asian countries and several other countries in terms of railroad network density with an average of 10.5 km per 1000 km^2 of the country's territory.

[10] https://www.uzembassy.uk/news/723?language=ru

The largest volume of GHG emissions is produced by road and pipeline transportation.

2.4.5. Land use and land tenure

Land ownership. The total land fund of the Republic of Uzbekistan amounts to 44,892.4 thousand hectares. Land in Uzbekistan is state owned, protected by the state and is not subject to purchase, sale, exchange, gift or pledge, except in cases established by legislative acts. Land use planning is the responsibility of the government, the Ministry of Economy and Finance, the Ministry of Agriculture, the Cadaster Agency and others. Formation of the land use market /ownership rights/ is the responsibility of the government and is also the function of responsible and authorized agencies, cadastral agencies and organizations, and local authorities.

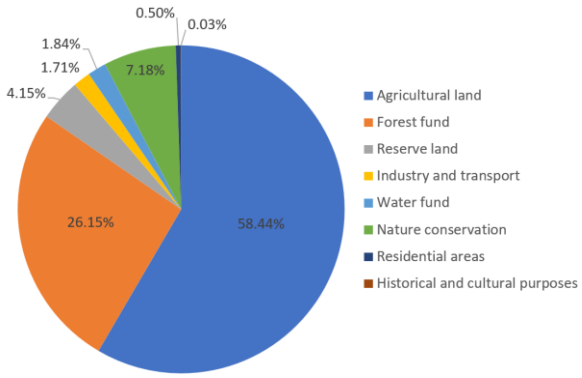


Figure 2.6 Land use categories, % (2023)

Land resources have a multipurpose functional purpose. In accordance with Article 8 of the Land Code of the Republic of Uzbekistan, they are subdivided into 8 categories, each of which is characterized by the nature of their use to meet the needs of nature and society (Figure 2.6). According to the Decree of the President of the Republic of Uzbekistan[11] agricultural lands are allocated on the basis of lease rights following open electronic tenders with subsequent approval by the Cabinet of Ministers, the Council of Ministers of the Republic of Karakalpakstan, regional khokims and the city of Tashkent.

Land use. Agricultural land is the most important category of land use, providing production for the population and raw materials for industry, including arable land, perennial plantations, hayfields and pastures, as well as land for the construction of agricultural infrastructure.

Lands of nature protection, health-improving and recreational purpose. These lands include state protected areas, national historical and natural reserves and monuments, wildlife sanctuaries, dendrological and botanical gardens, specially protected natural areas, as well as land plots for the use of public recreation and tourism. The total area of lands of this category as of 2022 amounted to 3222.7 thousand hectares.

2.4.6. Agricultural sector

The sector contributes 26.1% of gross value added to the GDP[12] (together with forestry and fisheries), employs about 27% of the total economically active population[13], and is the main source of livelihood for 18,193,800 rural residents.

As a result of large-scale reforms, agriculture has been growing steadily since the beginning of 2017. High efficiency is ensured by the development of new agro-clusters and cooperation for the production of competitive export-oriented products. The processes of reducing the area of cotton in favor of fruit plantations and vegetables are being actively promoted in the structure of crops (Figure 2.7).

The structure of agricultural production is represented almost equally by crop production (50.1) and livestock production (49.9%). Today Uzbekistan exports more than 80 types of agricultural products to

[11] https://lex.uz/docs/5450181
[12] https://stat.uz/uploads/doklad/2019/yanvar-dekabr/ru/4.pdf
[13] UZDAILY (2024). https://www.uzdaily.uz/ru/v-globalnom-indekse-goloda-uzbekistan

66 countries of the world, which contributes about 10% to foreign income. As a result of the implementation of comprehensive programs and measures to strengthen food security, Uzbekistan has strengthened its position in the world and in the Global Hunger Index[14] ranked 30th out of 107 countries, with an index of 6.7 points (for 2020).

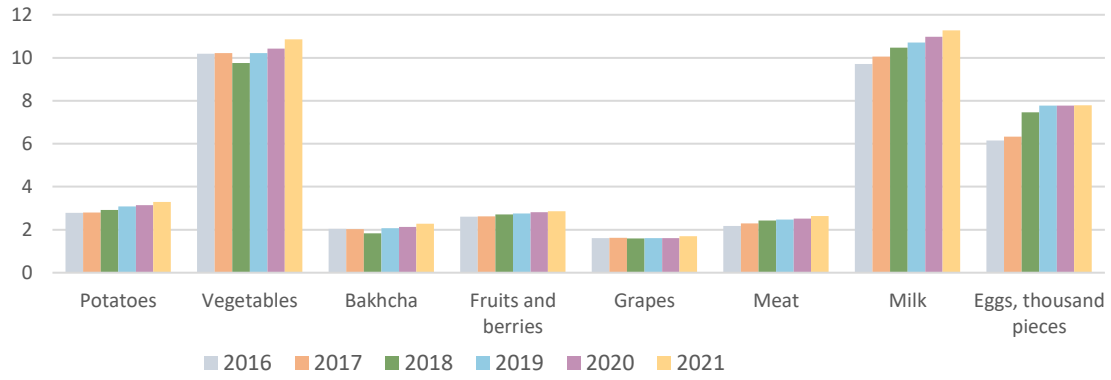


Figure 2.7 Dynamics of production of individual types of crop and livestock production (million tons) for 2016-2021

The dry and continental climate makes agriculture dependent on irrigation, with irrigated agriculture consuming more than 90% total water withdrawals. Climate change could lead to even deeper water stress, increased duration and recurrence of droughts like those that occurred in 2000, 2008, 2011, 2014 and 2018, and serious problems in meeting water demand in key sectors of the country.

Climate-resilient and innovative reforms and transformations are essential to ensure a flexible transition to a green economy in agriculture.

2.5 Ecosystems and biological resources

The territory of Uzbekistan is distinguished by a remarkable biodiversity, encompassing a wide array of natural ecosystems. Notably, six terrestrial ecoregions featured in the Global 200 (Global List of 200 sites of the World Wildlife Fund) are situated within the country's borders. The natural ecosystems of Uzbekistan are home to a rich biodiversity, with approximately 27,000 species documented to date. Of these, approximately 11,000 are higher vascular plants, along with mosses, lichens, fungi, and algae, while the fauna comprises over 15,600 species. The endemic flora, encompassing species exclusive to the country's biogeographical boundaries, constitutes approximately 8% of the total vascular plant diversity. Relict endemics constitute 10-12% of the total number of endemic species. The vertebrate fauna is classified into five distinct classes, encompassing a total of 715 species. These include 77 species of fish, 3 species of amphibians, 61 species of reptiles, 467 species of birds, and 107 species of mammals. Notably, the region boasts 53 species and subspecies of terrestrial vertebrates that are endemic to Uzbekistan and Central Asia, further underscoring the biodiversity richness of the area. The reptilian fauna exhibits a 50% endemic level, while the mammalian class exhibits a lower level of endemism, with 14% of its species endemic. The avian class demonstrates an even lower level of endemism, with only 1.7% of its species being endemic. Notably, the endemicity of fish species in Uzbekistan and Central Asia has been documented to exceed 50%. It is noteworthy that certain animal species exhibit seasonal

[14] FAO/GEF (2020). Sustainable management of forests and rangelands in dryland ecosystems of Uzbekistan. Project

presence in Uzbekistan, with their presence being limited to specific periods during the year, such as during seasonal migrations.

Strong anthropogenic impact has led to a significant reduction in the ranges, species and numbers of representatives of fauna and flora. There are 207 species and subspecies of animals included in various categories of rare and endangered animals, of which 184 are included in the Red Book of the Republic of Uzbekistan (2009). The Red List of the International Union for Conservation of Nature includes 73 species and subspecies of animals whose future is of global concern.

Wetland ecosystems. There are more than 500 lakes in Uzbekistan, mostly small bodies of water with an area of less than 1 km^2. Mountain lakes, usually of rubble or glacial-marine origin, are located within the altitudes of 1700-4000 m above level. On the plains, irrigation-drainage lakes dominate, formed in depressions of the landscape because of diversion of collector-drainage or flood waters from irrigated areas.

On the territory of Northern Karakalpakstan in the Amudarya delta there is a system of wetlands with a total area of 3,350.793 km^2, with a range of areas from 0.841 to 980.446 km^2, including 100 lakes larger than 1 km^2. As natural habitats, wetlands are threatened with extinction. The number of plant species in wetlands has decreased by 10–30%, and the number of animal species has decreased by 20–25%[15].

In the middle reaches of the Syrdarya River there is the largest in Uzbekistan Arnasay lake system, uniting Aydarkul, Tuzkan and Upper Arnasay lakes.

Virtually all plain lakes, especially drainless lakes, are highly dependent on climatic factors and at high evaporation rates (2,000 mm/year and more) reach a certain salinity threshold that progressively narrows the range of ecosystem services.

The Ramsar Convention is an international agreement that protects wetlands around the world. Uzbekistan joined this agreement in 2001 and has five natural wetland sites on its list: Lake Dengizkul (2001), the Aydar-Arnasay lake system (2008), the Tudakul and Kuyumazar reservoirs (2020), the Sudochye lake system (2023), and Lake Zhyltyrbas in Karakalpakstan (2024).

Protected natural areas. One of the important conditions for preserving the existing biodiversity is the creation of a full-fledged network of protected natural areas (reserves, sanctuaries, natural parks, natural monuments, protected landscapes, etc.). Currently there are 7 state natural reserves, 1 complex (landscape) reserve, 12 natural parks, 1 national park, 11 natural monuments, 2 state biosphere reserves, 12 wildlife sanctuaries, 1 specialized nursery “Jeyran”. Their total area is 6,321,258.21 hectares or 14.08% of the total area of the country according to the classification of the International Union for Conservation of Nature (IUCN). These territories are home to 102 species (83%) of vertebrate animals listed in the Red Book of the Republic of Uzbekistan and 280 species of plants (89%)[16].

The transboundary natural site “Turanian deserts of the temperate zone” has been included in the UNESCO World Natural Heritage List. This is important from the point of view of preserving unique biological diversity and will allow to bring to the international level the protection of globally endangered animals and plants (41 species of mammals, 167 species of birds, 42 species of reptiles, among which the kulan, saiga, gazelle, urial and other species are of special value).

[15] NIGMI (2017). Final report on NIIR A-7-021: Creation of information-analytical database of lakes on the territory of Uzbekistan as a basis for the development of integrated environmental monitoring of limnic systems. Executor-in-Charge V.N. Talskikh.
[16] https://gov.uz/ru/eco/news/view/18654 ; https://uznature.uz/ru/legislation/view?id=765

2.6 Water resources

The main sources of water resources in Uzbekistan are the surface runoff from the transboundary rivers Amudarya and Syrdarya, their tributaries, as well as inland rivers and streams, and groundwater deposits located in the Aral Sea basin.

The total average annual runoff of all rivers in the Aral Sea basin is approximately 116.2 km^3/year, which 67.4% is in the Amudarya basin (78.3 km^3/year) and 32.6% in the Syrdarya basin (37.9 km^3/year). Since the predominant territory of Uzbekistan is flat and foothill, the surface runoff of rivers entering the country is mainly formed outside its borders- in mountainous areas of Tajikistan and Kyrgyzstan from melting snows and glaciers of the Tien Shan and Pamir-Alay[17] . This causes the country's dependence on transboundary water sources. The flow of inland rivers (Kashkadarya, Zarafshan, etc.) is 11.47 km^3/year and can satisfy only about 16-18% of the total water demand.

Currently, the available water limit for the year hardly exceeds 59.2 km^3. The average volume of water used for irrigation and other needs was 51.2 km^3 in 2020 and 43.2 km^3 2021, mostly from transboundary rivers.

Use of water resources

According to the World Bank's assessment[18] climate risks in Uzbekistan are closely linked to water security, food security and land degradation. According to forecasts, under conditions of rising temperatures, decreasing precipitation and glacier area, Uzbekistan will become one of the countries in the world with the largest water deficit.

Water is a very important resource for Uzbekistan. Right now, there isn't enough water for farming, people's needs, and keeping the environment healthy. In a ranking published by the World Resources Institute[19], Uzbekistan ranked 34th out of 164 countries suffering from water stress.

As a result of the rapidly developing industry and Energy sector, their demand for water resources is growing annually and, according to calculations, by 2030, the total annual water consumption of these sectors will increase by 1.8 times from 1.9 billion m^3 to 3.5 billion m^3. Population growth will also lead to an increase in the demand for quality drinking water and the growth of water consumption in the municipal sector from 2.3 billion m^3 to 2.7-3.0 billion m^3 (by 18-20%). Per capita water resources have declined fourfold in recent decades, from 8,400 m^3 in 1960 to 2,100 m^3 today[20]. It is assumed that by 2030 the population of Uzbekistan will increase to 39-40 million people, and the available water resources will decrease by 7-8 km^3, therefore, under these conditions, the water resources deficit will increase from the current 13-14% to 44-46% and will become a limiting factor in the development of all sectors of the economy.

According to the World Bank, drinking water losses in Uzbekistan in 2018 amounted to 469 million m^3 (32% of the total volume of drinking water). The large-scale losses occur against the background of unfavorable forecasts of the Syrdarya and Amudarya rivers' flow reduction by 5 % and 15 % by 2050, respectively, which will increase the deficit. Demand for irrigation water will increase on average by 5 % by 2030 and by 7-10 % by 2050, with demand for water in summer months expected to increase up to 25 by 2040. This will cause serious damage not only to agriculture, but also to hydropower, as the

[17] http://www.cawater-info.net/6wwf/conference_tashkent2011/files/uzhymet.pdf; https://scholar.google.ru/citations?user=P4MYdBwAAAAJ&hl=en
[18] https://eabr.org/upload/EDB_2021_Report_Uzbekistan_and_the_EAEU_rus.pdf
[19] https://www.wri.org/applications/aqueduct/country-rankings/
[20] https://uznature.uz/ru/legislation/view?id=765

productivity of hydropower plants by 2050 in some parts of the region may decrease by up to 20 %[21].

The current situation and forecasts on river flows and water requirements of the economy, society, and nature underscore the importance of efforts to preserve water resources and increase their efficiency. To adapt to the anticipated negative impacts of climate change between 2023 and 2060 under a wet and warm weather scenario, Uzbekistan will require additional investments of USD 46.7 billion (in current prices). Under a dry and hot weather scenario, this figure would be USD 59.8 billion[22].

2.7 Forestry

As of 2022, the total forest area was 11,738.1 thousand hectares. In addition, the area covered by forests is significantly smaller than the area of uncovered land, covering 3,460 thousand ha (7.7% of the total area). The Republic of Karakalpakstan, Bukhara, Navoiy and Kashkadarya regions have the largest areas of forest fund lands, while the smallest areas are in Samarkand, Syrdarya regions and Fergana Valley.

Programs and projects on rehabilitation of degraded lands and establishment of protective forest plantations in the lower reaches of the Aral Sea basin are a key factor in implementing the Decree of the President of the Republic of Uzbekistan (No. PP- 4850 October 6, 2020) and the UN General Assembly Resolution (18.05.2021), as well as contributions of international development partners to promote sustainable actions to increase forest cover in the Uzbek part of the former Aral Sea bed[23]. As a result of integrated programs and projects, the area of forest cover increased 2.3 times due to the increase of desert forests (saxaul and shrubs) and reforestation on desert lands (about 39% of total reforestation)[24].

Since 2021, the country has been implementing a nationwide project “Yashil Makon” (green land), which provides for the annual planting of 200 million tree and shrub seedlings. Since 2019, a one-year moratorium on felling of valuable tree species has been introduced with subsequent indefinite extension. The Concept for the Development of the Forest Management System was adopted, which envisages bringing the area of the forest fund to 14 million hectares by 2030, or 32% of the country's territory.

2.8 Minerals

The Republic of Uzbekistan has rich reserves of mineral natural resources and is one of the leading countries in Central Asia with a developed infrastructure of mining and oil and gas industry. The list of mineral resources includes about 100 types of minerals, of which 60 are already used in the national economy. According to Best Diplomats[25], in 2024 Uzbekistan is ranked 10th among the largest countries in the world in gold production, with a volume of 100 tons, and is also among the top ten countries in the world in terms of reserves of important minerals such as uranium, gas, copper, potash, phosphates.

According to the State Committee of the Republic of Uzbekistan on Geology and Mineral Resources[26] the number of mineral deposits accounted for by the State Balance Sheet is estimated at 2065 and more than 60 types of minerals are listed, less than half of them are not extracted and are not fully utilized in production.

The current state of the mineral resource base of the Republic for strategically important types of

[21] Information and analytical portal of the journal Economic Review (2019) No. 10 (238).
[22]The WB (2023). Climate and Development Country Report: Uzbekistan, https://api.mf.uz/media/document_files/Uzbekistan_CCDR_RUS_Draft_CucG0Lv.pdf
[23] Fourth National Communication under the UNFCCC of the Republic of Uzbekistan, 2024
[24] LDN/Global Mechanism (2019]
[25] https://bestdiplomats.org/top-gold-producing-countries/
[26] https://unece.org/fileadmin/DAM/energy/se/pp/eneff/9th;__ Forum_Kiev_Nov.18/15_November_2018/UNFC_training/05.pdf

metallic minerals, oil and gas, mineral fertilizers, groundwater, construction materials is generally assessed as satisfactory[27].

2.9 Tourism

Uzbekistan has a huge tourist and recreational potential, which includes 7.4 thousand objects of cultural heritage, 209 of them in the four museum cities. Ichan Kal'a in the city of Khiva, Historical Center of the city of Bukhara, Historical Center of the city of Shakhrisabz, and City of Samarkand are included in the list of UNESCO World Heritage Sites.

2.10 Climatic characteristics

2.10.1. Observed climatic conditions and trends

The climatic characteristics of Uzbekistan are due to its southern location within the vast continent and its great distance from the oceans. The climate is arid, sharply continental, temperate in the north and subtropical in the south, with a large amplitude of seasonal and daily air temperatures and low humidity of the surface layers of the atmosphere. Summers are long, extremely dry and hot. Spring is humid, winter is erratic. The average annual air temperature in the perennial section in the flat part of the country is +14.9°C, the average temperature of the warmest month of July is +28.8°C, the average temperature of the coldest January is-0.9°C.

The duration of sunshine on the planes is 4,455-4,475 hours/year. The high level of solar radiation inflow in the warm season creates conditions for the formation of extensive heat centers, especially over hot deserts (Karakum and Kyzylkum). Absolute maximums of air temperature in summer in desert areas reach 45-49°C and higher (Figure 2.8).

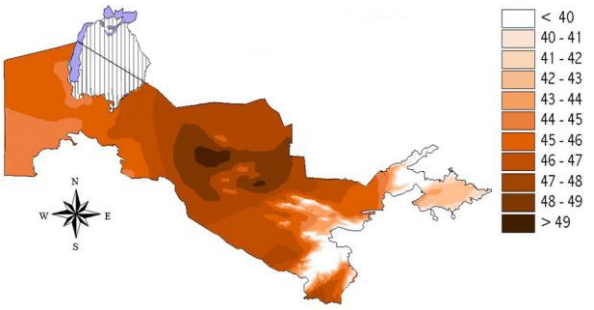


Figure 2.8 Distribution of absolute maximums of air temperature, °C

According to 4NC (2024), since the early 30s of the last century, average annual air temperatures have shown a steady warming trend against the background of significant inter-annual fluctuations. There is a tendency to increase extreme, average minimum T_{min}, and maximum T_{max} temperatures (Figure 2.9). Since 1950-1969, the duration of summer heat waves has increased: number hot days with temperatures (T_{max} > 25°C) increase by 18 days, hot days with (T_{max} >37°C) increase by 13 days, and the number of very hot days (T_{max} >39°C) has more than doubled. The sharpest increase is observed in the northwestern areas surrounding the Aral Sea and the lower reaches of the Amudarya[28].

In the northern part of Uzbekistan, an absolute minimum of -34.2°C was recorded (Ustyurt Plateau 2006). However, the number of days with negative temperature decreases every decade by an average of 4-5 days.

[27] https://kommersant.uz/nedropolzovanie-v-uzbekistane-rasshirenie-vozmozhnostej-dlya-investirovaniya/

[28] Uzhydromet (2024). UNEP/GEF/. Fourth National Communication of the Republic of Uzbekistan on the UN Framework Convention on Climate Change, Ministry of Ecology Tashkent, Uzbekistan

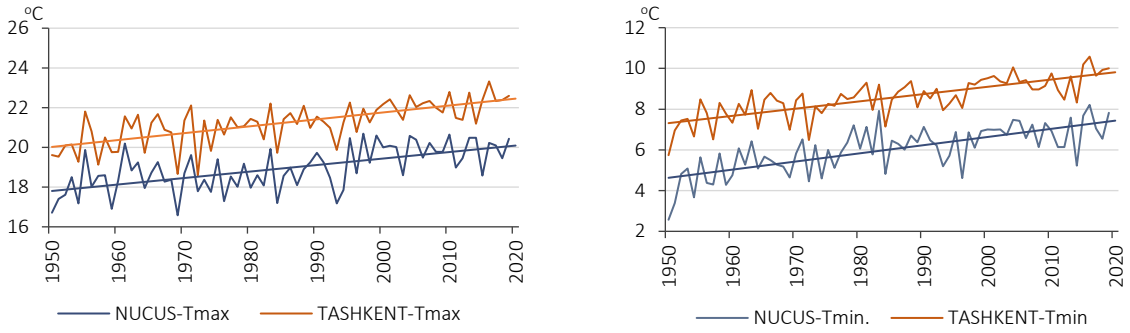


Figure 2.9 Change of mean annual T_{max}, T_{min} (°C) at Nukus and Tashkent meteorological stations for the period 1950-2020

According to WMO, the hottest decade record was from 2011 to 2020, especially the six years 2015 to 2020. In first place was 2016, which saw the natural phenomenon of El Niño causing warming, followed by 2019, and 2020 in third place [29].

Precipitation levels exhibit an increase in the southern, southeastern, and foothill-mountain regions of the country. Average annual precipitation varies from 100-200 mm in the desert part, to 300-550 mm in the foothill area and up to 800-900 mm on the slopes of the Western Tien Shan and Pamir-Alai. The predominant precipitation period extends from November to May, with a maximum observed in March (Figure 2.10).

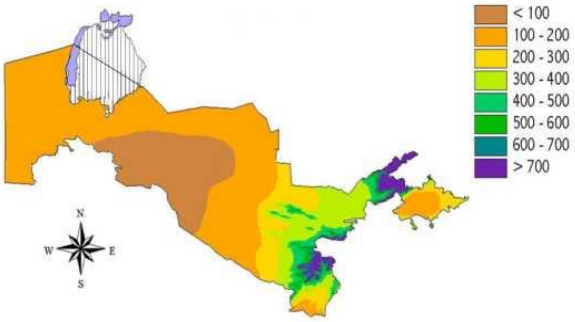


Figure 2.10 Distribution of multiyear average precipitation amount, mm

The observed changes in precipitation patterns are evident in the increased frequency and intensity of short, heavy rains, which have been linked to the occurrence of mudflows and floods (Table 2.3).

Table 2.3 Changes in precipitation regime for different time intervals in the period of 1900-2019 on the example of Tashkent meteorological station

Periods	Number of days with precipitation		Maximum precipitation for five days, Rmax5day	Share of extreme precipitation in annual total, >95% , R95pT	Rainfall Intensity Index, SDII	Daily maximum precipitation, Rmah1day
	> 10 mm	> 15 mm				
1900-1919	10	4	45	10	6	25
1950-1969	14	7	51	20	7	32
2000-2019	16	8	55	21	7	31

Source: 4NC, 2024

2.10.2. Climate change under CMIP5 scenarios

Based on emission scenarios IPCC AR5[30] emissions, climate change is expected to increase monthly maximum air temperatures across Uzbekistan. Evaluation of the model ensemble warming under the

[29] https://news.un.org/ru/story/2021/01/1394262

[30] IPCC Fifth Assessment Report (2013) "Climate Change" https://www.ipcc.ch/languages-2/russian/publications-russian/

highest emissions trajectory (RCP8.5) showed that the average temperature increase by mid-century would be 2.4°C and 5°C by the end of the century. The largest increase in average annual air temperatures is possible in Karakalpakstan and in the desert part of Navoiy region, the smallest in the mountainous areas of Tashkent and Kashkadarya regions. According to the climatic scenario RCP 8.5, the duration of hot periods is projected to increase by 28.6 days and tropical nights (with minimum temperatures above 20°C) by more than 31 days by 2040-2059.

According to the moderate scenario RCP4.5, it is projected that the average of absolute maximum air temperatures may exceed 46°C in desert areas by 2040-2059. In certain years under the more extreme scenario RCP8.5, higher values (47°C, 49°C, 51°C) are plausible, which could pose a threat to human health and habitat.

In accordance with the moderate scenario RCP4.5, precipitation levels are projected to undergo an increase of 5-10% during the winter months, while a slight decrease of up to 5% is anticipated in the summer and fall months by 2040-2059. In the long term (2080-2099), the increase in winter precipitation may reach 16% and 6%, respectively, in the spurs of the Western Tien Shan and Gissar-Alai, and the decrease in summer may reach 10% and 14%, respectively.

2.11 Vulnerability of key economic sectors to climate change

The northwestern territory of Uzbekistan, encompassing the districts of Muynak, Kegeyli, Chimbay, Takhtakupyr, and Kungrad in Karakalpakstan, exhibits a pronounced vulnerability to climate change affecting agriculture and rural populations. This region experiences pronounced socio-economic consequences due to the exacerbating desertification processes and the occurrence of salt and dust storms originating from the Aralkum Desert.

According to 4NC estimates (2024), 38% of the country's territory is highly or very highly vulnerable to climate change. Another 54% is moderately vulnerable, and only 8% is somewhat or minimally vulnerable. 4.1 million people (17% of the rural population) live in areas with low or reduced vulnerability. 17.5 million people (70%) live in areas with medium or increased vulnerability. 2.8 million (11%) and 400 thousand (2%) rural residents live in areas with high or very high vulnerability (Figure 2.11).

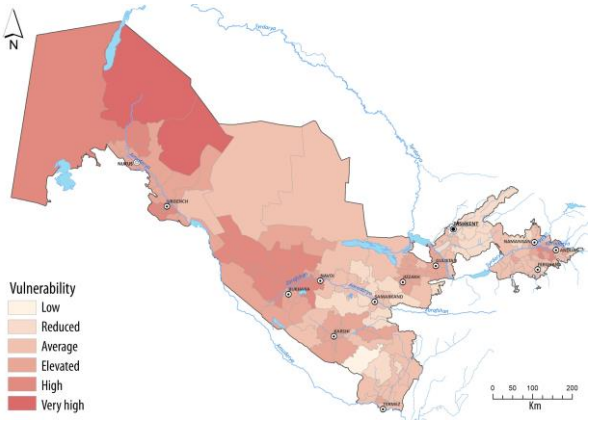


Figure 2.11 Vulnerability to climate change by composite index (IPCC)

2.11.1. Problems of land degradation

Arid areas of Uzbekistan are highly susceptible to land degradation due to low vegetation cover and vulnerability of arid ecosystems to external impacts[31]. About 46% of irrigated land areas are subject to secondary soil salinization. According to expert estimates for the last 25-30 years the shortfall of crop production in the Republic of Karakalpakstan and other regions of the country due to soil salinization is from 0.08 to 10.95 t/ha depending on salt tolerance of crops[32]. Over 40% of pasture areas have been degraded because of anthropogenic load. According to geobotanical surveys (1970-2017), pasture area

[31] GLADIS FAO Global Base, 2023

[32] GEF/FAO/WOCAT (2023) Decision support for mainstreaming and scaling up of sustainable land management - Uzbekistan. Technical report, GCP/GLO/337/GEF

has decreased from 72% to 52% and plant diversity has declined from 103 to 79 species[33]. According to 4NC (2024)[34], pasture productivity is estimated to decrease by an average of 1.5% annually.

2.11.2. Issues Associated with the Shrinkage of the Aral Sea

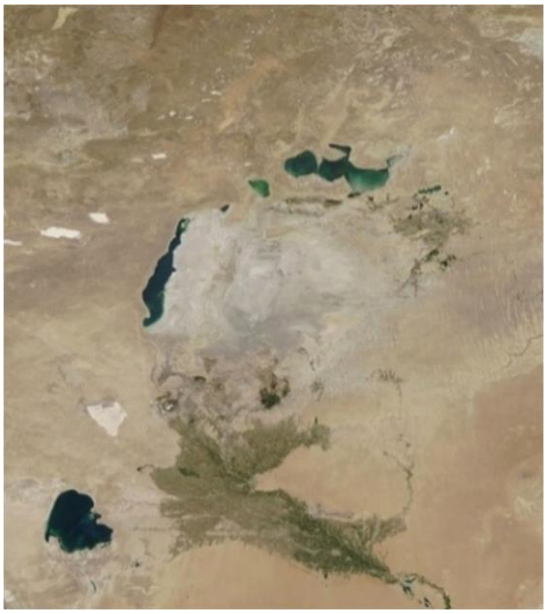


Figure 2.12 Aral Sea, NASA-2021

The ecological situation in the Aral Sea region is one of the most striking examples of a global-scale environmental catastrophe. Once the world's fourth-largest lake, the Aral Sea has dried up and shrunk tenfold in just half a century. In 1960, it covered an area of 68,900 km², but today, its water surface has decreased to just 32.0 km². The sea level continues to decline at a rate of approximately 0.5 m per year, reaching 37.0 m. Meanwhile, salinity has risen to 40 g/L in the northern section and 100 g/L in the western section, rendering the water uninhabitable. The specific ecosystem of the sea consists of plankton (Artemia parthenogenetica) and benthos, which have managed to adapt to the monstrous salinity of the water[35,36, 37].

A new desert “Aralkum” with an area of more than 5.5 million hectares saturated with salt, fertilizers and pesticides has formed on the dried bed, which is the source of emission of more than 700 million tons/year of hazardous dust-salt mixtures into the atmosphere (Figure 2.12). The Aral Sea catastrophe has worsened the region's climate and led to a loss of landscape biodiversity. As a result, more than 50 species of wild animals and plants have disappeared (Turanian tiger, Asian cheetah, striped hyena, etc.) and the number of endangered species has increased (12 species of mammals, 26 species of birds and 11 species of plants). Total direct and indirect losses caused by the ecological disaster in the Aral Sea region amounted to $146 million/year[38] (according to other sources 144.83 million/year[39]).

The Government of Uzbekistan has taken several initiatives to address these problems: major afforestation programs have been launched, a UN Multi-partner Trust Fund on Human Security for the Aral Sea Region in Uzbekistan has been established, a resolution by the UN General Assembly (18.05.2021) to declare the Aral Sea region as a zone of environmental innovation and technology has been adopted, and an Integrated Roadmap for Sustainable Development of the Aral Sea Region has been developed (January 2022).

2.12 Impact of economic changes on GHG emissions by economic sector

The impact of economic change on GHG emissions is a complex and multilevel problem that depends on many factors. Among them, the key ones are:

[33] LDN/Global Mechanism (2019). Summary Report on the LDN Target Setting Program in the Republic of Uzbekistan, 2019
[34] https://www.wri.org/applications/aqueduct/country-rankings/
[35] https://gov.uz/ru/eco/news/view/18654 ; https://uznature.uz/ru/legislation/view?id=765 ; https://lex.uz/ru/pdfs/4372841
[36] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[37] https://7universum.com/ru/nature/archive/item/16991
[38] WB (2018). The Value of Landscape Restoration in Uzbekistan to Reduce Sand and Dust Storms from the Aral Seabed
[39] https://unesdoc.unesco.org/ark:/48223/pf0000374222

- Economic growth based on the use of fossil fuels for energy production and the growing energy needs of industry and transportation.
- Increasing population, leading to higher energy consumption, construction rates and increased transportation services, contributing to higher emissions.
- Rising living standards, as people become wealthier, they consume more goods and services and this in turn requires more energy and resources.
- Inefficient use of resources.

Uzbekistan is a country with a rapidly growing population. In 2023, its population reached 36.025 million people[40], the annual growth of the permanent population amounted to 774.9 thousand people, or 2.2% and in relation to 2010, the population increased by 26.1%.

The average annual GDP growth for the period 2010-2021 is 6.3%. In 2022, Uzbekistan's GDP increased by 5.7% and by 6.0% in 2023.

The services and Agriculture sectors are the most important parts of the economy (Figure 2.13). In 2023, the services sector accounted for 43.4% of GDP, while agriculture, forestry, and fisheries accounted for 24.3%, industry accounted for 26.1%, and construction accounted for 6.2%. Over the period 2015-2021, there is a gradual increase (+8%) in the contribution of the industry sector. The growth in the sector is mainly caused by the increase in the value added of mining and manufacturing.

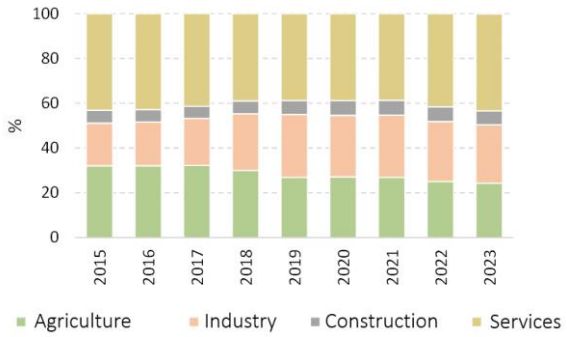


Figure 2.13 Dynamics of GDP structure by types of economic activity

In the structure of fuel and energy resources consumption, the share of natural gas is 60.2%, electricity accounted 14%, oil products (motor gasoline, diesel fuel, fuel oil, etc.) accounted 11.7% (Figure 2.14). The population accounts for 35% of the fuel and energy resources consumed, the industrial sector accounted 23%, and transportation accounted 21% (Figure 2.15). Over the period 2010-2022, GHG emissions increased by 20.9% (2010 is the base year for calculating the GHG emission reduction target under NDC). The highest growth rate of total GHG emissions was observed in the period from 2017 to 2021 (+22.1%), which is associated with the growth of energy consumption and intensive development of industrial production. In 2021 maximum GHG emissions reached 212.02 Mt CO_2-eq.

In the structure of total emissions, CO_2 accounts for the largest share. In 2022, its contribution amounted to 64.7%, CH_4 accounted for 28.7%, N_2O accounted for 6.1%, HFCs accounted for 0.5%.

The Energy sector is the largest contributor to GHG emissions (66.4% in 2022). The sector IPPU accounts for 15.0%, agriculture accounted for 17.6%, waste accounted for 5.2% (Figure 2.16).

From 2010 to 2022, there is a decrease in the contribution of the Energy sector (from 73.4% to 63.7%) and an increase in the contribution of the agriculture (from 13.8% to 16.9%) and IPPU sectors (from 8.8% to 14.4%).

Over the period 2010-2022, GHG emissions in the IPPU sector increased by 2 times, mainly due to the development of mineral products production (sheet glass, cement), in the agriculture sector the

[40] https://stat.uz/ru/ofitsialnaya-statistika/demography

increase is by 1.5 times, which is due to the growth of livestock and increased use of synthetic nitrogen fertilizers.

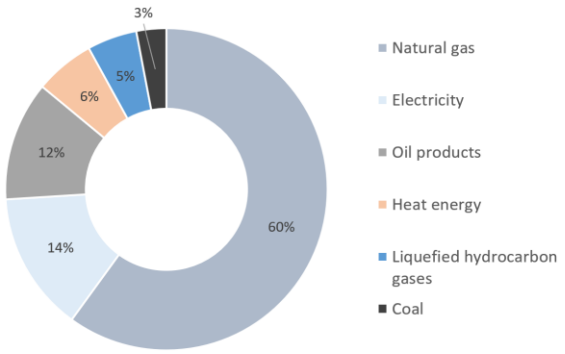


Figure 2.14 The structure of fuel and energy resources consumption by type (2023)

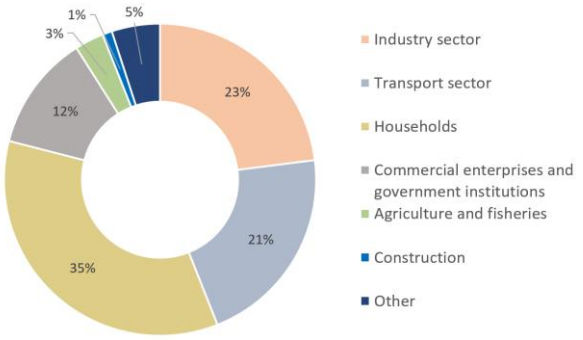


Figure 2.15 The structure of fuel and energy resources by consumption category (2023)

The Energy sector includes two categories: (1) fuel combustion activities and (2) fugitive emissions from fuels. In 2022, the GHG emissions from fuel combustion accounted for 81.2% and the fugitive emissions from oil, gas, and coal mining accounted for 18.8%. In the period 2010-2016, there was a trend towards stabilization of sectoral GHG emissions. This was due to the systematic elimination of natural gas leaks in the oil and gas sector, as well as to energy efficiency improvements in all industrial and Energy sectors. After 2017, further growth in emissions was observed due to the increase in fuel consumption (in heat and power generation, commercial and residential sectors, transportation). The Energy sector increased by 15.0% relative to the 2017 level and reached 133.5 Mt CO_2-eq in 2022.

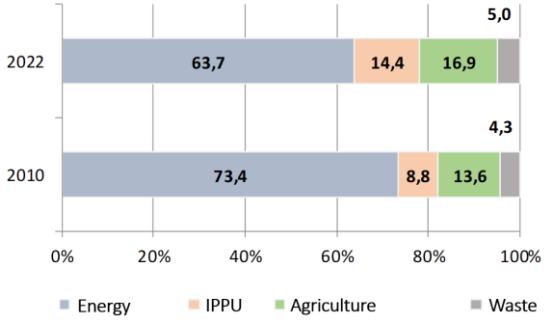


Figure 2.16 Change in the structure of GHG emissions by inventory sectors (2010- 2022)

The contribution of the Waste sector to total emissions was 5.2% in 2022. The waste management category accounts for 52% of sectoral emissions, or 5.46 Mt CO_2-eq, of which CH_4 emissions from municipal solid waste (MSW) landfills account for 2.58 Mt CO_2-eq (47.2%) and the emissions from industrial waste landfills are 2.88 Mt CO_2-eq (52.8%).

Between 2010 and 2022, emissions from MSW landfills increased by 23.8%, while emissions from industrial waste landfills doubled. The main reason for the increase in CH_4 emissions from municipal waste was the expansion of the population coverage by centralized waste disposal and an upward change in the waste generation coefficient per capita. CH_4 emissions from industrial waste increased due to increased production in the extractive and manufacturing industries.

In the LULUCF sector in 2022, total CO_2 removals reached 8.46 million tons and accounted for about 4% of the total emission. Overall, the sector's CO_2 uptake increased over the period 2010-2022:

- in the forest land category due to the growth of forest land areas because of the policy of targeted afforestation on desert lands in the Aral Sea region and on the territories of Navoiy and Bukhara provinces.

– in the cropland category due to changes in the structure of cropped areas, including under rice crops, reclaimed lands and fallow lands.

Uzbekistan strives to curb and further reduce GHG emissions in the context of economic growth and systematically introduces the principles of decarbonization. After ratification of the Paris Agreement, the government has been making consistent efforts to improve the national climate change policy.

2.13 Institutional and legal arrangements

2.13.1. Institutional arrangements

Establishing the necessary institutional framework and developing mechanisms to track progress made in implementing and achieving the NDC is a necessary link in terms of climate policy and builds national capacity to:

– Inform the country's leadership of progress and level of aspiration in this area.
– Provide decision-makers with the information they need to decide on courses of action and investments, taking into account national development strategies and SDGs.
– Regular preparation of National Reporting to the international community, which, among other things, reflects the country's achievements in planning and implementing global actions to combat climate change, and which contributes to building trust and mutual understanding, as well as attracting public and private investment.
– Timely fulfilment of international reporting requirements[41].

In 2019, to support the implementation of the Paris Agreement commitments (NDC1), the “Strategy of transition of the Republic of Uzbekistan to a green economy for the period 2019-2030” was developed and adopted, which provides for the implementation of several measures at the state and public levels. In order to effectively organise the work, an Interdepartmental Council on Promotion and Implementation of the Green Economy in the Republic was formed, whose tasks included developing and submitting to the Cabinet of Ministers for approval the annual action plan for implementation of the Strategy. The Council included ministers and the first heads of key ministries and agencies. The Ministry of Economic Development and Poverty Reduction (until 2022) coordinated the activities envisaged by the Strategy.

At COP26 in 2021, Uzbekistan presented an updated NDC2 and increased its ambition by planning to reduce GHG emissions per unit of GDP by 35% from 2010 levels by 2030.

In 2022, Presidential Decree[42] approved several strategic documents[43] and decisions, as well as an *institutional structure to coordinate the transition to a green economy*:

– The organizational powers of ministries and agencies are defined.
– Interdepartmental Council on coordination of measures on transition of the Republic of Uzbekistan to green economy and Donors Coordination Group were established.
– The procedure for coordination and monitoring of implementation of measures defined in the strategic documents and aimed at achieving the objectives of the NDC is established.

The Decree sets objectives:

– On the phased implementation of the state's GHG regulatory infrastructure in 2022-2026.

[41] https://unfccc.int/sites/default/files/resource/Institutional%20arrangements%20handbook_RU.pdf
[42] https://lex.uz/ru/docs/6303233
[43] Program on Transition to Green Economy and Green Growth in the Republic of Uzbekistan until 2030
Concept of transition to a green economy and energy saving in industries
Action Plan for Transition to Green Economy and Green Growth in the Republic of Uzbekistan until 2030.
Target parameters of fuel and energy resources saving in the sectors of economy in 2022- 2026.

- On the formation of a modern monitoring, reporting and verification system in the field of climate change, covering all GHGs.
- On the development of the draft law of the Republic of Uzbekistan "On limitation of GHG emissions".

Based on the adopted decisions, the country has established an institutional structure and defined the roles and powers of the ministries. The following ministries are involved in activities related to the transition to a green economy and the fulfillment of commitments under the Paris Agreement: Ministry of Economy and Finance, Ministry of Energy, Ministry of Ecology, Environmental Protection and Climate Change.

Box 2.1.

As part of the administrative reforms aimed at creating an efficient system of governance in 2022-2023, the structure of state bodies was optimized and new ministries were created.

The *Ministry* of *Economy* and Finance *and* the *Ministry of Employment and* Poverty Reduction of the Republic of Uzbekistan were established on the basis of the Ministry of Economic Development *and Poverty Reduction of the Republic of Uzbekistan and the Ministry of Finance (UP-269, 2022).*

The Ministry of Economy and Finance is responsible for managing the country's economy and for implementing, coordinating and regulating climate change projects and actions.

The Center for Hydrometeorological Service under the Cabinet of Ministers (Uzhydromet) is the national coordinator of the UNFCCC and the Paris Agreement, responsible for reporting and development of the National Climate Change Strategy.

In accordance with the Decree (UP-81, 2023) and Presidential Decree (PP-171, 2023), the Ministry of Natural Resources was transformed into the *Ministry of Ecology, Environmental Protection and Climate Change* with expanded functions, with Uzhydromet (formerly the Center for Hydrometeorological Service) as the Hydrometeorological Service Agency and the Forestry Agency and the Tourism Agency included in its jurisdiction.

The Central Asian University of Environmental Studies and Climate Change and the National Center for Green Transformation and Adaptation to Climate Change responsible for the implementation of commitments made under the Paris Agreement were established under the Ministry.

Ministry of Economy and Finance. The Ministry is responsible for coordinating the transition to a green economy and implementation of green growth principles, including the GHG emission reductions, coordinating the implementation of activities under Article 6 of the Paris Agreement, as well as regulating and coordinating the implementation and management of GHG emissions trading at the national and international levels, and is led by:

- An authorized national authority:
  - Responsible for coordinating activities to promote a green economy and implement green growth principles, as well as reducing GHG emissions in economic sectors.
  - Responsible for coordinating the implementation of measures under the Sustainable Development Mechanism in accordance with Article 13 of the Paris Agreement (Transparency Framework).
- Executive body responsible for regulation, coordination of implementation and management of GHG trade at international and national levels (Emission Trade System - ETS, Joint Credit Mechanism- JCM, etc.), as well as for monitoring and reporting during the implementation of projects in this area.

The Ministry of Energy is an authorized body for the development of green energy, in particular the wide introduction of RES and hydrogen energy, as well as improving energy efficiency and reducing the energy intensity of manufactured products.

The Ministry of Ecology, Environmental Protection and Climate Change performs the functions of developing and implementing a unified state policy in the field of environmental protection, including climate change and is the executive agency of the UN Framework Convention on Climate Change in Uzbekistan.

The work of ministries and agencies is organized by the Interdepartmental Council for the Coordination of Measures for Transition to a Green Economy (Interdepartmental Council).

The main tasks of the Council include:

- Ensuring the full implementation of the measures provided for in the Strategy, Program and Action Plan for the Transition to a Green Economy by state bodies and organizations, local executive authorities, as well as systematic monitoring of their implementation.
- Quarterly hearing of the reports of the heads of state bodies and organizations on the implementation of the planned measures for the development of a green economy.
- Based on continuous monitoring, taking measures to improve the activities of responsible organizations to increase efficiency (Figure 2.17).

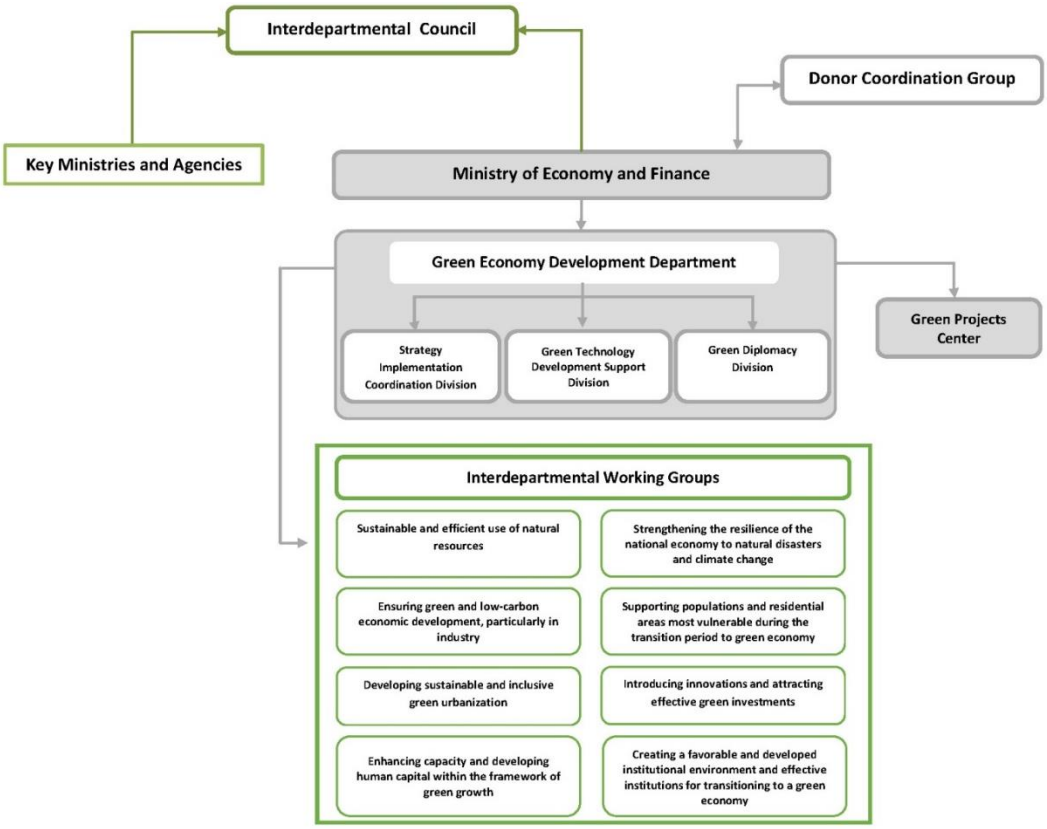


Figure 2.17 Institutional framework for coordinating measures on transition to a green economy

Subsequently, the Interagency Council was assigned additional tasks for the GHG inventory[44], namely:

- Approval of the GHG inventory report.

[44] https://lex.uz/docs/6956104

- Approval and regular updating of internal rules of the inventory system.
- Implementation of coordination of GHG emission reduction activities.
- Taking measures to increase the capacity of inventory system participants.

The head of the Interdepartmental Council is Deputy Prime Minister, Minister of Economy and Finance. The Council includes ministers and first heads of key ministries and agencies.

Donor coordination group. The main task of the group is to coordinate activities on technical support, analysis and capacity building of international financial institutions and development partner organizations operating in the field of climate change and green growth in Uzbekistan. The members included heads of representative offices of the International Financial Institute and international development programs in Uzbekistan.

2.13.2. Development of MRV/transparency system

The country's economy-wide climate change goals and plans, including the NDC, the Green Economy Transition Strategy, the Green Growth Program, and the Action Plan, is monitored by authorized bodies through periodic reporting and performance indicators as follows[45]:

- Ministries and agencies, local executive bodies, enterprises with state participation - to submit a quarterly report to the Ministry of Economy and Finance on the implementation of measures envisaged by the Action Plan and sectoral resource saving programs (Action Plan on practical measures to save fuel and energy resources in 2022-2026), as well as on the achievement of target parameters.
- The Ministry of Economy and Finance at the interagency level coordinates the activities of responsible ministries and agencies and submits generalized analytical information to the Interagency Council on a quarterly basis.
- The Interdepartmental Council submits to the Prime Minister of the Republic of Uzbekistan and the Administration of the President of the Republic of Uzbekistan information on the work carried out at the end of each quarter.

Currently, in accordance with the Presidential Decree[46], the IEF, together with the French Development Agency (AFD), is developing databases for the GHG registry to be created within the National Information Platform, which will be integrated into the Green Economy online platform, in order to develop a monitoring, reporting and verification system.

In 2024, in accordance with Article 13 of the Paris Agreement on Transparency, which aims to regularly assess the effectiveness of measures for mitigating and adapting to climate change, the Presidential Decree titled “On Measures to Implement a National System of Transparency in the Transition to a Green Economy in the Republic of Uzbekistan” was adopted[47]. This decree established a procedure whereby:

- The Ministry of Economy and Finance is defined as the national body of the *National Transparency System* with the following tasks:
  - Effective organization and coordination of the activities of the Ministry of Energy, the Ministry of Agriculture and the Ministry of Investment, Industry and Trade (hereinafter referred to as sectoral coordinators) jointly with the Ministry of Ecology.
  - Identification of national climate change mitigation commitments every 5 years, starting from 2025, based on economic and social impact assessments under the Paris Agreement.

[45] https://lex.uz/ru/docs/6303233
[46] https://lex.uz/docs/6561851
[47] https://lex.uz/docs/6956104

- Control over completeness, reliability and quality of information submitted in accordance with the requirements of the MRV system.
- Development, implementation and maintenance of the MRV system, including development and implementation of an online platform to support reporting in the MRV system.
- Coordination and regulation of GHG emission reductions in economic sectors, including industry.
- Implementation of the national register of GHG emission reductions, coordination of GHG reductions implementation at the national and international levels, ensuring fulfillment of international obligations.

- The Ministry of Ecology carries out the following tasks:
  - Together with Ministry of Economy and Finance preparation of the National GHG Inventory Report under the UNFCCC, integration of the approved report with the National Communication on Climate Change and the Biennial Transparency Reports.
  - Preparation and submission of reports to the UNFCCC Secretariat in agreement with the Ministry of Economy and Finance.
  - Management and protection of protected natural areas, expansion of the forest fund, collection and processing of data on GHG uptake because of expansion and restoration of areas under tree plantations.
- The sectoral coordinators together with the Ministry of Ecology, Ministry of Economy and Finance, as well as other ministries, departments and organizations carry out the following tasks:
  - Participation in the collection, processing of GHG data, ensuring transparency of information and integration with other industry information.
  - Conducting an inventory of GHG emissions in the industry, reporting on the inventory to the National Authority, and ensuring that this information is regularly posted on the Green Economy online platform.

In addition to the existing coordination mechanism under the Presidential Decree (No. UP-106 dated 04.08.2024), the Climate Council under the President of the Republic of Uzbekistan, which is the Supreme Advisory Body on issues related to climate change, was established to improve institutional mechanisms for the formation and implementation of a unified state policy.

The main objective is to monitor Uzbekistan's fulfillment of its commitments under the UNFCCC and the Paris Agreement adopted to enhance the implementation of the Convention.

The objectives of the Climate Council are:

- Effective solutions for problems related to climate change, improvement of internal institutional mechanisms for the formation and implementation of a unified climate policy.
- Effective fulfillment of the obligations assumed by Uzbekistan under the Paris Agreement.
- Accelerating the transition to a low-carbon economy and improving the well-being of citizens.

The following are identified as the main objectives:

- Development of a national climate change mitigation and adaptation strategy and a unified state policy.
- Coordination of effective implementation by ministries and agencies of a unified state policy on climate change mitigation and adaptation.
- Monitoring the fulfillment of Uzbekistan's obligations under the UNFCCC and the Paris Agreement.
- Identification of annual priorities in the implementation of foreign climate policy.

- Improving the base of legal and regulatory documents on climate change mitigation and adaptation.
- Facilitate the provision of resources and finance, including investment mobilization, to support projects on climate change mitigation and adaptation, including green technologies, research and innovation.

The working body of this council is the *National Center for Climate Change* under the Ministry of Ecology[48], which is:

- Authorized body for coordination and preparation for participation of the Republic of Uzbekistan in important international and regional official events on climate change issues, including annual meetings of the UNFCCC.
- Authorized body for coordinating the activities of the Loss and Damage Fund (LDF), as well as the green cities program (implementation of environmental plans of cities, regions, monitoring of their implementation and compilation of environmental rating of cities).

Meetings of the Climate Council shall be organized three times during one calendar year in the form of plenary meetings (once a year) and interim meetings (twice a year).

It is planned that the implemented administrative reform will improve inter-ministerial coordination, contribute to increased transparency and detail of climate reporting and improve the quality of documents (NDC), including because of the creation and development of the MRV system.

The main functions and roles of responsible ministries and agencies with mandates and authority to mitigate and adapt to the impacts of climate change are presented in Annex 1.

2.13.3. Legal Mechanisms and Policy

In order to fulfill the obligations under the Paris Agreement and requirements under the UNFCCC, the country has adopted a number of fundamental laws, decrees and resolutions of the President and the Cabinet of Ministers of the Republic of Uzbekistan, as well as initiated national programs, institutional reforms, and implemented a set of measures and actions aimed at combating climate change and sustainable green development in the long term. In particular, with the support of the World Bank, a long-term Strategy for the Decarbonization of Uzbekistan's Economy is being developed.

In September 2015, Uzbekistan, along with other UN member states, supported the adoption of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs). The Government of Uzbekistan adopted the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On measures to implement the National Sustainable Development Goals and Targets for the Period Until 2030” and approved the National Indicators for achieving the SDGs for the period until 2030.

Uzbekistan actively participates in three Rio Conventions: the Framework Convention on Climate Change, the Convention on Biological Diversity and the Convention to Combat Desertification, as well as in a number of other international conventions, protocols, agreements and memoranda of understanding in the field of environmental protection and sustainable development. A list of international conventions related to climate change adaptation is provided in Annex 2.

Government policies are aimed at enhancing innovation and institutional changes that create an enabling environment for promoting resource conservation, drought mitigation, efficient water use and adapting climate resilient management.

[48] The National Center for Green Transformation and Adaptation to Climate Change in the form of a state institution under the Ministry of Ecology was renamed into the National Center for Climate Change

In support of green economy principles, the country is actively promoting adaptation planning processes for the most vulnerable sectors and regions, and their integration into national and subnational adaptation plans within the framework of the post-Paris climate process and implementation of the NDCs in Uzbekistan. In 2024, an action plan and program on adaptation of agriculture have been approved and launched. Uzbekistan's commitment to advance adaptation and mitigation to climate change is strengthened through adopted long-term strategies, regulatory and institutional frameworks, nationwide programs and action plans (Annex 3). As part of the climate agenda, Uzbekistan is developing a long-term Low Carbon Development Strategy[49].

Below is a list of key legal, policy and sectoral plans and programs documents related to climate change mitigation and adaptation in Uzbekistan that were used in the study to track the country's climate commitments under the Paris Agreement.

Key National Strategic Documents:

- The Paris Agreement Ratification Act (No. ZRU-491 dated 02.10.2018).
- Law on the Use of Renewable Energy Sources (No. ZRU-539 of 21.05.2019).
- Law on Public-Private Partnership (No. ZRU-537 of 10.05.2019).
- Law on Energy Conservation, Rational Use and Improvement of Energy Efficiency (No. ZRU-940 of 07.08.2024).
- Strategy of Transition of the Republic of Uzbekistan to a Green Economy for the Period 2019- 2030 (No. PP-4477 dated 04.10.2019).
- Strategy for Achieving the Goals of the Sendai Framework for Disaster Risk Reduction in the Republic of Uzbekistan Covering 2015-2030 (No. PKM-299 dated 12.04.2019).
- Biodiversity Conservation Strategy for Conservation and Sustainability (No. PKM-484 dated 11.06.2019).
- Development Strategy of New Uzbekistan Until 2026 (No. UP-60-son 28.01.2022).
- Development Strategy of Uzbekistan-2030 (No. UP-158 dated 11.09.2023).
- Concept of Environmental Protection of the Republic of Uzbekistan Until 2030 (No. UP-5863 dated 30.10.2019)
- Presidential Decree “On Establishment of the Climate Council under the President of the Republic of Uzbekistan” (No. UP-106 dated 04.08.2024).
- Decree of the President “On Measures to Further Improve the Activities of the Center for Hydrometeorological Service of the Republic of Uzbekistan” (No. PP-4896 dated 17.11.2020).
- Decree of the President of Uzbekistan “On Measures to Improve the Effectiveness of Reforms Aimed at Transition to a Green Economy and Ensuring Green Growth in the Republic of Uzbekistan Until 2030” (No. PP-436 dated 02.12.2022).
- Decree of the President of the Republic of Uzbekistan “On Measures to Create a Climate-Resilient Agro-Ecosystem and Increase the Resilience of Agricultural Producers to the Risks Associated with Climate Change” (No. PP-233 dated 24.06.2024) and others.
- Decision of the Cabinet of Ministers “On Additional Measures to Accelerate the Implementation of the National Sustainable Development Goals and Targets for the Period Until 2030” (No. PKM- 83 dated 21.02. 2022).
- Resolution of the Cabinet of Ministers “On Approval of the Procedure for Development and Effective Implementation of the National Action Plan on Combating Climate Change Risks and Natural Disasters” (No. PKM-362 dated 11.08.2023).

[49] Towards Sustainable Energy: Low-Carbon Development Strategy of the Republic of Uzbekistan. Summary of the UNDP Project “Supporting Uzbekistan in Transitioning to a Low-Carbon Development Path of the National Economy”

A number of sectoral strategies and plans contribute to the harmonious promotion of a sustainable and inclusive approach of Uzbekistan, including the Strategy for the Development of Agriculture in the Republic of Uzbekistan for 2020-2030, the Concept for the Efficient Use of Land and Water Resources in Agriculture for 2020-2030, the Concept for the Development of the Forestry System until 2030 (2020), the Strategy for Innovative Development of the Republic of Uzbekistan for 2022-2026 (2022), other nationwide programs and plans (Annex 3).

2.14 Description of NDCs under Article 4 of the Paris Agreement, including updated information

NDC1. In 2017, the Republic of Uzbekistan, recalling Decision 1/CP.20 of the Conference of the Parties and in accordance with national circumstances and SDGs, taking into account the country's transition to a resource-efficient growth model, submitted its NDC for the period up to 2030. In the long term to 2030, it was envisaged to strengthen climate change policies and measures to achieve the target of ***reducing specific GHG emissions per unit of GDP by 10% by 2030 compared to the 2010 levels.*** The main indicator to track progress is the indicator of carbon intensity of GDP (kg CO_2-eq/USD), otherwise specific GHG emissions per unit of GDP, or GDP emissions intensity, where the value of annual GDP is expressed in international constant dollars, according to the World Bank. In the preparation of the NDC1, the main sources of information were the results of the inventory carried out in the framework of the preparation of the Third National Communication on Climate Change (3NC, 2016)[50] and the World Bank data:

- GHG Inventory 1990-2012, (3NC, NIR, 2016)
- World Bank database for the Republic of Uzbekistan values of annual GDP (expressed in international constant 2011 dollars).

The following methodological approaches were used to estimate and account for GHG emissions:

- Revised Principles for IPCC GHG National Inventories, 1996.
- IPCC Guidelines for National GHG Inventories, 2006.
- User's Guide for Climate Change Reporting to the Guidelines for the Preparation of National Communications of Non-Annex 1 Countries, 2004.

NDC2. In 2021, Uzbekistan, committed to the effective and transparent implementation of the Paris Agreement and guided by Decisions 4/CMA.1, 1/CP.21, 9/CMA.1, and 18/CMA.1 of the Conference of the Parties, updated its NDC in accordance with current national circumstances and capacities.

The updated NDC2 was prepared by the Interagency Working Group under the overall coordination of the Center for Hydrometeorological Service of the Republic of Uzbekistan (Uzhydromet) and with the support of the United Nations Development Program (UNDP) in Uzbekistan. Representatives of key ministries and agencies, academia and civil society, the private sector and youth participated in the development of the document.

The updated and strengthened NDC of the Republic of Uzbekistan represents progress from the previous NDC1, the country has increased its commitments in NDC2 and is committed to ***reduce specific GHG emissions per unit of GDP by 35% by 2030 from 2010 levels instead of the 10%*** previously envisaged.

Uzbekistan's NDC2 does not provide for an absolute reduction in GHG emissions by 2030, and aims only at some mitigation of emissions growth, without hindering the country's economic development. In fact, the implementation of the NDC2 is directly linked to the country's socio-economic development goals, the national SDGs, and depends on the extent to which the ambitious targets for low-carbon

[50] https://unfccc.int/sites/default/files/resource/TNC%20of%20Uzbekistan%20under%20UNFCCC_english_n.pdf

development and transition to a green economy that have been adopted and integrated into government strategies/programs to be achieved.

Achievement of the long-term goal is envisaged with the support of international organizations and financial institutions, ensuring access to advanced energy-saving and environmentally friendly technologies, and climate finance resources. Uzbekistan's needs for financing required for effective mitigation of climate change and adaptation to its consequences remain significant.

Thus, following Article 4.3 of the Paris Agreement, the Republic of Uzbekistan's NDC2 reflects its highest possible ambitions and represents progress beyond the commitments made in NDC1.

The term of the commitment is from January 1, 2020 through December 31, 2030. A single annual target has been set until 2030. 2010 is defined as the base year.

The main indicator for tracking progress has not changed and remains the same as in NDC1 the carbon intensity of GDP (kg CO_2-eq/USD), in which the value of annual GDP is expressed in international constant dollars, according to the World Bank.

The following are recommended as additional to the 2030 mitigation target:

- Increase the share of RES to 25% of the total volume of electricity generation.
- Double the energy efficiency indicator from 2018 levels, halving the energy intensity of the gross domestic product.

These indicators are included in the National SDGs, the Green Economy Strategy, and the Concept of Electric Power Industry Development.

In the development of NDC2, the main sources of information were:

- First Biennial Update Report of the Republic of Uzbekistan, 2021 (1BUR, 2021)[51], which prepared an inventory for 1990-2017.
- World Bank database for the Republic of Uzbekistan values of annual GDP (expressed in international constant dollars 2011.

The calculation of the updated NDC2 target was based on:

- GHG inventory data from 1990-2017.
- GHG emission projections for the period up to 2030.
- Assessment of progress in implementing the NDC.
- Assessment of the GHG emission reduction potential as a result of the implementation of development strategies and sectoral programs and projects that include the active introduction of renewable sources.
- GDP projections prepared by the Ministry of Economic Development and Poverty Reduction (known as Ministry of Economy and Finance from 2022).
- Main provisions of the Strategy for Transition to Green Economy and sectoral development programs.

The methodologies of the IPCC Guidelines, 2006 were used to estimate GHG emissions in the 1990-2017 inventory. In most cases, default emission factors were used in the calculations. Where possible, national factors were used to estimate emissions in key categories. As a result of the recalculation of GHG emissions for 1990-2012 due to the transition to the use of the IPCC Guidelines, 2006 methodologies and global warming potentials (GWP) according to the IPCC 4th Assessment Report, as well as the refinement of activity data for a number of categories, there were changes in the emission estimates for

[51] https://unfccc.int/documents/283216

this period and differences in the GHG emission estimates obtained in the preparation of the 1990-2012 inventory (under 3NC).

In 2021 NDC Update[52] provides values for total GHG emissions for the base year of 2010 and for 2017, the most recent year presented in the inventory for the development period of the NDC2.

Benchmark values varied as calculation methods were refined and improved in subsequent inventories for 4NC (2024) and 1BTR (2024) (Table 2.4).

In preparing the 1990-2021 Inventory (4NC NIR), estimates of GHG emissions/removals and indirect GHGs were made in accordance with the requirements of the IPCC Guidelines for National GHG Inventories (2006) and GWPs according to the IPCC 4th Assessment Report.

For the preparation of the 1990-2022 inventory (BTR NIR), estimates of GHG emissions/removals and indirect GHGs were made primarily in accordance with the requirements of the IPCC Guidelines for National GHG Inventories, 2006. The IPCC Good Practice Guidance for Land Use and Forestry Inventories, 2003, 2019 Refinement of the IPCC Guidelines, 2006 for National GHG Inventories were also used for selected categories. In according to the IPCC 5th Assessment Report GWPs were used for CH_4, N_2O, and HFCs.

Emissions were calculated using the IPCC 2006 Software (version V.2800) for individual categories using Excel spreadsheets based on the Appendices to the IPCC Guidelines, 2006.

Table 2.4 Total GHG emissions and carbon intensity of GDP at control points (2010 and 2017) based on inventory data from different periods

Source, (inventory years)	Total GHG emissions				Carbon intensity of GDP				Accounting LULUFC
	2010 basic	2017	2021	2022	2010 basic	2017	2021	2022	
	million t CO_2-eq				*kg CO_2-eq /USD$_{2011}$*				
3NC NIR, 2016 (1990-2012)	199.0	-	-	-	4.26	-	-	-	b/accounting
	190.6	-	-	-	4.08	-	-	-	in view of
1BUR NIR, 2021 (1990-2017)	200.1	189.2	-	-	4.28	2.55		-	b/accounting
	187.1	180.6	-	-	4.01	2.43	-	-	in view of
	million t CO_2-eq				*kg CO_2-eq /USD$_{2015}$*				
4NC NIR, 2024 (1990-2021)	171.6	167.4	206.9	-	2.83	1.76	1.77		b/accounting
	174.1	164.7	200.6	-	2.86	1.73	1.71		in view of
1BTR NIR, 2024 (1990-2022)	173.4	171.7	212.0	209.6	2.85	1.80	1.81	1.69	b/accounting
	173.3	169.9	207.5	201.2	2.85	1.78	1.77	1.62	in view of

Table 2.5 summarizes the values of the additional progress indicators for their base years.

Table 2.5 Values of additional progress indicators for benchmarks

Indicator	Base year	Significance
Share of RES in total electricity generation *(%)*	2019 г.	10.2%
Energy intensity of GDP *(tons of oil equivalent/thousand USD)*	2018 г.	0.220

[52] https://unfccc.int/sites/default/files/NDC/2022-06/Uzbekistan_Updated%20NDC_2021_EN.pdf

Gases covered: CO_2, CH_4, N_2O, HFCs. Sectors covered: energy, IPPU, agriculture, LULUCF, and waste.

Cooperative approaches that included the use of internationally transferable mitigation results under Article 6 were not considered during the development phase of NDC2.

Recalculation of emission estimates under the 4NC, NIR inventory (1990-2021). The 2024 National Report: Inventory of Anthropogenic GHG Emissions and Removals in the Republic of Uzbekistan for 1990–2022[53,54] is presented as part of the preparation of the 4NC on Climate Change. In this inventory, emission estimates were recalculated compared to previous estimates from the 1BUR (1990-2017)[55]. The basis for the recalculations were:

- The results of the expert review of the inventory obtained as part of the 1BUR assessment.
- The recommendations of international experts presented in the Voluntary Inventory Assessment Review conducted by the UNFCCC Secretariat in January 2021 as technical assistance to developing countries to ensure the quality of national GHG inventories.
- The National Inventory Improvement Plan (NIIP) prepared in 2023 with technical assistance from the UNFCCC Secretariat.

The recalculations were related:

- Planned activities included in NIIP.
- Specification of emission factors in the Energy sector categories.
- Refinement of activity data in selected categories for the period 1990-2017.
- Inclusion of new categories in the inventory.

In the Energy sector the discrepancies with the 1BUR estimates are mainly due to the recalculation of emissions in the natural gas category using IPCC default average factors. The recalculation was performed in accordance with the recommendations of international experts who performed the inventory assessment. As a result of the recalculation, GHG emissions in the Energy sector decreased by 36%. Previously, national coefficients were used in this category, which led to overestimation of fugitive GHG emissions. This recalculation had the greatest impact on the change in total GHG emissions and on the change in the contribution of methane emissions to total GHG emissions. Additional research is required to develop new national emission factors to be included in the NIIP.

In the IPPU sector, the 1990-2021 inventory estimated GHG emissions for the first time in the glass production, ceramics production, ferroalloys production, calcium carbide production, and lead production categories. The inclusion of new categories resulted in a significant increase in total GHG emissions compared to previous estimates. The largest impact on the increase in emissions in the IPPU sector was due to the inclusion of the glass production category, which contributed 15.3% to total emissions. As a result of the recalculations, emissions in the IPPU sector increased by a factor of 1.5-1.9 compared to previous the 1BUR estimates.

In the Agriculture sector, recalculations were also made relative to the 1BUR estimates. Recalculations were made in the categories of livestock and N_2O emissions from cultivated soils and related to refinement of activity data (livestock population, amount of nitrogen fertilizers applied to soils) and specific default emission factors. In general, the recalculation of emissions in the 1990-2021 inventory resulted in a 9-15% reduction in sector emissions relative to the 1BUR estimates for different years of the time series.

[53] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[54] https://unfccc.int/sites/default/files/resource/NIR_Uzb_rus_26_%2006%202024_%D1%84%D0%B8%D0%BD%D0%B0%D0%BB.pdf
[55] https://unfccc.int/sites/default/files/resource/FBURUzru.pdf

The recalculation of emissions/removals in the LULUCF sector was made due to the refinement of the activity data and emission factors in the Forest Land category and to improve the completeness of the coverage of the carbon pools in the Forest Land (including the soil pool) and Cropland (including the biomass pool) categories. In addition, emissions of GHGs and other gases from forest fires were estimated for the first time in the Forest Land category. Recalculations and changes in the methodologies for estimating carbon dioxide emissions/removals were made in accordance with the recommendations of international experts who evaluated the 1990-2017 inventory and as a result resulted in significant changes both in the trends and in the magnitude of the final values of CO_2 emissions/removals, including for the 2017 level the final removals estimated in the 1BUR are 3.2 times higher than those obtained in the 4NC.

In the Waste sector, recalculations relative to the 1BUR inventory estimates have been made in the solid waste disposal and domestic wastewater treatment and discharge categories. The recalculations are related to:

- The solid waste management category with the inclusion of industrial landfills in the CH_4 emissions estimate and clarification of the activity data and methodology for estimating CH_4 emissions from household landfills.
- The treatment and discharge of domestic wastewater category with clarification of the activity data regarding the coverage of the population included in the calculations (the entire population of the country is included, not only the population using sewerage services), as well as improvement of the methodology for estimating GHG emissions.

These recalculations resulted in a 2.4 to 3-fold increase in GHG emissions in the Waste sector compared to the 1BUR data.

In general, because of recalculations carried out for all sectors, the values of total GHG emissions given in 4NC decreased by 5-26 % relative to the 1BUR estimates for different years of the time series.

The minimum differences in the estimates are determined for 2016 and the maximum differences are determined for 2003.

The largest impact on the reduction of the total emission value was due to the recalculation in the category of fugitive emissions from fuels (natural gas) in the Energy sector.

The recalculations affected changing the contribution of individual sectors to total emissions relative to the 1990-2017 inventory:

- The contribution of the Energy sector decreased from 76.3% (1BUR) to 67.5% (4NC, for 2017 levels).
- The contribution of the IPPU sector increased from 4.5% (1BUR) to 14% (4NC).
- The contribution of the Agriculture sector remained unchanged.
- The contribution of the Waste sector increased from 1.4% to 4.9%.

The results of the total GHG emission values presented in the National Inventory for 1990-2021[56] as presented in Table 3.2.

Recalculations of emission estimates under the 1BTR NIR inventory (1990-2022)

Total GHG emissions were recalculated relative to the 4NC estimates. Recalculations were made at the category, sector, and total inventory levels for the following reasons:

[56] https://unfccc.int/sites/default/files/resource/NIR_Uzb_rus_26_%2006%202024_%D1%84%D0%B8%D0%BD%D0%B0%D0%BB.pdf

- IPCC Fifth Assessment Report GWPs for CH_4, N_2O, and HFCs were used instead of the previously used IPCC Fourth Assessment Report GWPs, in accordance with transparency requirements (Decision 18/CMA.1).
- Implementation the planned activities included in the Near-Term Inventory Improvement Plan (NIIP).
- Specification emission factors in several categories.
- Refinement of activity data in individual categories.

The recalculations result in slightly higher GHG emission estimates under the 1BTR than those previously obtained in the 4NC.

The recalculations had the effect of changing the contribution of individual sectors to total emissions compared to the 1990-2017 inventory:

- The contribution of the Energy sector decreased from 67.5% (4NC) to 66.4% (1BTR, 2024).
- The contribution of the IPPU sector increased from 14% (4NC) to 15% (1BTR).
- The contribution of the Agriculture sector remained unchanged at 17.6%.
- The contribution of the Waste sector increased from 4.9% to 5.2%.

2.15 Information needed to track progress made in implementing and achieving NDC under Article 4 of the Paris Agreement

2.15.1. Methodology for assessing progress made in the implementation and achievement of NDC

Three indicators (one primary and two additional) have been identified to assess the progress of the NDC. The evaluation algorithm includes the following steps

1. Calculate/determine the control and actual values of selected indicators.
2. Evaluate the changes in the indicators over the reporting period.
3. Compare the results with the target values.

The main indicator to track progress of the NDC is specific emissions per unit of GDP, otherwise *GDP carbon* intensity or GDP emission intensity, a measure that estimates the amount of carbon dioxide (CO_2) emissions produced per unit of GDP.

4. In NDC, the value of specific GHG emissions per unit of GDP, GDP carbon intensity, is calculated by the formula:

$$\textit{Carbon intensity of GDP (kg } CO_2\textit{-eq/USD}_{20xx}\textit{)} = \frac{\text{total GHG emissions}}{\text{value } GDP_{20ii}}, \text{ where}$$

in the numerator	the annual value of total GHG emissions according to the current NIR.
in the denominator	the annual GDP_{20ii} expressed in international constant dollars relative to a specific year, currently 2015. The calculations use GDP values from the World Bank database for the Republic of Uzbekistan (www.worldbank.org).

Anthropogenic emissions and removals are estimated through the inventory process for the period 1990-2021, using the 2006 IPCC Guidelines and the GWP from AR5.

Note that the main indicator used to track NDCs differs from SDG Indicator 9.4.1 in the method of calculation (see Box 2).

Calculation of carbon intensity reduction (ΔC, %) is carried out by formula

$$\Delta C_i = \frac{(C_i - C_{2010})}{C_{2010}} 100\%,$$ where:

C_i *is* carbon intensity in the *i-th* year, C_{2010} - carbon intensity in *2010* base year.

Additional indicator 1. Share of electricity generated by RES in total electricity generation (%).

This indicator is included in the list of national indicators for SDG:

- Goal 7: Low-cost clean energy.
- Objective 7.2: Significantly increase the share of RES in the energy balance.
- SDG indicator (7.2.1.): Share of electricity generated by RES in the total electricity generation.

The indicator is a target indicator of the Strategy and Program on Transition to Green Economy, Concept of Electricity Sector Development, Strategy of New Uzbekistan 2030.
Statistically observable indicator. Information from the open databases of the National Statistical Agency under the President of the Republic of Uzbekistan is used to measure progress[68].

Additional Indicator2. Energy intensity of GDP.
Energy intensity of GDP, calculated as the ratio of primary energy consumption to gross domestic product[57].

$$\text{Energy intensity of GDP} = \frac{\text{total energy supply}}{GDP_{PPP}}, \text{ where}$$

in the numerator	annual value of total energy supply in t.e.
in the denominator	value of annual GDP_{PPS} in thousand USD according PPP - Purchasing Power Parity

The indicator is included in the list of national indicators for the SDG:

- Goal 7: Low-cost clean energy.
- Target 7.3: Double the energy efficiency improvement indicator by 2030.
- SDG indicator (7.3.1.): Energy intensity calculated as the ratio of primary energy consumption to GDP.

This indicator is a target indicator of the Strategy and Program on Transition to Green Economy, Strategy of New Uzbekistan 2030.

Statistically observable indicator. Information from the open databases of the national Statistical Agency under the President of the Republic of Uzbekistan is used to measure progress.
The assessment of the progress made in the implementation and achievement of the NDC was conducted in accordance with the Technical Guidelines for Developing Countries (2023)[58].

2.16 Assessment of progress made in the implementation and achievement of NDC

Key Indicator. Uzbekistan's quantitative commitment under the Paris Agreement (updated *NDC*, 2021) is to *reduce specific GHG emissions per unit of GDP by 35% by 2030, relative to 2010 levels.*

Specific GHG emissions per unit of GDP, or *carbon intensity of GDP,* is a universal indicator for assessing the environmental impact of industrial production. It reflects the intensity of energy use, the energy efficiency of production technologies, and the use of fossil fuels. It gives an idea of how efficiently the economy uses carbon resources to create an economic product.

To assess the progress of the NDC, the calculation of the carbon intensity of GDP was based on the 1990-

[57] https://nsdg.stat.uz/goal/10
[58] https://unfccc.int/sites/default/files/resource/ETF%20Handbook-Edt2_RU.pdf

2022 inventory conducted during the preparation of this Transparency Report (1BTR, 2024).

Box 2.2.

Definition of Indicator 9.4.1 SDGs

Goal 9: Industrialization, innovation and infrastructure

Target 9.4: By 2030, modernize infrastructure and retrofit industrial plants to make them sustainable through improved resource efficiency and increased use of clean and environmentally sound technologies and industrial processes, involving all countries concerned according to their individual capabilities.

Indicator 9.4.1: CO_2 emissions per unit of value added. Currently measured as CO_2 emissions per unit of GDP in PPP terms.

However, there is a warning in the comments and limitations of the indicator metadata that data on energy consumption and GDP production in PPP terms may come from different sources, which may cause data compatibility problems.

To make the main indicator of the NDC transparent and unambiguously understood, the calculations use the value of annual GDP (expressed in international constant dollars) from the World Bank database for the Republic of Uzbekistan.

Estimates of GHG emissions/removals and gases with indirect greenhouse effect in this inventory were performed mainly in accordance with the requirements of the "IPCC Guidelines for National GHG Inventories, 2006". Also "IPCC Good Practice Guidance for Land Use and Forestry Inventories, 2003", "2019 Update to the IPCC Guidelines, 2006 for National GHG Inventories" were used in selected categories. IPCC Tier 1 methodologies were mainly used in the preparation of the inventory. Emissions were calculated using the IPCC 2006 Software (version V.2800). For individual categories, calculations were performed using Excel spreadsheets based on the Appendices to the IPCC Guidelines, 2006.

The carbon intensity of GDP was calculated for two variants of the values of total GHG emissions: one without considering removals in the LULUCF sector and one considering removals from LULUCF. The change in the indicator of carbon intensity of GDP from the level of 2010 was calculated (see Table 2.6).

Table 2.6 Change in the carbon intensity of GDP from the 2010 level

years	GDP_{2015}, billion	GHG emissions, *Mt CO_2-eq*		Carbon intensity of GDP, *kg CO_2-eq/dollar$_{2015}$*		Decrease of GDP carbon intensity, *% to 2010*	
		excluding LULUCF	including LULUCF	excluding LULUCF	including LULUCF	excluding LULUCF	including LULUCF
2010	60.88	173.44	173.27	2.85	2.85		
2011	65.46	171.49	169.85	2.62	2.59	-8.0%	-8.8%
2012	70.11	167.48	165.33	2.39	2.36	-16.1%	-17.1%
2013	75.22	169.60	167.95	2.25	2.23	-20.8%	-21.5%
2014	80.39	170.78	166.70	2.12	2.07	-25.4%	-27.1%
2015	86.2	166.98	163.08	1.94	1.89	-32.0%	-33.5%
2016	91.31	171.37	168.32	1.88	1.84	-34.1%	-35.2%
2017	95.32	171.74	169.86	1.81	1.78	-36.8%	-37.4%
2018	100.93	187.78	186.26	1.87	1.85	-34.7%	-35.2%
2019	106.96	188.25	186.29	1.76	1.74	-38.2%	-38.8%
2020	109.1	187.88	184.86	1.72	1.69	-39. 6%	-40.5%
2021	117.18	212.02	207.49	1.81	1.77	-36.5%	-37.8%
2022	123.82	209.61	201.15	1.69	1.62	-40.6%	-42.9

Over the period 2010-2022, the value of the carbon intensity indicator of GDP decreased by 40.6 % (Figure 2.18) excluding the LULUCF sector and by 42.9 % including LULUCF removals.

Decrease in the indicator of carbon intensity of GDP from the level of 2010 is due to the outstripping growth rate of GDP relative to the growth rate of total GHG emissions.

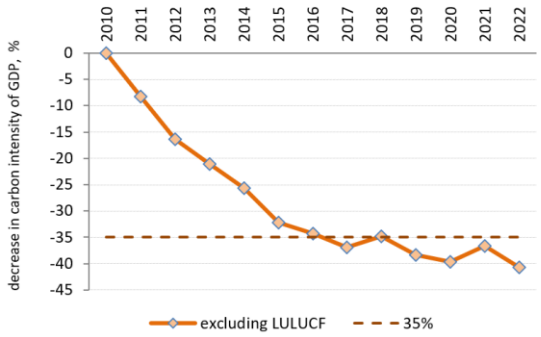


Figure 2.18 Decrease in carbon intensity of GDP from the 2010 level

Additional Indicator 1. The following was recommended as the first Additional indicator to the 2030 mitigation target: *To increase the share of RES to 25% of the total electricity generation volume.*

RES technologies are a key part of the strategy to green the world economy and solve the global climate change problem. If Uzbekistan fulfills this additional commitment, it will be able to reduce its dependence on fossil fuels, reduce GHG emissions, and achieve its climate goals. This will also contribute to economic development.

The year 2019 was selected as the initial point for monitoring this indicator due to the approval of the Strategy for Transition to a Green Economy and the adoption of the Concept of Electricity Supply to the Republic of Uzbekistan for the period 2020-2030. The Concept of Electricity Supply of the Republic of Uzbekistan for 2020-2030, which incorporates this indicator within its list of anticipated outcomes, is a pivotal document in this regard. Table 2.7 provides a comprehensive overview of the indicators for the past five years. At present, the RES contribution to the total volume is predominantly influenced by hydropower, and electricity generation is contingent on the annual water availability. Beginning in 2021, the country initiated a substantial expansion of large-scale PVPP and RES projects, which are scheduled to be fully operational in the near future.

Table 2.7 Share of electricity produced from RES in the total electricity generation volume

	2019	2020	2021	2022	2023
Share of RES (%)	10.2	7.5	7.0	9.3	9.7

Additional Indicator 2. Double the energy efficiency indicator relative to the 2018 level, halve the energy intensity of GDP by 2030.

The growth of production in the economy is due to the increased consumption of fuel and energy resources (FER), which are strategic raw materials. The efficiency of FER use is one of the most important indicators of the level of development and growth factors of energy demand and energy security. The energy intensity of GDP is used as one of the indicators characterizing the efficiency of FER use at the macro level. Reduction of energy intensity leads to limitation of emissions of carbon dioxide and other pollutants. Therefore, it is important to reduce the energy intensity in order to achieve the goals of the NDC, which is directly related to the use of more efficient technologies, reduction of energy consumption in production processes and transition to clean energy sources. This indicator is a target indicator of the Strategy and Program of Transition to Green Economy, Strategy of New Uzbekistan 2030.

Table 2.8 and Figure 2.19 present the energy intensity of GDP according to the national SDG indicators[59].

Table 2.8 Dynamics of GDP energy intensity indicator (tons of oil equivalent/thousand USD)

2010	2011	2012	2013	2014	2015	2016	2017	2018 basic	2019	2020	2021	2022	2023
0.426	0.384	0.299	0.275	0.237	0.218	0.204	0.202	0.200	0.193	0.168	0.159	0.139	0.126

There is a trend to reduce the energy intensity of the economy in relation to years:

- By 3.4 times by 2010.
- By 1.6 times by 2018.

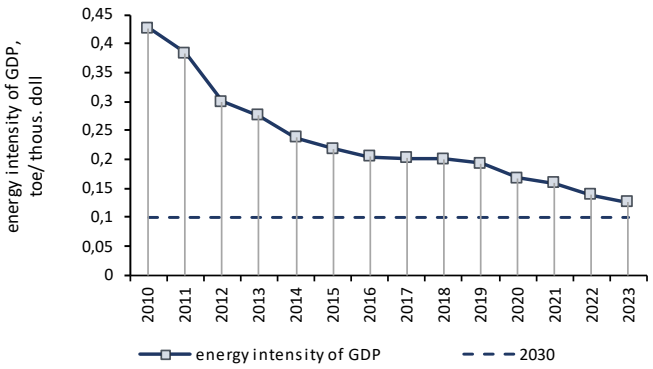


Figure 2.19 Dynamics of GDP energy intensity indicator

Analysis of the dynamics of the quantitative indicators selected to assess progress in the implementation and achievement of NDC has shown (Table 2.9) that:

- Uzbekistan has already achieved the target value for the main indicator and fulfilled its obligations in 2022 by 116%, which confirms the positive impact of the measures taken to achieve the goals of the NDC.
- For the first additional indicator, the achievement of commitments amounted to 39%.
- For the second additional indicator, there is a clearly pronounced trend of reduction in the energy intensity of GDP, which indicates an increase in the energy efficiency of the economy. The level of achievement is 74%.

Table 2.9 Assessment of the level of achievement of NDC targets by indicators

Indicators	2023	2030	Level of achievement $\Delta_{2024\text{-}2030}$ (%)
Main indicator *carbon intensity of GDP, (kg CO_2-eq/dollar$_{2015}$)*	decrease by 40.6% relative to the level of 2010	decrease by 35% compared to the 2010 levels	116%
Additional indicator 1 *share of RES in the total volume of electricity generation (%)*	9.7%	25%	39%
Additional indicator 2 *GDP energy intensity (tons of oil equivalent/thousand USD)*	decrease by 1.6 times against the 2018 level	a 2-fold decrease compared to the 2018 levels	74%

[59] https://nsdg.stat.uz/goal/10

2.17 Policies and measures, actions and mitigation plan that have mitigation co-benefits from adaptation actions and economic diversification plans related to the implementation and achievement of NDC in accordance with Article 4 of the Paris Convention

2.17.1. Methodology

The assessment of current policies and mitigation measures that are in place or have been approved in the last two years was conducted in accordance with the Technical Guidance for Developing Countries (2023)[60] based:

- Analysis of existing and/or new relevant policies, strategies (in all mitigation-related sectors such as energy, Industrial Processes And Product Use, Waste, Land-Use Change And Forestry) and assessment of how well they contribute to climate change and how they are consistent with the policy objectives of NDC.
- Analyzing national institutional frameworks and coordination mechanisms.
- Analyzing development and sector plans and assessment of the integration of climate change mitigation targets.
- Studying analytical reports and analyzing expert assessments in various areas related to climate change is used to assess the effectiveness of mitigation measures.
- Case studies- study and analysis of documents on specific projects that implement mitigation measures and have performance indicators.
- Time series analysis of key indicators (e.g., GHG emissions, SDG indicators, data from the Statistical Agency).
- Modeling techniques to estimate GHG emissions for the future, taking into account implemented and planned mitigation measures.

Quantitative estimates of GHG emission reductions from individual activities were made on the basis of: (a) analysis of IFI project documentation in terms of information on progress indicators that relate to GHG reduction and energy savings, (b) expert assessments of consultants representing interested ministries and agencies, (c) calculation methods.

The following were used to calculate emission reductions:

- A standardized baseline for Uzbekistan's Energy sector: k= 0.532 t CO_2-eq/thousand kWh[61].
- IPCC methodologies (Tier 1 and Tier 2) based on the 2006 IPCC Guidelines and AR5.

2.17.2. Policies and measures, actions and mitigation plans

The objectives of NDC2 are planned to be achieved by:

- Increasing the share of RES in electricity generation to 25% through the construction of solar, wind power plants and small HPPs.
- Further implementation of energy-saving technologies in industry, construction, agriculture and other sectors of the economy.
- Transitioning transportation to alternative fuels.
- Enhancing the fertility of agricultural land.
- Improving the solid waste management system.
- Enhancing water resources management system.
- Expanding forested areas.

[60] https://unfccc.int/sites/default/files/resource/ETF%20Handbook-Edt2_RU.pdf

[61] Clean development mechanism ABS0003 ASB0003Standardized baseline: Grid emission factor for the Republic of Uzbekistan

- Introducing effective incentives for resource mobilization.
- Other measures and actions reflected in the Strategy for the Transition to a Green Economy until 2030[62], which is currently being revised and is planned to be extended until 2050, taking into account the increased ambitions of Uzbekistan on NDCs, and in a number of medium- and long-term sectoral strategies.

Over the past years, the government has paid considerable attention to creating a legal and regulatory framework, improving planning, and developing strategic documents that define the country's long-term development goals. These documents include plans to implement measures and actions aimed at mitigating and adapting to climate change (see Figure 2.20).

Each sector of Uzbekistan's economy develops its own strategic framework, which defines key areas of development, priorities, indicators, as well as the main reforms and practical measures needed to achieve the set goals.

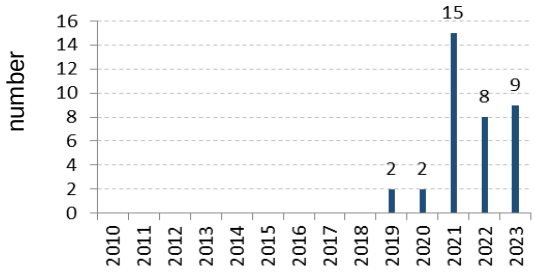


Figure 2.20 SDG Indicator 13.2.1.1: Existence of integrated development programs and strategies that include measures and actions to reduce GHG emissions and enhance climate resilience

The main strategic documents are:

- Strategy for the Transition of the Republic of Uzbekistan to a Green Economy for the Period 2019-2030 (No. PP-4477, 2019).
- Strategy for Municipal Solid Waste Management in the Republic of Uzbekistan for the Period 2019-2028 (No. PP-4291, 2019).
- Strategy of Agricultural Development of the Republic of Uzbekistan for 2020-2030 (No. UP-5853, 2019).
- Digital Uzbekistan 2030 Strategy (No. UP-6079, 2020).
- Strategy for Innovative Development of the Republic of Uzbekistan for 2022-2026 (No. UP-165, 2022).
- Environmental Vision 2030 (No. UP-5863, 2019).
- Concept of Electricity Supply of the Republic of Uzbekistan for 2020-2030.
- Concept of Water Sector Development for 2020-2030 (No. UP-6024, 2020).
- Concept of Forestry Development Until 2030 (No. PP-4850, 2020).

Detailed information on these documents is provided in the 1BUR[63] and 4NC of the Republic of Uzbekistan (2024)[64].

2.17.3. Integrating Climate Mitigation Measures into Uzbekistan's Development Policy for the period 2022-2023

In 2022, the “New Uzbekistan Development Strategy for 2022-2026” was approved, which is synchronized with the objectives of transition to a green economy. Within the framework of seven key areas, 96 goals are defined, each of which has a specific set of targets to be achieved by 2026. Priority areas of particular importance for climate change mitigation and adaptation are integrated into goals 24, 80 and 81.

In 2022, in order to realize the tasks defined in the Strategy of New Uzbekistan, to increase the

[62] https://lex.uz/docs/4539506
[63] https://unfccc.int/sites/default/files/resource/FBURUzru.pdf
[64] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf

effectiveness of measures taken to ensure green growth within the framework of the "Strategy of transition to a green economy", as well as to further expand the use of RES and resource saving, the Presidential Decree "On measures to improve the effectiveness of reforms aimed at transition of the Republic of Uzbekistan to a green economy until 2030" was adopted[65] which approved:

- Program, concept and action plan for transition to green economy and green growth in Uzbekistan until 2030.
- Target parameters of fuel and energy resources saving for the period of 2022-2026, aimed at reducing the energy intensity of products manufactured by 25 leading enterprises by 20% in 2026 relative to 2022.

Program on transition to a green economy and ensuring green growth in Uzbekistan until 2030. The document formulates six priority thematic areas: 1) sustainable and efficient use of natural resources; 2) strengthening the resilience of the national economy to natural disasters and climate change; 3) ensuring green and low-carbon development of the national economy, in particular industry; 4) introducing innovations and attracting effective green investments; 5) developing sustainable and inclusive green urbanization; 6) supporting the most vulnerable segments of the population and their places of residence, during the transition to a green economy. Target indicators defined in this program are presented in Table 2.10. The implementation of the tasks in these areas is carried out along with cross-sectoral measures to build capacity, create effective institutions for the transition to a green economy, as well as increase external and internal flows of green finance.

According to the above-mentioned regulation:

- The infrastructure for state regulation of GHG emissions is being gradually developed, which includes the creation of a GHG register and cadaster, as well as the procedure for implementing investment projects to reduce GHG emissions.
- A modern MRV system for GHG emissions is being implemented.
- The regulation provides for the introduction of electricity storage systems with a capacity of at least 25% of the installed capacity of RES.

In 2022[66], the Action Plan 2022-2026 for the effective achievement of the National SDGs and Targets was approved, which includes important targets in terms of meeting the NDC for goals 7 and 13.

Objective 7	7.1 Ensure universal access to affordable, reliable and modern energy supply 7.2 Significantly increase the share of RES energy in the energy balance. 7.3 Double the energy efficiency improvement indicator 7.B. Expand infrastructure and modernize technologies for modern and sustainable energy supply
Objective 13	13.2 Incorporating climate change mitigation measures into national policies, strategies and planning 13.3 Raise public awareness on prevention of, adaptation to, and early warning about the risks of climate-related hazards.

In 2023, a new version of the Constitution of the Republic of Uzbekistan was adopted, presidential elections were held in accordance with it, and then the program of measures for implementation of the tasks arising from the new version of the Constitution was approved. Among the tasks in the field of environmental protection, the program provides for the implementation of green finance mechanisms, the introduction of green certificates, green credits and other instruments used in international

[65] https://lex.uz/ru/docs/6303233
[66] https://lex.uz/docs/5873508

experience. Under the updated constitutional and legal conditions, it was necessary to improve the main directions of the country's development and bring the ongoing large-scale reforms to a new stage. In this connection, the strategy "Uzbekistan – 2030" was developed and adopted[67]. The implementation of the Strategy and the achievement of its goals have been identified as a priority task for all state bodies and organizations, whose top managers are personally responsible for its implementation. The Strategy "Uzbekistan – 2030" continues the implementation of the "New Development Strategy of Uzbekistan for 2022-2026" and ensures the achievement of all its goals, which have not lost their relevance.

Table 2.10 Key strategic targets and integrated priority areas for climate change mitigation and adaptation by key strategic documents

Directions/objectives	Targets
Development Strategy of New Uzbekistan for 2022-2026	
Target 24 Uninterrupted supply of electricity to the economy, active introduction of "green economy" technologies in all spheres, increase in energy efficiency of the economy by 20%	**By 2026** – Increase the volume of electricity generation by an additional 30 billion kWh to bring the total generating capacity to 100 billion kWh. – Save up to 3 billion m^3 of natural gas by bringing the share of RES to 25%. – Ensure stable operation of the energy system of Uzbekistan and ensuring its reliability in interaction with the energy systems of neighboring countries. – Reduce losses in industries and improve the efficiency of resource utilization. – Widespread introduction of RES and energy efficiency improvement in the housing and utilities sector, at social facilities and in other spheres. – Adoption of measures for the production and use of electric vehicles. – Reduction of GHG emissions per unit of GDP by 10 % by economic sectors.
Target 80 Protection of ecology and environment, improvement of ecological condition of cities and districts, implementation of the nationwide project "Green Krai"	**By the end of 2026** – Increase the level of MSW collection up to 100% and increase recycling change from the current 21% to 50%. – Planting of at least 200 million tree seedlings per year as part of the nationwide project "Yashil Makon". – Transformation of the city of Tashkent into a comfortable environmentally friendly zone for the population, increasing the level of its greening up to 30%. – Organization of public parks in cities and district centers for every 50-100 thousand people. – Creation of an additional 500 thousand ha of green areas on the dried-up bottom of the Aral Sea, increasing their total area up to 2.5 million ha (78% of the territory). – Implementation of projects under GCF and GEF programs in Aral Sea region aimed at climate change mitigation and adaptation, biodiversity protection, and soil erosion control, worth $300 million.
Target 81 Expansion of forest areas	– Expansion of forest areas in the regions of the Republic and effective use of forest lands. – Establishment of forest plantations in mountain and foothill areas. – Plant cultivation in desert areas, creation of protective forests in the regions. – Creation of protective forest belts to protect irrigated lands from erosion and land reclamation objects from sand migration.

[67] https://lex.uz/ru/docs/6600404

Continuation of Table 2.10

Directions/objectives	Targets
Program on transition to green economy and ensuring green growth in Uzbekistan until 2030	
Program targets (PP-436, 2022)	**By 2030** – Reduction of specific GHG emissions per unit of GDP by 35% from the 2010 levels. – Increasing energy efficiency in industry by at least 20%. – Reduction of energy intensity per unit of GDP by 30%, including through increased use of renewable energy sources. – Increase urban green cover to more than 30% by planting 200 million saplings per year and bringing the total number of saplings to more than 1 billion. – Increasing the index of forest reserves of the republic up to more than 90 million m^3. – Increasing the recycling rate of household waste to over 65%.
Target 51 Transition to a green economy, based on a radical increase in the use of renewable energies	**By 2030** – Increased renewable energy to 25 GW and 40% of total consumption. – Development of the market for "green certificates" in industry and introduction of the practice of "eco-labeling". – Reduction of natural gas consumption through the modernization of 3 TPPs with a capacity of 3 GW. – Introduction of an energy audit system for apartments in multi-story buildings. – Transition of all public transportation to environmentally friendly fuel. – Establish a monitoring and reporting system (MRV) for all GHGs in the area of climate change. – Reduce GHG emissions per unit of GDP by 30% from 2010 levels.
Target 52 Uninterrupted supply of necessary energy resources to economic sectors and population	– Increasing the volume of electricity supplied to economic sectors and households to 120 billion kWh. – Increase of natural gas production to 62 billion m^3. – Increase energy efficiency of economic sectors by 2 times. – Establishment of an independent regulator to streamline the energy market, separation of the functions of purchase, sale and supply of electricity. – Modernization of infrastructure for distribution, generation and supply of electricity and natural gas to consumers. – Complete digitalization of accounting for all types of energy resources. – Achievement of sustainable operation of the energy system of Uzbekistan with the energy systems of neighboring states.
Target 53 Deepening the integration of the Republic of Uzbekistan into global transport and logistics networks and increasing the potential of the national transport system	– Increased the share of electrified railroads to 65%. – Construction and repair of 56 thousand kilometers of roads. – Construction of a total of 5.5 thousand km of cement-concrete paved roads from district centers to rural settlements. – Full coverage of cities and districts by public transport, increasing the number of new buses to 5,000 and electric buses to 2,000. – construction of new high-speed railways in the directions Tashkent-Samarkand, Samarkand-Navoiy-Bukhara, increasing the number of passengers transported by high-speed trains by 2.5 times.

The Strategy "Uzbekistan – 2030" includes five priority directions, outlines 99 objectives and defines performance indicators for them, which will be achieved by 2030. Table 2.10 summarizes the main directions and objectives, the achievement of which is directly related to the fulfillment of the country's commitments under the Paris Agreement.

In order to implement the strategies, state programs are adopted for each year, which are developed on the basis of proposals made in the course of broad discussions with the public. In order to achieve the main general economic goals related to the reduction of GHG emissions, the State programs for implementation of the New Development Strategy of Uzbekistan for 2022-2026 include: for 2022- 21 activities and a project on decarbonization of the Energy sector and industry, as well as the development of RES and energy-efficient technologies, for 2023 - 18 activities, taking into account actions on afforestation[68].

The legislative framework for GHG emission reductions includes the following laws:

- An Act ratifying the Paris Agreement (ZRU-491 dated 02.10.2018).
- Renewable Energy Act (No. ZRU-539-sun dated 21.05.2019).
- Environmental Audit Act (No. ZRU-678 dated 15.03.2021).
- Law on Hydrometeorological Activities (No. ZRU-74 dated 12.01.2022).
- On Additional Measures to Accelerate the Implementation of the National Sustainable Development Goals and Targets for the Period Until 2030 (No. PKM-83 dated 21.02.2022).

Laws and analysis of regulations, policies, programs adopted between 2018-2022 and currently in force are presented in the 4NC[69].

In 2023-24, according to the Presidential Decree[70], a draft law titled "On limiting GHG emissions"[71] has been developed, which is aimed at consolidating the legal framework for reducing GHG emissions in the country and establishing the procedure for the treatment of carbon units formed as a result, as well as ensuring systemic control over GHG emissions. The draft law is currently under discussion.

Development of measures and instruments of green financing. In Uzbekistan there is a gradual growth of activities in the field of green financing. While initially this segment was presented mainly in the form of grants from international financial institutions, in recent years other instruments such as green loans and bonds have been introduced.

A significant step in the development of green finance in the country is the adoption of the Action Plan on Transition to a Green Economy and Green Growth in the Republic of Uzbekistan by 2030[72], according to which in 2023:

- A system of "green energy" certificates has been introduced in cooperation with the International Certificate System I-REC.
- The National Taxonomy of Green Economy was approved, which provides for the definition of categories of the main directions of this sphere and the assessment of compliance criteria based on the classification of green activities. The taxonomy will be used to classify the type of investment costs of all economic entities using state financial support, including private and public economic associations and projects financed by green bonds and loans[73].

The development of green credit in Uzbekistan is aimed at creating conditions for sustainable economic growth and promoting environmental responsibility among the population and business. In 2023, the regulation on the procedure for reimbursement of part of interest payments on green consumer loans was approved.[74]

[68] https://lex.uz/ru/docs/6396150
[69] https://unfccc.int/sites/default/files/resource/FBURUzru.pdf
[70] https://lex.uz/ru/docs/6303233
[71] https://www.senat.uz/ru/events/post-2465
[72] https://lex.uz/ru/docs/6303233
[73] https://lex.uz/ru/docs/6646012
[74] https://lex.uz/ru/docs/6623340

Green bond issuance is underway and three thematic bonds have been issued in a short period of time: the first in 2020.- A sovereign sustainability bond (called a “sustainability target bond”) and two green bonds in 2023: one sovereign and one corporate. These successes have made Uzbekistan a leader in this area in Central Asia, where target bonds are still a new financial instrument. For the first time, Uzbekistan placed green bonds worth 4.25 trillion UZS and international bonds worth $660 million on the London Stock Exchange (See section 4).

Implementation of ESG principles. In Uzbekistan, state-owned companies and the private sector have started to incorporate ESG principles into strategic planning and reporting, especially in sectors related to foreign investment and to determine their level of climate responsibility- to develop GHG emission reduction strategies/plans and targets at the scale of their operations. Financial institutions, particularly banks, are increasingly interested in green projects and lending, and international organizations are supporting efforts to improve ESG capabilities. For example:

- In 2022, Uzbekneftegaz JSC established an intra-corporate ESG responsibility center.
- Tobacco manufacturer BAT-Uzbekistan is investing in energy-efficient equipment and diversifying its energy consumption.
- In 2023, Artel included ESG in its long-term strategic development plans.
- In the spring of 2024, Uzpromstroybank and Ipoteka-bank reported on the creation of an ESG strategy, followed by Asakabank and Tenge Bank.
- Beeline Uzbekistan has an ESG project called Go Green, where company volunteers collect garbage and plant trees.

According to the analysis of companies' awareness of ESG, currently 46% of the surveyed companies demonstrate a comprehensive understanding of ESG practices. An important factor is the adoption of the “Uzbekistan 2030” strategy, which is socially oriented and meets ESG criteria.

2.17.4. Energy sector

After signing the Paris Agreement, Uzbekistan identified the green economy as a strategic priority, one of the main components of which is the transition to green energy. In the Energy sector, the government is implementing several reforms aimed at modernizing and improving the efficiency of the sector[75,76]. Key aspects of the reforms include:

1. Legislative changes: Introduction of new laws and regulations that govern the Energy sector to create a more predictable and stable regulatory environment for investors. Laws “On Ratification of the Charter of the International Renewable Energy Agency (IRENA)” (No. ZRU-432, 2017); “On the Use of Renewable Energy Sources” (No. ZRU-539, 2019); “On Public-Private Partnership” (No. ZRU-537, 2019), “On Amendments and Additions to the Law of the Republic of Uzbekistan “On Rational Use of Energy” (No. ZRU-628, 2020), “On Electric Power Industry” (No. ZRU-939, 2024) have been adopted.
2. Diversification of energy sources: Uzbekistan seeks to reduce dependence on fossil fuels. Solar and wind energy projects are being actively developed, which helps to diversify the country's energy matrix.
3. Attracting investment: To implement new energy projects, Uzbekistan is opening the market to private investors and foreign companies, using the mechanism of public-private partnership (PPP), which contributes to improving efficiency and introducing modern technologies.

[75] https://unfccc.int/sites/default/files/resource/FBURUzru.pdf
[76] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf

4. **Infrastructure improvement:** The reform includes modernization of existing energy facilities, renewal of thermal power plants and grid infrastructure.
5. **Energy efficiency:** Energy efficiency programs aimed at reducing energy losses and improving consumption management.
6. **Development of information transparency of infrastructure and wholesale electricity market:** Digital platform technologies for analysis and control of data on production, distribution and consumption of energy are being developed and implemented, regular audits and inspections are conducted to ensure compliance with standards and norms. The process of liberalization of the energy market and introduction of a new system of electricity tariffs based on market principles has been initiated.
7. **Participation of international organizations:** Uzbekistan cooperates with organizations such as the World Bank, Asian Development Bank, EBRD and others to obtain technical and advisory assistance for reforms.

The following targets have been set for the development of the sector:[77]

- By 2025, the power system capacity is expected to reach 25.6 GW, of which thermal power plants will provide 18.8 GW, hydroelectric power plants 2.5 GW, and solar and wind power plants 4.3 GW. At the same time, physically obsolete plants will be gradually decommissioned.
- By 2030, the total generation capacity will reach to 29.2 GW. As a result, in 2030, electricity generation will amount to 120.1 billion kWh (compared to 78.0 billion kWh in 2023).

To create a competitive environment in the Energy sector, increase the inflow of foreign and private investments into the industry, and organize an efficient electricity market based on the introduction of free and transparent pricing mechanisms, the *Concept of phased transition to wholesale and retail electricity market mechanisms until 2030* was developed and adopted in *2023*[78].

In 2023, in cooperation with the International Certificate System I-REC, a system of green energy certificates[79], confirming the generation of electricity using RES, was introduced. From 01.07.2023 for electricity generated by hydroelectric power plants of the system of JSC Uzbekhydroenergo, from 01.10.2023 for electricity generated by solar, wind and hydroelectric power plants, as well as from other RES[80]. The certificates are offered for sale on the exchange of commodities. The sale of I-REC certificates allows the country to demonstrate environmental responsibility and commitment to the use of RES.

In order to introduce new mechanisms of state control over the use of fuel and energy resources, the introduction of automated control and metering systems for the use of electric power and natural gas, improvement of state control mechanisms and introduction of the “Digital Energy Control” system in the fuel and Energy sector has been initiated[81].

From 2019, all leading companies in the sector are developing development strategies and reporting based on ESG principles.

Electricity

Construction and modernization of thermal power plants. Thermal power plants (TPPs) account for the bulk of generating capacity (about 85%). To ensure stable energy supply, the development programs envisage the construction of highly efficient thermal power plants, modernization and expansion of

[77] https://minenergy.uz/ru/news/view/1476
[78] https://lex.uz/ru/docs/6624460
[79] A “Green Energy Certificate” is an electronic document certifying that 1,000 kWh of electricity has been generated from solar, wind, hydro and other renewable energy sources.
[80] https://www.lex.uz/uz/docs/6464658
[81] https://lex.uz/ru/pdfs/6472930

existing TPPs through the introduction of modern combined cycle CCGTs. By 2030, 15.6 GW of new and modernized generating capacities of TPPs are forecasted to be commissioned[82].

In 2022, 6 new TPPs with a total capacity of 1,374 MW were commissioned in Tashkent, Khorezm, Bukhara and Kashkadarya regions. As a result, natural gas savings amounted to 1,455 million tons of m^3, which reduced GHG emissions by 2.8 Mt of CO_2[83]. In October 2023, the first power unit (120 MW) of the TPP in Syrdarya region (Shirin, Bayavut district), which is constructed with the participation of ACWA Power, started operation.

According to the Investment Program for 2022-2026[84] and the Presidential Decree "On Measures for Implementation of the Investment Program of the Republic of Uzbekistan for 2023-2025", an address list of capacities[85] to be commissioned has been defined (additional 6.9 GW of capacity will be added and 700 new jobs will be created, the estimated emission reduction is about 13 Mt of CO_2 (Table 2.11).

At the same time, the introduction of gas turbines (GTs) in combined heat and power plants continues, and a total of about 20 CCGT/GTU units planned to be installed in the future.

Table 2.11 TPP construction and modernization projects to be implemented in 2020-2026

	Project	Date commissioning	Reduction of emissions, thousand tons of CO_2	Planned	
				Energy production	Saving of natural resources, gas million m^3
Construction	Construction of combined-cycle TPP in Surkhandarya region, Angor district *(PPP - Siemens Energy, IDEF, Stone City Energy, Germany, France, Netherlands)*	2020-Jan. 2026	1 907.2	12.0 billion kWh of electricity	1000
	Construction of TPP in Syrdarya region (Shirin town, Bayavut district) *(PPP - The International Company for water and power projects, CA)*	2020-2024 1 e/block 27.10.23	3 814.5	10.0 billion kWh of electricity	2000
	Construction of TPP Syrdarya-2, in Syrdarya region, Shirin city. *(PPP - EDF, Nebras Power, Sojitz Corporation, France, Qatar, Japan)*	2022-Jan. 2026	2800	12.0 billion kWh of electricity	1100
	Construction of 2 new gas turbine units at Tashkent CHPP JSC	08.05.24 completed	0.4	515.6 million kWh of electricity, 690.3 thousand Gcal t/e	0.219
	Expansion of JSC Talimarjan TPP with construction of CCGT	2019-2025	991.8	7.2 billion kWh of electricity	520
	Construction of the third CCGT at Navoiy TPP JSC	2023-2026	1 777.5	4.9 billion kWh e/e, 931.4 thousand. Gcal t/e	932
	Construction of the fourth CCGT of Navoiy TPP JSC	After 2025	1 777.5	4.9 billion kWh e/e, 931.4 thousand Gcal t/e	932
	Total		13 068.9		6 484.2

[82] https://gov.uz/ru/minenergy/pages/about
[83] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[84] https://lex.uz/uz/docs/5801125
[85] https://lex.uz/docs/6329453

Continuation of Table 2.11

	Project	Date commissioning	Reduction of emissions, thousand tons of CO_2	Planned	
				Energy production	Saving of natural resources, gas million m^3
Modernization	Reconstruction of 3-turbine unit of Fergana CHPP	Q3 2025			
	Expansion of Mubarek CHPP through construction of 4 gas turbines (1-stage)	2027			
	Construction of cogeneration technologies in CHPP No. 4 in Tashkent	2024			
	Implementation of cogeneration projects in 6 mahallas of Tashkent city located at the last heat supply points	2026			

RES development and deployment. Uzbekistan has significant potential in the field of RES, primarily in solar and wind energy, and is well equipped to meet the growing needs in the transition to clean energy. In recent years, the government has paid great attention to the development of this sector and the creation of an appropriate legal framework. An attractive environment for investors has been created. Major programs for the construction of green energy production facilities have been launched. According to the President of Uzbekistan Sh.M. Mirziyoyev, "Green energy is becoming one of the drivers of our economy and a truly national movement"[86].

The Government has set a goal to increase the share of RES in electricity generation to 25 GW or 40% of the total electricity consumption in the country by 2030. Comprehensive state support is provided for the development and introduction of RES, the main measures of which include:

- Introduction of requirements to achieve established indicators for increasing the share of RES in total electricity production (number of solar and wind installations, indicators of RES capacity growth).
- Development of the legislative and regulatory framework.
- Provision of targeted state subsidies, tax incentives, and loans to RES producers and consumers.

Since 2017, the country has adopted several legal and regulatory documents aimed at creating conditions for the active implementation of RES[87,88], but the regulatory framework is in constant development. In 2022-2023, new requirements are set[89] according to which:

- Identification of potential investors for the implementation of industrial-scale RES projects (1 MW and above, excluding hydropower plants) was carried out through transparent auction bidding.
- Starting from January 1, 2024, as part of investment projects for the construction of new solar power plants (PVPPs) and wind power plants (WPPs) with a capacity of over 1 MW, an electric energy storage system with a capacity of at least 25% of the installed capacity must be introduced on a mandatory basis.

The Government has defined the main directions of state support for the wide use of RES by the population and business entities and the mechanisms for their implementation[90]: (i) financial incentives for the purchase of RES equipment by the population and business entities; (ii) implementation of

[86] https://president.uz/ru/lists/view/7055
[87] https://unfccc.int/sites/default/files/resource/FBURUzru.pdf
[88] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[89] https://lex.uz/uz/docs/6189043
[90] https://lex.uz/uz/docs/6189043

targeted measures for the use of alternative energy sources in buildings and structures for administrative and household purposes; (iii) support for business entities engaged in the production of solar and wind power plants:

- Since October 1, 2022, a system of benefits and compensations funded by the Intersectoral Energy Saving Fund has been introduced. Low-income families will receive RES equipment funded by the local budget, while legal entities engaged in RES production will receive tax benefits for three years. The digital online platform of the Intersectoral Energy Saving Fund, under the Ministry of Energy of the Republic of Uzbekistan[91], allows individuals to apply for compensation or installment plans[92].
- New rules for the sale of RES energy, customs requirements for the import of RES equipment, and tax incentives for individuals installing RES[93].
- Since April 1, 2023, the "Solar House" program has been launched, under which state budget subsidies are allocated to encourage the installation of small-capacity solar panels (up to 50 kW) in households across the regions. The program aims to install solar panels in the homes of 37,000 residents[94].

Construction of large solar and wind power plants based on public-private partnership is envisaged by the Investment Programs[95,96] and the address list in the Presidential Decree "On Measures to Accelerate the Introduction of RES and Energy Saving Technologies in 2023"[97] (Table 2.12). This Decree also includes plans to introduce low-capacity RES in the social sphere, housing and communal services, and economic sectors, as well as several measures to ensure compensation of energy deficit by improving energy efficiency on a national scale.

Table 2.12 Projects for construction of large PV power plant (PVPP) and wind power plants (WPP) based on PPP

	Project	Implementation Timeline, commissioning	Reduction of emissions, thousand tons of CO_2	Electricity generation million kWh
Construction of PVPP				
Commissioned	PVPP (100 MW) Navoiy region, Karmaninskiy district *(PPP, "Masdar", UAE)*	2020-2021, comm. Aug. 2021	138.3	260
	PVPP (100 MW) Samarkand region, Nurabad district *(PPP, "Total Eren" France)*	2020-2021, comm. May 2022	138.3	260
Total			276.6	520
In progress	PVPP (220 MW) Samarkand region, Kattakurgan district *(PPP, Masdar, UAE), NUR SAMARKAND Solar PV Ltd.*	Stage 1 Dec. 2023	11.2	21
		comm. May 2024	304.3	572
	PVPP (220 MW) in Jizzakh region, Gallyaaral district (PPP, "Masdar", UAE), "NUR JIZZAKH Solar PV" Ltd.	Stage 1 Dec. 2023	11.2	21
		comm. May 2024	304.3	572
	PVPP (457 MW)Surkhandarya region, Sherabad district *(PPP, Masdar, UAE), NUR SHERABAD Solar PV Ltd.*	Stage 1 Dec. 2023	11.2	21
		comm. 2024	632.0	1188

[91] https://energymarket.uz/
[92] https://lex.uz/ru/docs/6303233
[93] https://lex.uz/ru/docs/6385720
[94] https://lex.uz/ru/docs/6385720
[95] https://lex.uz/uz/docs/5801125
[96] https://lex.uz/ru/docs/6329453
[97] https://lex.uz/ru/docs/6385720

Continuation of Table 2.12

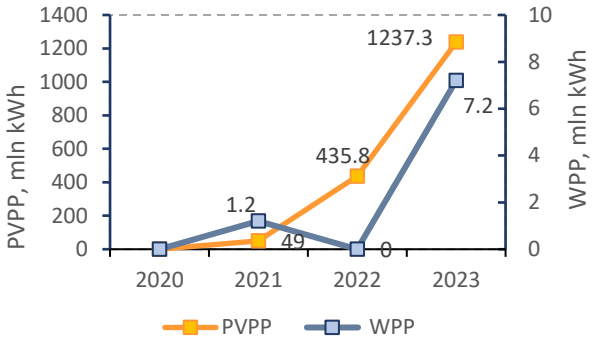
	Project	Implementation Timeline, commissioning	Reduction of emissions, thousand tons of CO_2	Electricity generation million kWh
In progress	PVPP (500 MW) Bukhara region, Karaulbazar district *(PPP, Masdar, UAE)*	Stage 1 Dec. 2023	22.3	42
		comm. Dec. 2024	691.6	1300
	PVPP (500 MW) Kashkadarya region, Nishan district (*China Gezhouba Group Overseas Investment)*	Stage 1 Dec. 2023	22.3	42
		comm. Dec. 2024	691.6	1300
	PVPP (1000 MW) Samarkand region, Nurabad district *(PPP, Masdar, UAE)*	Stage 1 Dec.2023	22.3	42
		comm. Dec. 2024	1383.2	2600
	PVPP (2000 MW) Samarkand, Namangan, Bukhara and Tashkent regions *(Tepelen Group AG, Switzerland)*	Stage 1 Dec.2023	26.1	49
		comm. Dec. 2024	2553.6	4800
	PVPP (190 MW) in "Mubarak TPP", "Syrdarya TPP" and "Turakurgan TPP" regions	Stage 1 Dec.2023	1.6	3
		comm. 2025	221.3	416
Total			**6781.9**	**12 748**
Total for all items			**7058.5**	**13 268**
Note: comm. – commissioning				
Construction of WPPs				
In progress	WPP (500 MW) Navoiy region, Tamda district *(PPP, Masdar, UAE)*	Stage 1 Dec. 2023	8.0	15
		comm. Avg. 2025	970.9	1825
	WPP (500 MW) Bukhara region, Peshkun district (*PPP, ACWA Power, Saudi Arabia)*	Stage 1 Dec. 2024		
		comm. May 2025	957.6	1800
	WPP (500 MW) Bukhara region, Gishduvan district (*PPP, ACWA Power, Saudi Arabia)*	Stage 1 Dec. 2024	0.0	
		comm. May 2025	957.6	1800
	WPP (100 MW) R.Karakalpakstan, Karauzak district	Stage 1 May 2025	0.0	
		comm. May 2025	186.2	350
	WPP (1500 MW) 1,2,3 R.Karakalpakstan, Kungrad district *(PPP, ACWA Power, Saudi Arabia)*	2023-2026	2766.4	5200
	Total		5838.7	10 975
Installation of PV panels and small PVPP				
	20,000 social facilities and public institutions (219.4 MW)		112.3	211.1
	on buildings and structures 11 thousand entrepreneurs (742.7 MW)		267.6	503.1
	37,000 households ("Solar House") (182.1MW)		99.0	186.1
	765 high-rise buildings to be commissioned in 2023 (15.3 MW)		12.1	22.8
	Total		**491.1**	**923.1**
Note: comm.- commissioning				

It is assumed that installation of RES in 2023, conversion of consumers to alternative energy and introduction of energy-efficient technologies generated an additional 5 billion kWh of electricity and save 4.8 billion m^3 of natural gas. By 2026, a total of 27 RES projects with a total capacity of 13.9 GW and generation of 36.6 billion kWh are planned to be commissioned.

Modern PVPPs and WPPs are being built in almost all regions of the country. At the end of 2023, 6 large PVPPs and WPPs with a total capacity of 2,400 MW were commissioned and connected to the grid: the first stages of solar power plants were built in Jizzakh, Samarkand, Surkhandarya, Bukhara and Kashkadarya regions. The first capacities (100 MW) of a WPP were launched in Tamdy district.

According to the Statistics Agency, in 2023, the amount of electricity generated by PVPPs and WPPs was 1,244.5 million kWh. (Figure 2.21)

In 2023, PV panels were installed in 50,000 households, residential buildings, business and social facilities in the country with a total capacity of 457 MW[98,99]. The country's leading companies are also making efforts to expand the use of green energy for their production needs. For example, PVPP with a total capacity of 15.7 MW have been installed at all facilities of JSC TPP. As a result, since the beginning of 2023, 8.5 million kWh of electricity and 841.5 Gcal of heat energy have been generated through PV panels, which are directed for consumption by the system's enterprises for their own and economic needs and saved 1.8 million m^3 of natural gas. In 2024-2025, it is planned to commission PVPPs with a total capacity of 183 MW, with an annual output of 25 million kWh of green electricity[100].



Source: https://www.stat.uz/ru/ofitsialnaya-statistika/industry

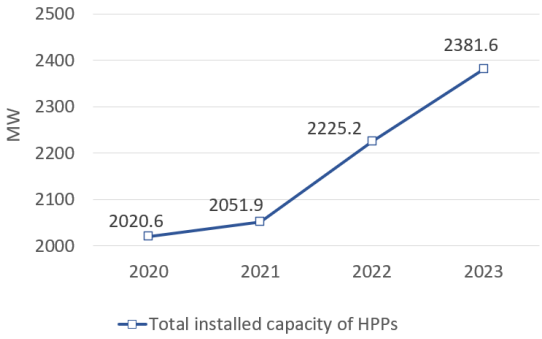
Figure 2.21 Electricity generated by PVPP and WPP

The development of the RES sector also has a positive impact on related industries. In particular, the establishment of large PVPP and WPP, their connection to the grid, maintenance and repair opens up a market of at least USD 1 billion for domestic enterprises[101].

In 2023, 4 companies start PV panel production, another 2 companies start steel structure production. About 50 green energy projects have created an additional $500 million cable market [102].

The "Solar Cluster" project, which is located in the free economic zone "Chirakchi" in the Kashkadarya province, is building the "Sun-Hightech" facility of local enterprises for the production of solar water heaters and solar photovoltaic panels[103]. The cost of the project is $10 million, and the annual capacity is 150 MW. As a result, 150 permanent jobs created in the region.

Hydropower development. During 2017-2022, 12 new hydropower plants (HPPs) with a total capacity of 262.8 MW were commissioned by JSC Uzbekhydroenergo and 16 existing energy facilities were modernized. As a result, the number of hydropower plants reached 52. The total amount of electricity sold in 2022 reached 6394.6 million kWh[104]. In 2023, the installed capacity increased to 2381 MW (Figure 2.22).



Source: https://www.stat.uz/ru/ofitsialnaya-statistika/industry

Figure 2.22 Total installed capacity of HPPs

Due to the low water availability in recent years,

[98] https://president.uz/ru/lists/view/6952
[99] https://president.uz/ru/lists/view/7055
[100] JSC Thermal Power Plants. Sustainability Report 2023
[101] https://president.uz/ru/lists/view/7055
[102] https://president.uz/ru/lists/view/6952
[103] https://lex.uz/ru/docs/6201423
[104] https://minenergy.uz/ru/news/view/2644

emphasis has been placed on the development of decentralized energy, the introduction of mini- and micro-generation technologies, and the construction of micro-HPPs that can operate with a small volume of water. In 2022, the Government defined the directions of state support[105] for the development of the industry of small and micro HPPs: (i) established tax benefits for legal entities whose main activity is the production of small HPPs; (ii) in order to establish the procedure for the construction and operation of micro and small HPPs, 200 promising sites for the construction of micro HPPs with a capacity of up to 500 kW have been identified.

The Presidential Decree "On measures to accelerate the introduction of renewable energy sources and energy-saving technologies in 2023"[106] approved the address list of 103 projects for the construction of small and micro HPPs with the total capacity of 196.8 MW to be implemented by Uzbekhydroenergo JSC on the territory of the republic. It is estimated that electricity production in 2023 amounted to 9,235.4 million kWh.

In 2023, 8 HPPs were put into operation in Uzbekistan. These include three large and 5 micro-hydropower plants. The total capacity of all these facilities is 190 MW[107]. Currently, in accordance with the investment program, 13 projects with a total capacity of 749 MW are under construction and installation.

In 2023-2024 the government adopted decisions on accelerating measures to reform the hydropower sector[108,109] according to which Uzbekhydroenergo JSC:

- Modern principles of corporate governance are being implemented, including the introduction of ESG management principles and the achievement of an ESG rating by 2025.
- The project "Digital Transformation of the Hydropower Sector" is being implemented.
- The "Program of Measures for the Further Development of the Hydropower Complex for 2024-2028" was approved, setting the goal of increasing the total capacity of hydropower plants to 5508 MW by the end of 2028, including the construction of pumped storage plants with a total capacity of 1600 MW.

Implementation of the projects included in the program would result in an additional 8,708.90 million kWh of generation, which would reduce GHG emissions by 4.6 million tons of CO_2-eq by 2028 (Table 2.13).

Table 2.13 Projects included in the "Program of measures for further development of hydropower complex for 2024-2028"

	Design capacity, MW	Additional power, MW	Average annual output, million kWh	Additional output, million kWh	Implementation period
Investment projects implemented by Uzbekhydroenergo JSC					
Underway					
- 7 projects	635.9	635.9	2 278.3	2 278.3	2018-2028
- 23 micro and small hydropower projects	26.6	26.6	110.6	110.6	2023-2024
Planned					
- 19 projects, of which 4- on construction 15- on modernization	867.8	335.8	3 377.8	1 228.0	2024-2028
TOTAL	**1 550.3**	**1 018.3**	**5 816.7**	**3 666.9**	

[105] https://lex.uz/uz/docs/6189043
[106] https://lex.uz/ru/docs/6385720
[107] https://e-cis.info/news/567/114700/
[108] https://lex.uz/ru/docs/6420318
[109] https://lex.uz/ru/docs/7024222

Continuation of Table 2.13

	Design capacity, MW	Additional power, MW	Average annual output, million kWh	Additional output, million kWh	Implementation period
Investment projects in the hydropower sector with the participation of private investors					
9 HPP construction projects 150 micro and small hydropower projects	2 275		5 042	**5 042**	2024-2028

Electricity transmission and distribution

The country pays attention to the pace of development and modernization of the electricity distribution system, as the expansion of RES capacities, growth of industrial production requires an increase in the efficiency of distribution networks.

Reducing the level of technological losses of electric energy during its transportation and distribution is one of the main objectives of the transition to green energy and belongs to climate change mitigation measures.

In Uzbekistan, two large companies are responsible for electricity transmission: JSC "National Electric Networks" (JSC NEN) and JSC "Regional Electric Networks" (JSC REN)[110].

JSC NEN supplies electricity from generation sources (JSC TPP) to distribution and sales companies (JSC REN) via 220-500 kV main power grids with a total length of over 9.7 thousand km. The company's activities include the operation and development of long-distance grids, interstate transit, and interaction with the energy systems of neighboring countries.

The balance of JSC RES enterprises includes power transmission lines (289.6 thousand km) and substations with voltage up to and including 110 kV (1,787 units). The most branched (more than 223.8 thousand km) are 0.4-6-10 kV power grids, which are mainly used to supply electricity to consumers.

The average level of technological losses of electric power is 2.72% in long-distance grids and 12.47% in distribution grids.

The "Concept of Electricity Supply to the Republic of Uzbekistan for 2020-2030" defines a range of technological tasks to be implemented to solve the problems of efficient energy transmission and reduce technological and commercial losses. It is assumed that their realization will allow reduced losses of electric energy by 2030 during transmission to 2.35%, during distribution to 6.5% as compared to 2019.

Development of distribution networks. Modernization and reconstruction of power transmission lines is implemented within the framework of long-term state programs "Obod kishlok"[111], "Obod makhalla"[112,113]. The Presidential Decree[114] sets targets for the period 2022-2026. By 2026, it is planned to repair/lay 13367.4 km of power networks, and repair/replace 5759 transformers.

During implementation of JSC RES programs, over 3,000 km of power lines and 1,100 transformer points were upgraded and reconstructed. To improve the living conditions of the population in 1071 mahallas,

[110] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[111] https://lex.uz/ru/docs/3604661
[112] https://lex.uz/ru/docs/3797782
[113] The Obod Kishlok and Obod Mahalla programs were launched at the initiative of the President in 2018. The objectives of the programs are to improve the territories of rural and urban settlements, comprehensive development of existing infrastructure, as well as construction/reconstruction of road and transport infrastructure, utilities and social facilities.
[114] https://lex.uz/en/docs/5914977

5.1 thousand km of power lines were renewed, and 1063 transformer points were modernized.

In 2023, the Presidential Decree[115], approved the planned annual indicators of reduction of losses in distribution power grids in the territories of the Republic in 2023. Due to organizational and technical measures aimed at reducing losses in power and grid transformers and transmission networks, optimization of power grids, modernization and reconstruction of grids, the total savings amounted to 909.8 million kWh (104% of the planned amount), i.e. the actual electricity savings exceeded the planned indicators.

ADB's Digital Transformation and Resilience of Distribution Grid Project is under implementation. The main objective of the project is to modernize and digitalize 26 35/110kV distribution substations to strengthen climate change resilience and improve distribution grid management. The project also includes installation of SCADA systems for remote monitoring and control of substations and the use of low-leakage equipment.

Development of trunk grids. The modernization and expansion of the main power grid infrastructure includes the replacement of obsolete equipment, increasing the capacity of power transmission lines, and the construction of new substations. The focus is on improving the reliability of power supply and reducing power losses. To solve these tasks, cooperation with international financial institutions and companies is underway, investments and technologies are being attracted, and the following projects are being implemented.

- WB Project "Modernization and reconstruction of 22 transformer substations of main power grids", to reduce losses in the project area from 0.71 to 0.25[116].
- The complex of measures developed according to the Scheme of development of the North-Western part of the energy system of Uzbekistan for 2020-2026 includes 7 projects and envisages construction of 662.8 km of 110/220/500 kW transmission lines; 500/220/110 kW substations with a total capacity of 1401 MVA; and 900 MW of generating capacity.
- IDA WB/GCF project "Electricity Sector Transformation and Sustainable Electricity Transmission"[117], which envisages implementation of SCADA, modernization and reconstruction of main power grid substations, construction of a new 500 kW substation and overhead transmission lines of 220, 500 kW, ERP implementation. The expected emission reduction will amount to 460 thousand tons of CO_2-eq.

One of the key areas of development is the integration of RES (solar and wind energy) into the energy system, which requires significant development of trunk networks to transmit electricity from remote sources to consumers. In 2023, Resolution[118], approved a targeted list of 15 PPP projects for the construction of substations and transmission line networks to connect large solar and wind power plants to the unified power system.

To improve the efficiency and reliability of the main power grids, attention is being paid to the introduction of smart grid systems. ADB's Digitalization for Decarbonization- Improving the Transmission Grid project is being implemented to support the Government of Uzbekistan's low-carbon transition and green economy program by improving the reliability and stability of the transmission network, increasing operational efficiency, and improving monitoring and management of the power system through the introduction of modern digital and telecommunication technologies, reducing the number of outages in the system, and reducing transmission losses. The following outputs are planned:

[115] https://lex.uz/ru/docs/6385720
[116] https://www.lex.uz/docs/3352701
[117] https://lex.uz/ru/docs/5849839
[118] https://lex.uz/ru/docs/6385720

1. Twelve transmission lines in 7 regions will be rehabilitated and equipped with climate resilient technologies.

2. Four 220 kV substations will be renovated, equipped with climate resilient technologies and expanded by 420 MW. SCADA connectivity and readiness will be ensured through the installation of intelligent electronic devices. All four substations will have rooftop PV panels (100 kW each) to support the power supply of substation auxiliary services.

3. Improvement of corporate governance in "National Electric Grid of Uzbekistan" JSC.

Energy efficiency and energy saving

Nowadays energy efficiency improvement is considered as the main energy resource. Uzbekistan belongs to the countries with high energy intensity, therefore the government of the country takes measures to stimulate energy saving and reduce energy costs. The strategic framework is based on such documents:

- Strategy for the transition of the Republic of Uzbekistan to a green economy.
- New Uzbekistan Development Strategy for 2022-2026.
- "Uzbekistan-2030" Strategy.

The country has set a goal to increase energy efficiency by 20% by 2026 and by 2 times by 2030. It is believed that without the implementation of a series of measures aimed at improving energy efficiency and ensuring energy saving in all spheres, from electricity generation to the consumer, all efforts and capital investments in the energy sector will be ineffective.

In 2022, the Presidential Decree PP-436 approved the following documents: Program and Action Plan for Transition to a Green Economy and Ensuring Green Growth until 2030; Concept of Transition to a Green Economy and Ensuring Energy Saving in Industries; Target Parameters of FER Savings in Economic Sectors in 2022-2026.

One of the objectives of the Green Economy Transition Program is to significantly improve energy efficiency through: (i) development of financial incentive mechanisms for technological modernization and introduction of green technologies; (ii) setting energy saving and energy efficiency targets; and (iii) energy management in economic sectors. The program defines the following target indicators to be achieved by 2030 (Table 2.14).

The concept of transition to a green economy and ensuring energy saving in industries, adopted for the purpose of decarbonization of the country's industrial sector, considers energy efficiency improvement and FER saving as the main factor of economic development, and defines:

- Measures to improve energy efficiency and save FER in large energy-intensive enterprises in economic sectors.
- Obligations of FER consumers to improve energy efficiency and achieve energy savings.

Table 2.14 Targets for the transition to a green economy by 2030

No.	Indicators	Ed	2022	2024	2026	2028	2030
1.	Reduction of energy intensity per unit of GDP *(relative to 2021)*	%	5.0	14.0	22.0	27.0	30.0
2.	Energy consumption in industry, (*share of total energy consumption)*	%	26.0	25.0	23.0	21.0	20.0

The target parameters of FER savings in the economic sectors in 2022-2026, provided by the Concept, aimed at reducing the energy intensity of products manufactured by 25 enterprises and organizations in 2026 by 20% compared to 2022, are shown in Table 2.15.

The State Program on implementation of the New Uzbekistan Development Strategy for 2022- 2026 determined to reduce the energy intensity of GDP by 5% by saving up to 3.9 billion m^3 of natural gas, 4 billion kWh of electricity and 21 thousand tons of oil products in 2022. As a result of the measures taken, there is a decrease in the energy intensity of GDP (Table 2.16). It is important to note that this indicator is defined as SDG indicator 7.1.3 and as an additional indicator for tracking the progress of the NDC2.

Table 2.15 Target parameters of FER savings in economic sectors in 2022-2026

FER	2022	2023	2024	2025	2026	2022-2026	Reduced GHG, Mt CO_2-eq
Natural gas, *million m^3*	855.46	813.26	756.53	767.22	721.24	3 913.70	7.5
Electricity, *million kWh*	872.94	737.01	686.11	860.39	853.69	4 010.14	2.1
Petroleum products, *t*	5678.23	5427.83	4689.55	2908.67	2417.9	21 122.17	0.1
Total:							9.7

Table 2.16 Change in energy intensity of GDP for 2021-2023

	2021	2022	2023
GDP energy intensity	0.159	0.139	0.126
$\Delta_{(2021\text{-}i)}$ (%)		-12.6%	-20.9%

To achieve the target parameters, the Presidential Decree[119] approved the planned indicators for saving FER for 2023 and a practical plan of measures for large industrial enterprises of the Republic.

Leading companies and enterprises develop strategies and development plans taking into account measures to improve energy efficiency and save fuel resources and report annually on implementation, conduct energy audits within the framework of ISO 50001 standard. Every year the government defines tasks and indicators to achieve the set goals.

From 2011 to 2024, the World Bank project "Improving Energy Efficiency of Industrial Enterprises" operated in Uzbekistan. The objective of the project was to improve energy efficiency in industrial enterprises by developing and establishing a mechanism for financing investments in energy saving technologies. During this period, 159 sub-projects were implemented in 101 beneficiary enterprises. The participating banks mobilized more than $384.6 million, which was directed towards energy savings. As a result, upon project completion, energy savings amounted to 3.442 million MWh, CO_2 emission reduction is 2,949,692 tons [120].

Oil and Gas

There are three major companies in the oil and gas industry structure:

- Uzbekneftegaz JSC produces and processes oil, gas, and gas condensate, and sells oil products throughout the country.
- Uztransgaz JSC, performs the function of natural gas transportation by main gas pipeline, as well as export and import operations.

[119] https://lex.uz/ru/docs/6385720

[120] https://documents1.worldbank.org/curated/en/099052424044012299/pdf/P11873710ca8500fe1ba391403e9d43b022.pdf

- Hududgazta'aminot JSC, responsible for distribution and supply of natural and liquefied gas to retail customers.

In accordance with the Presidential Decree[121], companies in the industry are tasked with publishing an ESG Report in line with the Global Reporting Initiative (GRI) starting at the end of 2020.

Uzbekneftegaz JSC is the largest state-owned company in the Republic of Uzbekistan operating in the oil and gas production and processing sector. It unites more than 60 organizations, including 8 joint ventures. In 2022, the ESG Implementation Department was established within the company's organizational structure. This department is responsible for the systematic management of sustainable development, coordination of initiatives, enhancing information transparency, and preparing annual reports in accordance with the GRI standards.

One of Uzbekneftegaz JSC's key priorities in environmental protection is reducing GHG emissions over the medium and long term by decreasing energy intensity and improving energy efficiency in production.

In line with its commitment to achieving SDG 13, the company has set targets to reduce both direct and indirect GHG emissions (Scope I and Scope II, according to the GGP methodology) by 25% by 2030 and to fully neutralize its carbon footprint by 2050.

The GHG emission reduction targets set imply the following technical measures:

- Introduction of economically viable and energy-efficient technologies into the hydrocarbon production system.
- Introduction of advanced gas processing technologies to produce gas chemical products with high liquidity.
- Utilization of alternative fuels and energy sources.

To date, the company has implemented measures to introduce GHG emission utilization technologies. Most of the previously flared associated gases are now successfully utilized. At the same time, only an insignificant part of flared gases at processing plants are flared to maintain a standby fire at the emergency gas discharge line.

The main sources of emissions are the production processes of hydrocarbon extraction and oil and gas refining, and the intensity of direct and indirect GHG emissions (Scope I and Scope II) within these processes amounted to 0.108 t and 0.045 t of CO_2-eq, respectively.

In 2022, the company estimates total GHG emissions to be 6.3 Mt of $CO_{2\,e}$, of which direct GHG emissions account for 4.0 Mt of $CO_{2\,e}$ and indirect emissions account for 2.2 Mt of $CO_{2\,e}$. Emissions decreased by 3.72 % year-on-year due to lower production volumes. The following measures to reduce GHG emissions were implemented:

- Replacement of catalysts and repairs at the sulfur production units at Mubarek GPP and Shurtan GCC to improve conversion of waste acid gas emissions to sulfur.
- Launch of the Uzbekistan GTL plant to produce environmentally friendly synthetic fuel that meets Euro 5 standards.
- Implementation of recycling CO_2 emissions from the Uz-Kor Gas plant.

The company has approved the GHG Emission Reduction Plan for 2023, which provides for the reduction of GHG emissions by 40.4 thousand tons of CO_2-eq through the implementation of organizational and technical measures to save fuel gas, electricity, and petroleum products.

Uztransgaz JSC. Part of the strategy of Uztransgaz JSC in the field of environmental safety management

[121]https://lex.uz/pdfs/4410281

is commitment to the six principles of the UN SDGs 3, 6, 7, 8, 12, 13.

The reduction of GHG emissions is one of the company's priority areas in the field of environmental protection. In order to minimize the negative impact and mitigate the consequences of climate change, Uztransgaz plans and implements measures in the following areas:

- Reducing losses during gas transportation and distribution.
- Promoting efficient use of energy resources.
- Modernizing compressor stations.
- Upgrading the gas transmission system.
- Introducing of modern technologies of gas supply distribution and metering.

The production processes of Uztransgaz JSC are quite energy-intensive, therefore the search and implementation of solutions to reduce the consumption of energy resources is an urgent task. Uztransgaz JSC has a procedure for energy planning and energy efficiency analysis, which defines a unified procedure for energy audit within the framework of ISO 50001 standard. Based on energy analysis, measures aimed at reducing energy consumption and improving energy efficiency are developed. The company has a schedule of organizational and technical measures to save energy resources because of production modernization and reconstruction for 2023-2025. This document reflects the total cost of implementing the measures and sources of financing (foreign investments, loans, own funds). Starting from 2018, the company has been reducing energy consumption. In 2023, the reduction in energy consumption amounted to 19.5 million kW of electricity in physical terms, which is 4% higher than in 2022, and more than 7 times higher than in 2021.

Direct GHG emissions (ScopeI) from stationary sources at Uztransgaz facilities are realized during purging and venting of natural gas from gas pipelines and process equipment, as well as a result of leaks from flange connections of pipeline fittings. Methane, carbon dioxide, and nitrous oxide are directly discharged into the atmosphere. The CH_4 fraction of the gas is up to 96%, CO_2 is 1%, and N_2O is 0.5%.

The company conducts an annual inventory and internal assessment of GHG and other air pollutant emissions and identifies the most significant emission sources. According to the report[122], in 2023 the volume of GHG emissions decreased by 33.8% compared to 2021. The decrease in emissions is related to the implementation of the “Program of modernization and efficiency improvement of the main gas transmission system of the Republic of Uzbekistan in 2021-2022”. Repairs and elimination of bottlenecks on the main gas pipeline allowed to reduce the volume of technological losses of natural gas, which in turn affected the volume of direct GHG emissions.

Uztransgaz JSC implements projects aimed at mitigating the effects of climate change. One of these projects is the project “Modernization of the gas transportation system of the Republic of Uzbekistan with the introduction of the SCADA center for dispatching, monitoring and control of gas infrastructure facilities”, which is aimed at introducing effective technologies for controlling losses of hydrocarbon resources during transportation and increasing the capacity of gas pipelines to supply densely populated areas.

JSC Hududgaztaminot. To comply with environmental legislation and reduce environmental impact, the company pays attention to the implementation of the following measures: air quality monitoring, modernization and reconstruction of the gas supply system, creation of “green belts”. Special attention is paid to the reduction of GHG emissions. Taking into account the specifics of the activities of

[122] https://www.utg.uz/upload/reports/ESG-%D0%BE%D1%82%D1%87%D0%B5%D1%82%20%D0%A3%D0%A2%D0%93%202023.pdf

Hududgaztaminot JSC, CH_4 is the main pollutant and GHG.

The main sources of direct GHG emissions are:

- GHG emissions when safety valves are triggered.
- Losses through shut-off and regulating equipment, flanged and threaded connections on the linear part of gas pipelines.
- Emissions from the operation of power generation equipment.

Direct GHG emissions (Scope 1) due to methane leaks, which account for 99.9% of total direct GHG emissions. Total direct GHG emissions in 2023 amounted to 120.3 thousand tons of CO_2-eq, compared to 2022 emissions decreased by 31%. One of the factors that influenced this reduction is the modernization of gas networks, as well as the introduction of the Automated System of Control and Metering of Natural Gas (ASCMNG) in the Republic of Uzbekistan.

As part of the implementation of the investment program 2023-2025[123] JSC Hududgaztaminot jointly with the company Gas Green Asia LLC (USA) carried out works in Tashkent and the region to reduce methane emissions from medium and low pressure networks in the system of JSC Hududgaztaminot. The aim of the project is to reduce GHG emissions and transition to a green economy. Within the framework of the agreement by the end of 2023, 5200 gas distribution points were checked, the volume of losses in technological processes was reduced by 10.3 million m^3 more than 250 new jobs were created, the reduction of GHG emissions amounted to 2.6 t CO_2-eq. In order to expand the project to the whole country, it is envisaged to attract 35 million USD of foreign direct investment over the next 10 years [124].

Buildings

The residential sector is the largest energy consumption sector in Uzbekistan, accounting for 34.8% of total final energy consumption, and together with the tertiary sector (trade and public services) all buildings account for 48.4% of total final consumption. Most of the energy is used for space heating and about 20% is used for hot water supply in houses with district heating [125].

Currently, the main measures to mitigate climate change in the sector are to improve the efficiency of heat supply systems (HSS) and buildings. According to assessments carried out in various international projects[126]:

- The energy efficiency potential in the district heating sector ranges from 34.3 to 44.6 %. The total amount of energy saved is estimated at 1,033.0 thousand tons of oil equivalent per year, which is 34.3 % of the actual heat production. This leads to saving of natural gas by 1.2 billion m^3 per year and reduction of GHG emissions by 2.2 million tons per year.
- The energy saving potential in the residential sector can be estimated at 71%. The overall improvement of energy performance of the existing building stock will save up to 6.7 billion m^3 of natural gas and reduce GHG emissions by 12.6 million tons per year.

In the main strategic documents of the country[127] the government has prioritized the energy efficiency improvement in housing and communal services, social facilities, as well as the introduction of an energy efficiency assessment system (energy audit) for apartments in multi-storey buildings. The Concept for

[123] https://lex.uz/ru/docs/6329453
[124] https://www.utg.uz/upload/reports/ESG-%D0%BE%D1%82%D1%87%D0%B5%D1%82%20%D0%A3%D0%A2%D0%93%202023.pdf
[125] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[126] Protocol to the Energy Charter on Energy Efficiency and Related Environmental Aspects of PEEREA. "In-depth Review of the Energy Efficiency Policy of the Republic of Uzbekistan", 2022
[127] "New Uzbekistan Development Strategy for 2022-2026", Strategy "Uzbekistan – 2030"

transition to a green economy and energy conservation in industries envisages a 30% increase in the energy efficiency of buildings and structures by 2030[128].

Improving the efficiency of HSS. The main directions for the development of energy-efficient HSS are outlined in the Strategy for Transition to a Green Economy. These include:

- Development of a system of differentiated tariffs to create incentives for energy saving.
- Development and modernization of technologies to produce engineering equipment, thermal insulation materials, heating and air conditioning systems based on green standards.
- Widespread implementation of "closed" HSS under central heating systems.
- Application of local boiler houses with highly efficient automated systems for heating and hot water supply of individual housing stock and apartment buildings, public buildings.
- Development and implementation of smart systems for controlling the mode of thermal units for uniform heat supply to the system of parallel consumers.
- The use of high-tech air conditioning and ventilation systems tailored to the needs of individual rooms.
- Introduction of PV panels as a source of energy supply.

In recent years, the government has adopted several resolutions and programs on the development of heat supply systems, approved target parameters in the context of regions for the construction, modernization and reconstruction of boilers in boiler houses; heat networks, optimized tariff policy, developed measures for further improvement of the Tashkent city HSS[129,130].

The following projects are being implemented in the country:

- IDA project "District Heating Energy Efficiency Improvement Project"[131] (2019- 2024) aimed at reconstruction and modernization of district heating systems and energy efficiency improvement in the cities of Andijan, Chirchik, Bukhara, Samarkand and Tashkent (TC-8). It is assumed that because of implementation, energy savings of 5 million kWh, reduction of GHG emissions of 550 thousand tons CO_2-eq (by April 2024, energy savings of 255.8 thousand kWh, reduction of GHG emissions of 27.0 thousand tons of CO_2-eq have been achieved).
- The project "Modernization and Management of the Tashkent City Heat Supply System on the Basis of Public-Private Partnership' is being implemented"[132,133]). The project will modernize 181 boiler houses, install 28,000 heating points, reconstruct 841 km of existing networks and lay 576 km of new networks over 30 years. In addition, 391 units of special machinery and other equipment will be purchased. An international technical audit and billing system will be introduced.

It should be noted that in the city of Tashkent the transfer of heat supply to closed HSS based on the principle of circulation and heat reuse will prevent the loss of 3 million Gcal of heat, save 320 million m^3 of natural gas and 85 million kWh of electricity[134] and reduce GHG emissions by 2.5 million tons of CO_2-eq.

Energy efficiency of buildings. Sustainable and energy-efficient buildings are highlighted in the Green Economy Transition Strategy, which outlines the following key directions:

[128] https://lex.uz/ru/docs/6303233
[129] https://unfccc.int/sites/default/files/resource/FBURUzru.pdf
[130] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[131] https://projects.worldbank.org/en/projects-operations/project-detail/P146206
[132] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[133] https://lex.uz/docs/5657490
[134] https://president.uz/ru/2905

- Implementation of state programs to improve energy efficiency of buildings.
- Creation of a system of energy certification of buildings.
- Development of a mortgage lending system for energy-efficient renovations, in particular, the use of green mortgage loans.
- improvement of technologies for construction, reconstruction and capital repair of buildings with the use of double-glazed windows and modern heat-insulating materials.
- Introduction of energy efficiency standards for household equipment.
- Development of smart systems and widespread use of modern energy-efficient lamps for lighting in buildings.

Taking into account that the existing housing stock is extremely energy efficient, in 2018 the government introduced a procedure to verify the compliance of buildings and structures of state bodies and institutions, as well as multi-family housing stock, with urban planning norms and regulations in terms of the use of energy-efficient and energy saving technologies during design, reconstruction, construction and commissioning. Requirements were introduced for thermal insulation of buildings, installation of energy-efficient windows, ventilation systems with heat recovery, LED lighting with motion sensors and energy-saving lamps in the design, reconstruction and construction of all buildings and structures (except for individual housing), as well as mandatory installation of certified solar water heaters for hot water supply[135][136]. In 2023[137] a targeted list of indicators for the installation of solar panels in the commercial and residential sectors has been approved (see Energy Section) Certification requirements are being developed and introduced, e.g. from 2020 all newly designed buildings have to obtain an energy audit passport before they are put into operation. In addition, there are also voluntary certification schemes such as LEED, BREEAM and EDGE.

In 2022, the UNDP/GEF project “Promotion of Energy-Efficient Rural Housing in Uzbekistan” was completed. The project established and piloted a Green Mortgage Facility that uses GEF funds to subsidize rural demand for energy-efficient and low carbon housing. 1,328 households in nine pilot regions purchased Energy-Efficient housing under the Green Mortgage Mechanism and it was put into operation. Buildings constructed using the Energy-Efficient rural house designs developed under this project reduced GHG emissions by 920,000 tons of CO_2-eq[138].

The construction of green buildings in Uzbekistan is based on private initiatives. Examples of certified buildings appear in Uzbekistan and become visible due to compliance with one or another international certification methodology. By the beginning of 2024, 11 applications have been submitted from Uzbekistan to LEED, BREEAM and EDGE, and 5 objects have received certificates[139].

As part of the World Bank's Partnership Program with Uzbekistan for 2022-2028, the “Clean Energy for Buildings in Uzbekistan” project was launched. The project will implement energy efficiency measures in facilities of the Ministries of Preschool Education, Public Education and Health located in rural and urban areas across the country. Energy efficiency measures will include improvements to building insulation, heating, ventilation, air conditioning, and lighting systems. In addition, coal-fired boilers will be replaced with RES-based heating and hot water systems in the facilities. As a result of the project implementation, the following indicators are planned to be achieved: number of public buildings renovated with Energy-Efficient or RES investments is 800; projected energy or fuel savings is

[135] https://unfccc.int/sites/default/files/resource/FBURUzru.pdf
[136] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[137] https://lex.uz/ru/docs/6385720
[138] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[139] https://hpbs.uz/services/leed-sertifikatsiia

34,153 million MJ, of which energy is 4,440 million MJ and fuel is 29,713 million MJ; projected electricity generation savings is 5,496 million MJ; RES capacity built under the project is 25 MW; GHG emission reduction is 3,509 thousand tons of CO_2/year.

2.17.5. Industrial Processes And Product Use

One of the goals of Strategy 2030 is the efficient use of the local raw material base and the development of industry based on advanced technologies. By 2030, the share of industrial technological products should increase from 25% to 32%. At the same time, to fulfill the obligations of the Paris Agreement, the country has adopted a target of increasing the energy efficiency of industry by at least 20% through the widespread use of clean and environmentally friendly technologies.

The manufacturing sector accounted for almost 38.8% of total electricity consumption and 24% of total natural gas consumption in 2022. The largest consumers of energy resources are the chemical, metallurgical, and construction materials industries, accounting for 78.7% of total industrial energy consumption[140].

In 2022, GHG emissions in the IPPU sector amounted to 30.5 Mt of CO_2-eq contributing 14.5% to the total emissions. CO_2 emissions in the sector accounted for 90.8%, N_2O - 5.5%, HFCs - 3.7%, CH_4 contribution - 0.01%. Over the period 2010-2021 (relative to the Paris Agreement base year), GHG emissions in the sector increased by 95% (1BTR NIR, 2024).

The largest contribution to the emissions of the IPPU sector is made by the categories “Manufacture of mineral materials” (76.6%) and “Chemical industry” (14%). The contribution of “Metallurgy” is 4.3%.

In the industrial sector of Uzbekistan, mitigation measures include technical measures aimed at direct GHG emission reductions and energy efficiency improvements, as well as restrictive policy measures, e.g. targets for FER savings, mandatory energy audits, mandatory ISO 50001 certification, introduction of increasing coefficients for energy prices, personal responsibility of managers.

Chemical industry

The chemical industry is the basic sector of Uzbekistan's economy, specializing in the production of nitrogen and phosphate fertilizers, as well as basic petrochemical products. The National Chemical Industry Development Program for 2019-2030[141] includes 31 projects with a total cost of $12 billion. The government plans to increase production of high value-added products such as PVC, synthetic rubbers, and polymer composites.

As a result of the ongoing reforms, the volume of chemical industry products increased by 3.4 times in 2017-2022, while the production of mineral fertilizers increased from 1,141.9 thousand tons to 1,484 thousand tons[142], while its share in the total volume decreased by 10%.

The chemical enterprises of the Republic are organized into a unified corporate structure known as Uzkimyosanoat JSC. In 2023, 44 enterprises and organizations operated in the system of Uzkimyosanoat JSC, including such large enterprises as Navoiyazot JSC, Maksam-Chirchik JSC, Fargonaazot JSC, Ammophos-Maksam JSC, Dehkanabad Potash Plant JSC and others. Currently, the industry produces more than 180 items of chemical products.

The structure of GHG emissions is dominated by CO_2 (60.4%), which is emitted during the production of ammonia and N_2O (39.65%), which is emitted during the production of nitric acid. The share of CH_4 is

[140] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[141] https://lex.uz/docs/4271634
[142] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf

insignificant (0.05%). Sources of CH_4 emissions are calcium carbide, methanol, acrylonitrile, and formaldehyde production.

According to the inventory data in 2022, the total GHG emissions of chemical industry enterprises in the IPPU sector amounted to 4.3 Mt of CO_2-eq and decreased by 3.6% compared to 2010: the reduction of CO_2 emissions amounted to 133.6 thousand tons of CO_2-eq (4.9%), N_2O- 24.3 thousand tons of CO_2-eq (1.4%). The reduction of GHG emissions id due to the modernization of ammonia and nitric acid production.

Uzkimyosanoat has developed a "Vision for Addressing Climate Change"[143], outlined its role in combating climate change, and set ambitious climate goals to help move the world to a 1.5°C scenario:

- Achieve 'net-zero' emissions by 2050.
- Reduce Scope I and Scope II emissions by 42% from 2022 levels by 2030.
- Reduce Scope I-III emissions by 90% from 2022, neutralize the remaining 10%, and continue work on quantifying Scope III emissions by 2050.

GHG emission reductions are determined from Scope I-III estimates and are based on the concept of low-carbon development: Scope I considers direct GHG emissions from sources that are associated with natural gas reforming and nitric acid production.

To achieve the targets, the company assesses the implementation of the following measures

1. Recycling/circular economy (e.g. development of plastics recycling).
2. Energy efficiency and mitigation measures applied to existing mature technologies (e.g., N_2O emission reduction projects).
3. Deep decarbonization of purchased heat and electricity (e.g. purchase of energy from renewable sources).
4. Innovative low-carbon ammonia production technologies (e.g. use of green hydrogen).
5. Actively engage with stakeholders to address emissions in Scope III (e.g., developing improved fertilizers, using inhibitors to reduce emissions in fields, working with farmers/the entire agricultural sector to optimize nutrient composition and advising them on best agricultural practices to reduce emissions).

Uzkimyosanoat JSC together with the international consultant ERM[144] and with the support of EBRD prepared a roadmap for low-carbon development on the basis of Navoiyazot JSC, the largest producer of nitrogen fertilizers in Uzbekistan[145]. The medium-term plan up to 2030 includes the following emission reduction projects:

- Production modernization, which will reduce N_2O emissions by up to 90%.
- Installation of scrubbers at ammonium nitrate production.
- Modernization of nitric acid production.

In 2021, Uzbekistan joined the global NACAG initiative and committed to transform nitric acid production through the purchase and installation of nitrous oxide reduction technologies. The sector's GHG reduction potential in Uzbekistan is estimated to be about 2 Mt of CO_2-eq/year. Currently, Navoiyazot JSC, Ferghanaazot JSC and Maksam-Chirchik JSC are implementing projects to reduce N_2O emissions in cooperation with NACAG and the German Agency for International Cooperation (GIZ). It is planned to allocate funds in the amount of 6.7 million euros for the implementation of projects at the three

[143] https://pda.uzkimyosanoat.uz/ru/esg/environmental/our-vision

[144] ERM- Environmental Resources Management

[145] Corporate Climate Governance Assessment. Low-carbon development in the chemical and fertilizer industries in Uzbekistan. EBRD Project No. 22022.006169 October 2023

enterprises. The installation of secondary catalysts is expected to reduce N_2O emissions by 1,613.3 thousand tons of CO_2-eq annually, including 425.0 thousand tons at JSC Ferghanaazot, 508.3 thousand tons at JSC Navoiyazot, and 680.0 thousand tons at JSC Maksam-Chirchik[146].

In order to decarbonize the ammonia industry in Uzbekistan, taking into account the use of ammonia in the production of fertilizers, the first pilot project in Central Asia for the production of green hydrogen was launched with the support of the EBRD. In 2023, the construction of a complex to produce green hydrogen using electrolysis technology with the use of renewable energy sources began. Based on agreements with the Ministry of Energy and Uzkimyosanoat JSC, ACWA Power (Saudi Arabia) has started realization of the 1st stage of the project. The electrolysis plant with the capacity of 20 MW will be located on the territory of the ammonia production plant of Maksam-Chirchik JSC. The new wind power plant (52 MW) will be located on the territory of the Bash Wind Power Plant (500 MW) in Gijduvan district of Bukhara region. The electrolyzer is expected to produce 3 thousand tons of hydrogen, which will be fed directly into the ammonia plant system, which is expected to reduce annual CO_2 emissions by 22 thousand tons[147].

The hydrogen produced at the plant will be used for ammonia synthesis and further production of nitrogen fertilizers. This technology is expected to produce up to 500,000 tons of nitrate per year, while saving 33 million tons of natural gas[148].

Metallurgy

Metallurgy is one of the largest industries in Uzbekistan and has now entered a period of rapid development. The government is actively investing in the modernization of metallurgical plants, introducing new technologies and equipment to improve efficiency and product quality, this includes the renovation of old plants and the construction of new ones [149].

The main component of the industry is non-ferrous metallurgy, which produces copper, zinc, refractive and heat-resistant metals, and gold. Ferrous metallurgy is represented by the country's only metallurgical plant JSC Uzmetkombinat, which is the industry leader in Central Asia and the largest enterprise to produce long products and steel grinding balls in the country.

In 2023, energy consumption at the enterprises of this industry amounted to 1,527.6 thousand tons of oil equivalent. Of this, electricity accounted for 53.3%, natural gas 42.2%, and coal 3.5%.

In 2022, GHG emissions in the “Metal Production” category amounted to 1.37 Mt CO_2-eq, an increase of 59% compared to 2010. The contribution to total emissions in the CO_2 category was 99.93%, while methane contributed 0.07%. The largest share of GHG emissions from metallurgy comes from the 'Steel Production' category (82.9%). The largest increase in GHG emissions occurred in the newly added categories of “Ferroalloys Production” and “Lead Production”, which started in 2018, although their contribution to total emissions in the 'Metal Production' category remains insignificant[150].

The reduction of GHG emissions in the metallurgical industry is influenced by such measures and actions as organization of new production facilities based on advanced technologies, improvement of energy efficiency through process optimization, increased control and monitoring of emissions, transition to the use of RES.

[146] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[147] https://www.spot.uz/ru/2024/08/30/green-hydrogen/
[148] https://www.spot.uz/ru/2024/05/16/green-hydrogen/
[149] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[150] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf

In recent years, a series of measures have been formulated and systematically implemented in the industry.

- All major companies have obtained ISO50001:2018 and ISO9001:2015 certifications from the International Management Certification Organization.
- Enterprises implement corporate disclosures in accordance with ISAR principles and publish ESG reporting, which includes reporting on GHG emission reductions, in accordance with the Global Reporting Initiative (GRI).
- All large companies have development strategies/concepts that integrate energy efficiency issues and annually develop plans for saving fuel and energy resources in accordance with the targets approved in the Concept for Transition to a Green Economy.

Ferrous metallurgy is an energy-intensive industry. As a leading iron and steel company, Uzmetkombinat JSC is a major energy consumer and GHG emitter. In early 2024, it presented a "Climate Change Policy"[151] in which it reaffirmed its commitment and that of its subsidiaries to combat the anthropogenic causes of climate change and to adapt to its effects. The company identified the following key aspects of its activities: minimizing its own impact; communication and awareness raising; and development of the regions in which it operates.

Key activities to minimize its own impact include:

- Inventory of Scope I and Scope II GHG emissions.
- Setting quantitative targets for GHG emission reductions.
- Development and formalization of a system for annual assessment of GHG emissions to monitor the achievement of targets and provide reporting to all stakeholders.
- Modernization of equipment and improvement of technological processes using resource-saving, environmentally and technically safe technologies, Best Available Technologies (BAT).
- Gradual increase the RES electricity consumption.
- Development, implementation and realization of a long-term strategy for GHG emission reduction.

JSC "Almalyk MMC" is considered the flagship of non-ferrous metallurgy in the Republic of Uzbekistan. The production capacities of the combine are based on the reserves of copper-molybdenum, lead-zinc and gold-silver deposits. The main activities of the company are: extraction of mineral resources (ore), enrichment of extracted ore at enrichment and gold-extraction plants, obtaining finished products of more than 10 names. During JSC "Almalyk MMC" operations, GHG are generated because of the consumption of fossil fuels (diesel, fuel oil, coal) for technological needs, and fuel combustion by mobile sources (motor vehicles and machinery).

JSC "Almalyk MMC" has developed its own climate change policy, decarbonization and carbon neutrality measures, and identified targets up to 2050 (Table 2.17). Considering global and local drivers and the Combine's commitment to the goals of energy transition to carbon neutrality, in a realistic scenario, JSC "Almalyk MMC" defines for itself:

- A goal to reduce direct and indirect GHG emissions by 15% in 2030, 25% in 2035, 35% in 2040, and 50% in 2050 from 2023 levels.
- An increasing the share of RES consumption in the amount of 400 GWh per year.
- Plant up to 300,000 trees annually[152].

[151] https://www.uzbeksteel.uz/storage/files/ru1728977889.pdf
[152] https://agmk.uz/ru/menu/ekologicheskaja-otvetstvennost

Table 2.17 GHG emission reduction targets of JSC "Almalyk MMC"

	2023	2030	2035	2040	2050
GHG reduction, (%)		15%	25%	35%	50%
Target GHG emissions, thousand tons of CO_2-*eq*	3 080*	2 618	2 310	2 002	1 540

*Note: *According to AGMC estimates*

Building materials industry

The construction materials industry of Uzbekistan is undergoing a phase of active development, as a significant increase in the construction of housing, infrastructure and industrial facilities stimulates the demand for construction materials. In the last five years, large-scale work has been carried out to reform the industry, increase the efficiency and potential of production[153]. The industry provides construction projects with all types of materials - cement, lime, gypsum, wall, roof, finishing and waterproofing materials, sanitary and technical ceramics. Currently, out of 170 items of construction materials produced in the country, domestic demand is covered by 97 items.

The Green Economy Transition Strategy identified priorities for decarbonization of the building materials industry:

- Introduction of innovative energy-efficient technologies for the production of the following types of building materials: cement, bricks, lime, aerated concrete products.
- Introduction of advanced cement production technologies (dry method) with application of heat utilization technologies and technological processes for electric power generation.
- Increasing the use of secondary resources and large tonnage technogenic waste from industries advanced in the production of construction materials.

The "Uzbekistan-2030" Strategy sets a goal to double the production volume of construction materials and expand the production of new types of energy-saving materials by 2030, within the framework of the development of "driver" industries.

The forecast parameters for the expansion of the raw material base of the construction industry and the production of construction materials in 2019-2025, were approved by the Presidential Decree[154] and provided for an increase in production volumes, including gas concrete blocks - 7 times, architectural glass based on energy and heat-saving float technology - 4 times, and cement - 2 times.

In 2021-2022, in accordance with the President decisions, a completely new management system for the construction materials industry was introduced[155,156]. About 24 districts in the regions of the Republic were specialized in the production of construction materials, including cement and cement-based products. A program for the development of the building materials industry for 2022-2026 was also developed[157]. To develop entrepreneurship and deepen market relations in the production of construction materials, tax incentives were introduced[158].

Special attention is paid to the development of production of energy-efficient building materials. In 2021, East Mining Invest LLC was established, which is considered one of the leaders in the production of autoclaved aerated concrete blocks, which are characterized by strength, energy efficiency, vapor

[153] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[154] https://lex.uz/ru/docs/4351740
[155] https://lex.uz/docs/5449566
[156] https://lex.uz/ru/docs/5871094
[157] https://yuz.uz/ru/news/strategiya-razvitiya-promshlennosti-stroitelnx-materialov-na-2022-2026-god
[158] https://lex.uz/ru/docs/5610430

permeability, lightness and fire resistance. There are 7 basalt enterprises in the country with a capacity of 140 thousand tons. As a result of wide application of their products in construction, energy consumption in new residential and social buildings has decreased up to 20%[159]. Tasks have been set for production of such materials as sun-reflecting glass, vermiculite mixture and use of fiber panels on the facade of buildings, which allow to reduce energy consumption by almost 2 times.

According to the inventory[160], GHG emissions in this industry increased almost 2.3 times from 2010 to 2022, reaching 23.4 Mt of CO_2, which is 76.6% of the sectoral emissions of IPPU. The main sources of GHG emissions are the production of glass and glassware (82.2%), and the production of cement clinker (14.6%).

The main measures to reduce GHG emissions are aimed at reducing the energy intensity of existing enterprises producing construction materials and introducing modern resource-saving technologies into the production process to ensure energy efficiency and increase the productivity of enterprises.

Over the past two years, the industry's production has increased by a factor of 1.2, and targeted measures have reduced energy consumption by enterprises by a factor of 1.3 and energy intensity by a factor of 1.6. The reduction of energy consumption in the production of construction materials is an important task set by the government. According to an estimate based on an energy audit of 34 enterprises with high energy consumption, the potential for energy savings through the reuse of thermal energy is 300 million kWh per year[161].

Glass production. At JSC “Quartz” (Fergana region, Kuvasay), the leading enterprise in the Central Asian region for the production of colored, tinted and tempered sheet glass and glass containers, the Investment program was adopted, which is one of the largest in the glass industry and is aimed at the growth of the enterprise, modernization, introduction of modern technologies and expansion of the range.

Asl Oyna, a manufacturer of specialized glassware, plans to implement several investment projects. In particular, the company will implement projects to expand the production of glassware through the construction and commissioning of 3 glass furnaces and a plant for the enrichment of raw materials for glass production with the introduction of advanced energy-efficient technological equipment.

Cement production. According to the decree of the President[162] all new investment projects in cement production realized in Uzbekistan apply technologies based on the energy-saving “dry” method.

Large cement plants of Uzbekistan (JSC Qizilqumsement, JSC Bekobodsement JSC Quvasoycement) have joined the holding UCG[163] (United Cement Group), whose development plans include a multi-stage project to reduce carbon footprint and compliance of each company with ESG standards.

Qizilqumsement JSC in cooperation with one of the leading engineering companies KHD[164] carried out modernization of cyclone heat exchange units as part of clinker roasting production lines. The modernization allowed to reduce the specific consumption of natural gas by up to 13%, and electricity consumption by up to 5% per 1 ton of clinker and save 37 million kWh of electricity per year.

[159] https://president.uz/ru/lists/view/7564
[160] 1BTR NIR (1990-2022), 2024
[161] https://president.uz/ru/lists/view/7564
[162] https://lex.uz/docs/3221897
[163] https://unicementgroup.com/ustojchivoe-razvitie/
[164] https://www.khd.com/

2.17.6. Transportation

All types of transportation are developed in Uzbekistan: automobile, aviation, railroad and pipeline. The share of road transport is predominant. In terms of energy consumption, road transport ranks second after the residential sector. It accounts for 90.7% of cargo and 97.2% of passengers in the transportation structure[165].

At the national level, the transportation category accounts for 15% of total GHG emissions from fuel combustion. The main contribution to GHG emissions (excluding pipeline transport) is made by road transport - 92.2%, air transport - 0.3%, rail transport - 1.8%. Carbon dioxide (99.9%) dominates the composition of GHG emissions from motor transportation. Methane and nitrous oxide make up 0.1%. In the period 2010-2022, the growth of emissions from transport is 36.1%, with a 3.2-fold decrease in emissions from aviation, a 1.5-fold decrease in emissions from railways, and a 2.3-fold increase in emissions from road transport. The decrease in emissions from air transport is related to the decrease in the number of domestic flights, and from rail transport to the implementation of measures that lead to a reduction in fuel consumption: renewal of the transport fleet and its maintenance in a technically serviceable condition; systematic conversion of rail transport to electric traction[166].

The 48% increase in emissions from road transport over the study period is explained by a significant increase in the number of motor vehicles. Measures for technical renewal of motor vehicles, conversion of a significant number of vehicles to gas fuel (mainly trucks and public transport) contribute to curbing the growth of emissions[167].

The adopted strategic documents have formulated actions that aim at low-carbon development of the transport structure.

The Green Economy Transition Strategy identifies the following priorities:

- Development of green transportation in accordance with long-term urban development plans and measures to ensure environmental safety.
- Expansion of production and use of vehicles with improved energy efficiency and environmental performance in accordance with Euro-4 and higher standards, electric vehicles, vehicles with hybrid engines running on gas.
- Renewal of the vehicle fleet, development of an incentive program for scraping old and purchasing new, more environmentally friendly vehicles.
- Stimulating the development of electric transport, developing and improving efficient public transportation systems.
- Development of new transportation and logistics systems, road infrastructure, and strengthening state control over the environmental condition of vehicles.

The main directions of the Concept of environmental protection of the Republic of Uzbekistan until 2030 are the conversion of motor transport to alternative fuels, adoption of standards for wheeled vehicles and motor fuels, ensuring efficient organization of road traffic, and improvement of the environmental certification system. As a result of the implementation of the concept by 2030, it is expected that 80% of public transport will be converted to gas and electric fuel.

In the New Uzbekistan Development Strategy 2022-2026, one of the set goals is to develop a unified transportation system in interconnection with all modes of transport, creating conditions for the

[165] https://stat.uz/ru/default/ezhekvartal-nye-doklady/39035-2023-2
[166] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[167] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf

possibility of daily travel on regular transport routes between major cities.

In order to deepen the country's integration into global transport and logistics networks and increase the potential of the national transport system (Goal 53), the “Uzbekistan – 2030” Strategy sets specific objectives for the construction of new roads, electrification of railway transport, and the development of public transport.

In recent years, the government has adopted several resolutions[168], which have formed the regulatory framework for the realization of the strategic goal set and are described in detail in the 4NC:

- A ban on the introduction of new facilities to produce Euro-4 motor fuel and on the import of motor fuel, several categories of wheeled vehicles that do not meet the requirements of Euro-4. It is envisaged to limit the operation of motor vehicles that do not comply with Euro-5 in a number of cities of the country until 2030.
- Customs and tax incentives were introduced to support the production of electric and hybrid cars, as well as the development of infrastructure for electric vehicles, including the construction of 2,500 charging stations.
- International standards for road infrastructure development have been introduced.
- Measures have been developed to create a smooth and safe environment for the development of bicycle traffic.
- Priority development areas and a plan for the comprehensive development of public transport, including the integration of transport modes, etc. have been identified.

At the regional level, the Concept of Transport Development of Tashkent City has been developed and approved[169]. Its priorities are to at least double the level of public transport use by the population, to improve the ecological situation in the city by reducing the negative impact of transport on the environment through (i) upgrading public transport with modern, environmentally friendly buses, including electric buses, and (ii) developing unified state standards defining requirements for vehicles, and gradually increasing the level of transition to environmentally friendly green transport.

As a result of the implementation of a set of measures in the city of Tashkent, the public transport network is actively developing, new subway lines are being built, the network of bus routes is expanding, the bus fleet has been modernized, and new technologies for controlling and monitoring the bus transport system have been introduced. For the last 2 years the number of buses has increased 2 times. Their interval has been reduced by 2-3 times, a new network of routes covering all residential districts of the capital has been developed, daily passenger traffic has increased by 1.7 times[170]. The task of gradual transition of the capital's public transport to the green transport system has been set. The renewal of the bus fleet is proceeding at a fast pace: 58.7% of the buses purchased in 2022-2023 are powered by compressed natural gas and 21.4% by electricity[171].

New public transport systems are being introduced in Nukus and regional centers.

In order to green public transportation, the following projects are being implemented in the country:

- EBRD Green Cities Project (2022) aimed to reduce air pollution, including CO_2 emissions. The project procures 100 medium-size (10.5 meter) electric buses and chargers for Samarkand.
- GEF/UNDP project “Tashkent - Accelerating Investments in Low Carbon Transport” (TAILEV) (2022-2027) aims to accelerate the introduction of electric vehicles in Tashkent, reduce GHG

[168] PP-4035,2018, UPP-5863,2019 PP-812,2020, PP-111, 2022 PP-443,2022 PP-444,2022
[169] https://lex.uz/ru/docs/5847481
[170] https://kun.uz/ru/news/2023/11/30/kak-izmenilas-sistema-obshchestvennogo-transporta-tashkenta
[171] https://kun.uz/ru/news/2023/12/04/yeshche-200-elektrobusov-privezut-v-tashkent-v-2024-godu

emissions in the transport sector, and improve the quality of the urban environment. As a result of the pilot project implementation, it is planned to create a green urban transport corridor, reduce GHG emissions by 20.7 thousand tons of CO_2-eq because of replacing buses running on compressed natural gas and diesel with electric buses; reduce the load of pollutants (CO, NO_x and NH) by 10%.

The Tashkent Metro has undergone significant development, with 32 km of new lines, 21 stations, and 15 modern trains introduced in recent years. A 7.7 km section with five stations was completed in 2023, and work began on a 3.6 km section with two stations in 2024. Currently, the metro consists of four lines, 50 stations, five interchanges, and a total length of 70.8 km.

The popularity of electric cars is growing rapidly in the country: 809 units were delivered in 2021 and 3.7 thousand electric cars in 2022. According to the statistics agency in 2023, Uzbekistan has already imported 25.7 thousand electric cars.

Within the framework of measures to launch the production of electric vehicles, cooperation projects are being implemented in the country. In 2024, production of the first electric vehicles began at the joint Uzbek-Chinese company BYD Uzbekistan Factory in the Jizzakh region. This is the first stage of a $160 million project that is capable of producing 50,000 electric cars per year[172].

In 2017-2022, more than 80.5 thousand kilometers of highways were built, reconstructed and repaired at the expense of the national and local budgets, and 1 265 bridges and overpasses were reconstructed and repaired. Within the framework of the Investment Program[173] 5 IFI projects are being implemented to improve the highway system. By the end of 2026, 993.4 km of highways will be put into operation in the Republic, including 754 km with concrete pavement and 239 km with asphalt pavement.

In rail transportation, the main mitigation measures are the phased electrification of rail lines and the replacement and modernization of rolling stock.

The strategy “Uzbekistan-2030” sets the goal of building new high-speed railways and increasing the share of electrified railways to 65% (in 2023 their share will be 49%). In recent years, the electrification of Karshi-Termez, Urgench-Khiva, Angren-Pap-Kokand-Andijan, Pap-Namangan-Andijan and other sections has been completed. Projects are being implemented in accordance with the investment program for 2022-2026 [174]:

- Electrification of the Marokand-Navoiy railway line 135 km 2019-2022.
- Construction of the second track of the electrified Navoiy-Bukhara high-speed railway line 92.3 km.

The ADB project “Renewal of the Locomotive Fleet” (2022-2027) is currently being implemented. It is planned to supply a total of 24 electric locomotives with modern modifications and spare parts for them. The reduction of GHG emissions during the operation of the new locomotives will reach 900 thousand tons/year [175].

2.17.7. Water management

There are more than 4.0 million hectares of agricultural land, of which 82.5% is irrigated. Most of the irrigated lands of the country (60%) are supplied with water by pumping stations and pumping units[176] .

[172] https://president.uz/ru/lists/view/7349
[173] https://lex.uz/ru/docs/6329453
[174] https://lex.uz/uz/docs/5801125
[175] https://www.adb.org/projects/documents/uzb-51052-002-rrp
[176] https://lex.uz/ru/docs/5956151

Electricity used in the pumped irrigation system accounts for 16% of the total electricity consumed by the country. At the same time, at least 70% of the pumping stations operating in the country are obsolete. The main measures to save energy and reduce GHG emissions in this sector are related to the renewal and modernization of pumping units, electrical equipment in irrigation systems and vertical drainage systems.

The strategy "Uzbekistan-2030" sets the task (N 65) to reduce the power consumption of pumping stations within the framework of wide introduction of green energy technologies, the solution of which means achievement of the following indicators:

- Replacement of worn-out 1,069 pumps and 1,079 electric motors at pumping stations with energy-saving ones.
- Installation of energy saving devices, modernization of pumping stations, reduction of their annual electricity consumption by 30%.
- Conversion of pumping stations to alternative energy through widespread adoption of modern technologies that save electricity and other resources.

In 2020, the Water Sector Development Concept until 2030 was adopted[177], which provides for gradual modernization, replacement and renewal, elimination of energy efficiency and energy saving problems, creation of an automated monitoring system for management and control of electricity consumption, etc. The results of the implementation of the Concept until 2030 include replacement of 1,750 pumping units and 2,100 electric motors with modern energy-saving ones and reduction of the annual electricity consumption by pumping stations from 8.0 billion kWh to 7.0 billion kWh in 2025, to 6.0 billion kWh in 2030.

During the implementation of the "Strategy for water resources management and development of the irrigation sector in the Republic of Uzbekistan for 2021-2023" (PP-5005, 2021), 547 pumping units and 824 electric motors were replaced. Thus, reducing annual electricity consumption from 7.6 to 6.76 billion kWh (11%). In addition, in 2021-2023 1,717 remote water flow monitoring devices were installed, pumping stations were equipped with capacitors compensating for reactive power, modern frequency converters, and solar PV stations (308 sets).

Priority actions include measures to improve energy efficiency and reduce carbon emissions and operating costs of pumping stations.

To date, Uzbekistan is working to achieve the main targets outlined in the Concept and Strategy and is implementing the following projects:

- *The ADB/JICA Amu-Bukhara Irrigation System Rehabilitation Project* (2014-2023) is being implemented in accordance with government decisions[178].
  Progress Indicators:
  - Ensuring stable water supply to 275 thousand hectares of land in Bukhara province and 40 thousand hectares in Navoiy region.
  - Electricity savings 134.2 million kWh/year.
  - Reduction of GHG emissions by 178.1 thousand tons CO_2-eq.
- *The Karshi Pumping Station Cascade Overhaul (Phase III) SFR Project* (2018-2023) is being implemented in accordance with (PP-2977, 2017; PP-4170, 2019)[179].
  Progress Indicators:

[177] https://lex.uz/docs/4892946
[178] https://lex.uz/ru/docs/5956151
[179] https://lex.uz/docs/4196412?ONDATE=22.07.2020&ONDATE2=12.11.2019&action=compare

- Improving water supply to 402 thousand hectares of irrigated areas.
- Electricity savings of 106.55 million kWh per year.
- Reduction of GHG emissions by 56.7 thousand tons CO_2-eq.

– *The EBRD project "Modernization of 118 pumping stations in Andijan, Namangan and Fergana regions"* (2023-2027) is implemented according to the decision of the President[180].

Project goals to ensure before the end of the period:

- Reintroduction of 30 thousand hectares of unused land areas into turnover.
- Improvement of water supply to 57 thousand ha of irrigated land areas.
- Sustainable water supply to 4,500 households.
- Saving 287 million kWh of electricity.
- Reduction of GHG emissions by 152.7 thousand tons CO_2-eq.

– *The VEB/RF project "Modernization of 299 Pumping Stations" (2021-2026)* is being implemented in accordance with the Presidential Decision (PP-7230, 2021).

Indicators of progress include:

- Introduction of about 78 thousand hectares of land into turnover.
- Save of 80 million kWh.
- Reduction of GHG emissions by 42.6 thousand tons CO_2-eq.

2.17.8. Waste

In 2022, GHG emissions from the Waste sector amounted to 10.5 Mt CO_2-eq or 5.0% of total emissions. Of these, methane emissions from municipal solid waste (MSW) landfills account for 25% (2.6 Mt CO_2-eq)[181]. According to the inventory data, an average of 430 kg/year of waste per capita is generated on the territory of Uzbekistan. The estimated annual volume of MSW generation in 2022 is 15.2 million tons. There are 2.8 thousand waste collection points and 221 landfills in the country. The total area of all landfills is 1,533.79 ha, the area of one landfill varies from 0.5 ha to 60.0 ha.

The existing practice of MSW management has focused exclusively on its collection and transportation to landfills, where MSW is mostly disposed of without burial. Currently, experts estimate that all landfills in the country are classified as unmanaged landfills according to the IPCC classification, as none of the landfills are built according to the requirements of the regulatory documents (i.e. impermeable bottom, leachate collection, LFG collection, etc.). Most of the landfills are not equipped with scales for weighing machines, so it is difficult to quantify the mass of waste entering the landfills. At the same time, the number of landfills deeper than 5 meters is about 35%, the number of unmanaged shallow landfills is 65%. In 2022 the construction of a new landfill that meets modern requirements in Tashkent region was started.

The main activities aimed, among others, at curbing GHG emissions from MSW decomposition in landfills include:

- Increasing recycling and reuse rates.
- Introduction of separate collection, sorting and efficient recycling technologies.
- Carrying out land reclamation.

Uzbekistan has adopted the Law "On Waste", which is aimed at preventing harmful effects of waste on life and health of citizens and the environment, reducing waste generation and ensuring its rational use in economic activity.

[180] https://lex.uz/ru/docs/6307884
[181] 1BTR NIR (1990-2022)

The problem of waste management is very urgent for the country, measures and actions are proposed in many programs:

- National Sustainable Development Goals and Targets until 2030.
- Solid Waste Management Strategy.
- The concept of environmental responsibility.
- A strategy for the transition to a green economy.

The Solid Waste Management Strategy of Uzbekistan for 2019-2028 identified key challenges in solid waste management: insufficient provision of MSW collection and disposal services in rural settlements, unsatisfactory condition of MSW management infrastructure and non-compliance of existing landfills with the requirements of international law, sanitary and environmental standards (presented in detail in 4NC)[182].

In recent years, significant work has been done to improve the infrastructure of the solid waste management system, 13 state unitary enterprises for sanitary cleaning with 172 branches in districts and cities, as well as 9 clusters for integrated Solid Waste Management (SWM) have been established. In addition, as a result of the activities, the solid waste disposal coverage rate increased from 6% (2016) to 95% (2022)[183], the waste recycling rate increased 4 times compared to 2017[184] (Figure 2.23).

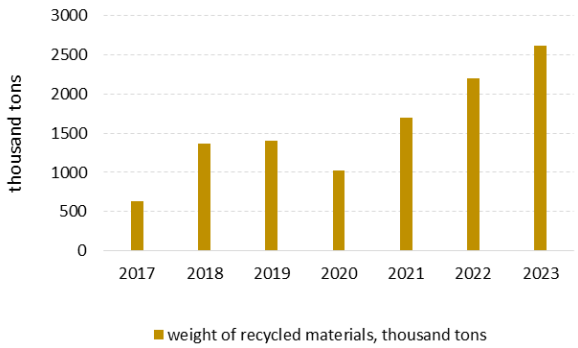


Figure 2.23 SDG Indicator 12.5.1 National level of waste recycling

In the Strategy "Uzbekistan-2030", the task of improving the quality of MSW collection and disposal services provides for the realization of the objectives:

- Increase the coverage of MSW collection and disposal services by 100%, the rate of waste recycling by 65%.
- Increase the rate of waste incineration to 35% and to reduce the rate of landfilling of municipal waste by at least 50%.
- Establish a cluster system covering the processes of urbanization, recycling of household waste and production of clean energy and other products from it under the Zero Waste System.

The following projects are being implemented to achieve the objectives of the Solid Waste Management Strategy:

- *ADB's Tashkent Solid Waste Management Project (2014-2022) (No. PP-2255, 2014).*
  Project Objective:
  - Reconstruct two transfer stations and close one in the city of Tashkent.
  - Construction of 350 new and reconstruction of 350 existing MSW collection points.
  - Purchase special machines and mechanisms for the sanitary landfills and transfer stations.
  - Purchase of 13.5 thousand garbage containers.
- *Project "Electricity generation through waste gas processing at Ahangaran landfill" (No.PKM-895, 2018) jointly* with Sejin G&E Co., Ltd (Republic of Korea). The project includes installation of 12 new modern generators and auxiliary equipment for electricity generation

[182] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf
[183]Voluntary National Review on the implementation of the National Sustainable Development Goals and targets of Uzbekistan until 2030 (second) https://nsdg.stat.uz/publications/26
[184] https://nsdg.stat.uz/uz/goal/15

from landfill gas (methane) generated at the Ahangaran (Ahangaran district) and Maidontol (Parkent district) household waste landfills in Tashkent region, with a total production capacity of at least 16 MW (10 units of 1,560 kW and 2 units of 500 kW).

- *EC/AFD/Uzbekistan Project "Modernization of Solid Waste Management in Samarkand City" (PP-3139, 2017).*
- Project objective: Improvement of the solid waste collection, transport and disposal system, improvement of the sanitary and ecological condition of Samarkand city, reduction of harmful emissions into the atmosphere.

  The existing landfill will be replaced by a sanitary landfill to safely isolate waste from the environment.
- *The EBRD project "Reclamation and Construction of New Solid Waste Landfills in the Republic of Karakalpakstan and Khorezm Region"* will promote resource efficiency by introducing sustainable waste management practices in the region through the construction of sanitary landfills designed to EU standards and waste sorting facilities. This is expected to reduce GHG emissions and provide significant health and environmental benefits. The project design in Karakalpakstan includes the construction of a new landfill and the rehabilitation of three existing landfills, plans to establish a low-capacity (700 tons/year) medical waste incinerator, the construction of eight transfer stations, and the rehabilitation of the access road to the landfill in the Kungrad district (including two bridges over canals). The solid waste management project in the Khorezm region includes the construction of two new landfills and a low-capacity (700 tons/year) medical waste incinerator, six transfer stations (TS), two municipal solid waste reception points (RP), construction/rehabilitation of roads leading to the landfills.
- The ADB Sustainable Solid Waste Management Project aims to: (i) assist the Government of Uzbekistan in developing the national solid waste management (SWM) sector by supporting sector reforms; and (ii) improve access to SWM services for residents of small towns, peri-urban areas, and rural areas. The project aims to improve the waste management system within the Toza Hudud. This includes improving the policy and regulatory framework, developing technologies to reduce GHG emissions, strengthening institutional structures, and optimizing private sector participation.

2.17.9. Land Use, Land Use Change and Forestry

Sustainable soil management and restoration of degraded land can mitigate climate change and improve food security. Carbon sequestration and storage in the soil reservoir not only contributes to resilience to climate change, but also maintains an optimal levels of organic carbon, which in turn benefits vegetation cover.

In the structure of the land fund of Uzbekistan, the largest share is occupied by agricultural land- 60.5%, followed by forest land (26.8%), and other categories account for 12.7%. In order to conduct the GHG inventory according to the methodology of the Intergovernmental Panel on Climate Change (IPCC) Guidelines 2006, the IPCC land categories were compared with those of the Republic of Uzbekistan. In the LULUCF sector, emissions and removals were estimated using the IPCC Tier 1 methodology in the following categories: forest land, cropland and grassland. The main removals of CO_2 in this sector are the Forest Land and Cropland categories, while the Grassland category is the main source of emissions.

Key land use mitigation measures to reduce emissions, increase carbon sequestration and stabilize soil carbon are:

- Improving soil fertility and restoring degraded lands.

- Adopting sustainable agricultural practices, including crop rotation and mixed cropping, reducing the use of chemical fertilizers and pesticides, and switching to organic farming to improve soil health.
- Optimizing pasture management to maintain the forage base and reduce pressure.
- Agroforestry.
- Reforestation and afforestation.

In 2022-2024. The government has adopted several laws and regulations, the implementation of which will contribute to the mitigation of climate change impacts on land use.

The Law "On Organic Products" (No. ZRU-766, 2022)[185] aims to develop organic agriculture in Uzbekistan, improve product quality and protect consumer interests and establishes clear criteria and standards for the definition of organic products, including requirements for production, processing and storage methods, including preservation, restoration and improvement of soil fertility.

The Law "On Plant Protection" (No. ZRU-877, 2023)[186] defines the regulation of relations in the field of plant protection, including: implementation of measures to protect plants from pests; procedure for obtaining permission to import of mineral fertilizers and chemicals used for plant protection, as well as import/export of biological protection products; compliance with technological processes of production of biological protection products and requirements to quality indicators of biological products grown in them.

The Law "On Soil Protection and Increase of Soil Fertility" (No. ZRU-903, 2024[187]) establishes the basic principles in the field of soil protection and increase of soil fertility, state regulation of the sector, the basis and procedure for increasing soil fertility. The law defines, among other things, measures to protect soils and increase their fertility, requirements for the protection and rational use of soils during urban planning or other non-agricultural activities, provisions for the preservation of the fertile soil layer and land reclamation, etc. The law also establishes the principles of soil protection and soil fertility improvement.

To combat land degradation, prevent desertification and increase soil fertility, a Presidential Decision (No. PP-277, 2022)[188] was adopted to create an effective system to combat land degradation, which raises these problems to the level of state policy. The Ministry of Agriculture has been given additional tasks:

- Development of state programs and strategies to combat land degradation and coordination of actions of ministries and agencies.
- Collecting and providing open access to information on the status and measures to combat land degradation through a single electronic resource.
- Monitoring land degradation and desertification, including measures for restoration, reclamation and improvement of land, pasture rotation, its protection and phytomelioration, crop rotation processes, creation of forest belts and protective forest plantations using modern technologies (drones, remote sensing, etc.) in accordance with national and international standards.

The document approved an action plan to combat soil degradation, prevent its processes and protect the soil, as well as forecast indicators for 2022-2025, which include increasing the humus content of soils by 1.02 million hectares, reducing soil salinization by 93.3 thousand hectares and the area of degraded pastures by 1.88 million hectares, creating 26.2 thousand hectares of protective forest plantations on agricultural land, expanding the areas covered with forest plantations by 981.4 thousand hectares.

[185] https://lex.uz/en/docs/5980349
[186] https://www.lex.uz/en/docs/6658266
[187] https://lex.uz/ru/docs/6787883
[188] https://lex.uz/en/docs/6058692

In order to improve soil fertility and yield of cotton lands, the Presidential Decree (No. PP-179, 2022)[189] on the implementation of effective incentive mechanisms for measures carried out by leaseholders of agricultural lands at the expense of the state budget in 2022-2023 was adopted on an experimental basis:

- Tax benefits for measures to improve fertility and protection against erosion.
- Partial exemption from land tax and subsidies for measures to restore, recultivate, reclaim and improve agricultural land.

The experiment is planned to be carried out in 13 administrative districts with the total area of 342.8 thousand hectares located in different regions of Uzbekistan, of which 127.8 thousand hectares are cotton areas. It is planned to test the practice of subsidization, selection and implementation of agrotechnical measures depending on the state of soil fertility. To implement the project, a roadmap has been approved for the introduction of science-based measures to improve soil fertility and yields, transition to new technologies for irrigation of cotton areas, establishment of plant protection services and modern laboratories, as well as training of farmers.

In order to protect pastures and ensure their rational use, a Presidential Decree (No. UP-24, 2023) was adopted[190], which includes a program of measures for pasture protection and the establishment of enterprises for the production of mixed fodder for small livestock with a capacity of 10,000 tons per year.

In this subsection, Uzbekistan provides qualitative descriptions of policies and measures, as it does not currently have data for quantitative assessments, including research results to determine ratios.

Forestry

Afforestation and reforestation are effective measures to mitigate climate change, as forests are important GHG sinks. The forest fund of the Republic of Uzbekistan covers 11,975.2 thousand hectares, of which 3,435.2 thousand hectares are forested. Although forests cover only 7.2% of the country's territory (much less than the world average, according to FAO), they are essential for curbing desertification processes, protecting biodiversity and landscapes. Desert forests, which occupy large areas despite their low productivity, have a significant potential for reducing GHG emissions.

Forest policy is implemented on the basis of the Constitution of the Republic of Uzbekistan, the laws of the Republic of Uzbekistan “On Forest”, “On Nature Protection”, “On Plant Protection”, “On Protected Natural Areas” and others.

Reforestation in Uzbekistan is a difficult task, given the country's arid climate and limited water resources. However, the government of the country has made this activity among the priority tasks necessary to combat desertification, improve the environmental situation, and create more favorable living conditions for the population. The main directions of forestry development until 2030 were formulated in the following strategic documents:

- A strategy for the transition to a green economy.
- Concept of environmental protection.

Concept of development of the forestry system in the Republic of Uzbekistan until 2030[191].

The documents define the basic approaches and goals for forest reform, forest protection and conservation, and the establishment and rational use of the Forest Fund[192].

[189] https://lex.uz/ru/docs/5924585
[190] https://lex.uz/ru/docs/6386441
[191] https://lex.uz/docs/5037204
[192] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf

In recent years, the Republic has taken systematic measures to green settlements, protect trees and shrubs, and expand green areas. These include the introduction of a moratorium on the falling of valuable species of trees and shrubs, and an increase in the number of fines and compensation for felling trees. Creating forest strips- Planting trees along roads and fields helps combat soil erosion and improves microclimate. Studies are underway to identify and use the most adapted species of trees and shrubs (saxaul, acacia, and other drought-resistant species).

The Government of Uzbekistan conducts large-scale tree planting programs using seedlings of fast-growing and drought-resistant species. These programs are often carried out as part of national campaigns involving volunteers. In 2021, the President of Uzbekistan launched the nationwide Yashil Makon project[193], which aims to plant 1 billion tree and shrub seedlings across the country over the next five years and increase the area of green spaces and parks from 8% to 30% by 2026.

Special attention in the country is paid to the creation of protective forests ("Yashil Koplamlar") on the dried up bottom of the Aral Sea. Reforestation is part of the complex of measures aimed at improving the environmental situation in the region. In accordance with the State Program on development of the Aral Sea region for 2017-2021[194] and the Government Decree[195], starting from autumn 2018 to 2023 on the dried bottom of the Aral Sea and in the Aral Sea region, forest creation works have been carried out on the area of more than 1.7 thousand hectares. The planted saxaul, tamarix and other salt-tolerant plants will prevent the transfer of salt and dust into the atmosphere and absorb salt from the soil, making it suitable for land use. Innovative technologies such as aerosowing of seeds, cutting of sand accumulation furrows, etc. are used in the creation of forest plantations[196]. The project "My Garden in the Aral Sea" is being implemented, the main purpose of which is to attract foreign tourists and local residents to eliminate the consequences of the Aral Sea crisis, to contribute to the greening of the Aral Sea region.

The adopted Strategy "Uzbekistan-2030" formulates the following directions of the state policy in the field of forestry development and sets target indicators:

- Expansion of the nationwide project "Yashil Makon" aimed at stabilizing the environmental situation*:*
  - Planting 200 million tree seedlings annually and increasing the level of greening of the republic up to 30%, creating a system of care and irrigation for each planted tree.
  - Creation of 1,984 green gardens, including 112 large industrial enterprises on their own and adjacent territories within-3 years "green belts" of 30 million seedlings; "green gardens" on the territories of all government agencies, enterprises, educational institutions.
  - Creation of public parks in city and district centers for every 50-100 thousand people.
  - Increasing the territory of green areas in the city of Tashkent 5 times, making it 5 thousand hectares.
- Expansion of the forest area:
  - Creation of 26.2 thousand hectares of protective forest plantations to protect land from erosion and reclamation facilities- from sand drifts.
  - Increasing the area of forest plantations in the country up to 6.1 million hectares.
  - Establishment of forest plantations in mountainous and foothill areas.
- *Stabilization of the ecological situation in the Aral Sea region, reduction of the negative impact of the environmental problems caused by the drying up of the Aral Sea:*

[193] https://lex.uz/docs/5801449
[194] https://lex.uz/docs/3099707
[195] https://lex.uz/docs/4759792
[196] https://unfccc.int/sites/default/files/resource/4NC_Uzbekistan_RU.pdf

- In the Aral Sea region to increase forest plantations to 2.3 million hectares.
- Creation of additional 600 thousand hectares of green areas at the bottom of the dried Aral Sea, bringing their total volume up to 2.6 million hectares or 80% of the territory.

– Preventing the negative effects of climate change:
- Creation of 600 thousand hectares of protective forest plantations as a measure to counteract desertification, drought, dust and sand storms.

Uzbekistan cooperates with international organizations to obtain technical and financial support in the field of afforestation. The following projects are currently being implemented:

– *FAO/GEF project "Sustainable forest management in mountain and valley areas of Uzbekistan".* (2018-present), funding amount $3.3 million.
The objective is the sustainable management of mountain and valley forests in Uzbekistan.
The project is implemented in 4 areas representing different types of forest ecosystems in Uzbekistan: are Syrdarya, Dehkanabad, Kitab and Pap State Forestries.
Progress indicators: sustainable benefits such as carbon sequestration and improved livelihoods for at least 500 local households. Sequestration: 4.1 Mt CO_2-eq over 20 years or 206,021 t CO_2-eq/year, mitigation potential is 2.4 t CO_2-eq/ha/year.

– *Project GEF-7 Sustainable management of forests and pastures in dryland ecosystems of Uzbekistan (2020-2025).*
Objective- Demonstrate the Land Degradation Neutrality (LDN) approach and scale up SLM/SFM practices in the Bukhara-Navoiy landscape.
Progress indicators: Number (ha) under SLM meeting LDN criteria:
25,000 hectares of irrigated agricultural land.
100,000 hectares of forests.
100,000 hectares of pastures.
13,000 hectares of restored land.
1,000 direct beneficiaries.
Carbon sequestration is 5.1 Mt CO_2-eq over 20 years.

– *Turkish Cooperation and Coordination Agency TIKA project "Promotion of natural regeneration of tugai trees in the coastal zones of the Amudarya delta and strengthening the material and technical base of forestry farms of the Aral Sea zone"* (2017-present).
The aim of the project is to organize a modern tree nursery in the Khorezm forestry with the construction of nursery infrastructure, purchase of necessary machinery and organization of cultivation of planting material.
Promotion of natural regeneration of tugai trees on 5 thousand hectares of the coastal zones of the Amudarya delta and strengthening of the material and technical base of forestry enterprises.

– *GIZ regional project "Integrated land use in response to climate change in Central Asia".*
Main objective is Integrated land use management. Implementation period is from 2022.

2.18 Conclusions

The update of the NDC provided stimulus for the development of the country's national climate policy for 2022-2023. The analysis of key policies and measures, actions and mitigation plans related to the implementation and achievement of NDC2 led to the following conclusions.
Uzbekistan's domestic climate policy is implemented in accordance with its commitments under the Paris Agreement and is aimed at achieving sustainable development:

- Uzbekistan is seeking to integrate climate responsibility into its economic development model and increase efforts to reduce dependence on fossil fuels. The New Development Strategy of Uzbekistan for 2022-2026 and the Uzbekistan 2030 Strategy include key strategic objectives and priority areas related to climate change mitigation and adaptation, which are in line with the objectives of the Green Economy Transition Strategy and previously approved sectoral development concepts.
- Institutional structure for coordination of green economy transition activities is established and functioning. Monitoring the achievement of general economic goals and plans related to climate change (including the NDC, the Green Economy Transition Strategy, the Green Growth Program and the Action Plan) is carried out by authorized bodies through periodic reports on the implemented measures. The efficiency and effectiveness of the work carried out will be evaluated on the basis of the targets for the transition to a green economy and green growth by 2030.
- The legislative and regulatory framework for the regulation of GHG emissions is being developed. A draft law "On limitation of GHG emissions" has been developed, several normative acts regulating and stimulating the development of RES, green transport, etc. have been adopted.
- To improve data collection and management of GHG emission reductions, conditions and procedures for a modern MRV system are being developed. The National Transparency System will be introduced to improve the system of reporting on the fulfillment of commitments and requirements under Article 13 of the Paris Agreement.
- Green financing instruments are being developed: a system of green energy certificates has been introduced, the National Taxonomy of the Green Economy has been approved, green bonds have been issued, and the process of green lending has been launched.
- The introduction of ESG principles into corporate strategic planning and reporting has begun, with large companies developing a carbon reporting mechanism and developing measures and targets to reduce GHG emissions.
- Technological measures are being implemented in various sectors of the economy to reduce direct GHG emissions.

The package of technical measures includes the following activities to reduce GHG emissions in the key sectors of energy (electricity, heat, oil and gas), industry, transport, water and forestry:

Power generation:

- Modernization and renewal of generation capacity through the construction of modern CCGTs and GTUs.
- Reduction of losses in power grids.
  - Construction of RES (PVPPs, WPPs, HPPs) and development of infrastructure for their connection to the energy system.
- Development of decentralized energy: construction of HPPs using mini- and micro-generation technology, introduction of distributed small-capacity RES.

Buildings:

- Improving the efficiency of heat supply systems and projects for modernization and reconstruction of the central heating system and improvement of energy-efficiency.
- Improving the energy efficiency of buildings: strengthening of building standards, renovation of public buildings, energy savings and use of energy-efficient building materials, energy-efficient household appliances and light bulbs, introduction of low-power RES.

Industry:

- Reduce direct nitrous oxide emissions.
- Introduction of green technologies throughout the process chain in the modernization of mineral fertilizer production.
- Improve energy efficiency of technologies used in all industries.
- Comprehensive measures to save FER planned indicators of FER saving, mandatory energy audit, mandatory certification according to ISO 50001 standard, introduction of increasing coefficients for energy prices.

Water management:

- Increasing the energy efficiency of pumping stations and improving the efficiency of pumps.
- Phased modernization, replacement and renewal of equipment.
- Introduction of RES for power supply of pumping stations.
- Creation of an automated system for monitoring, management and control of electricity consumption, etc.

Transportation:

Highway

- Limiting emissions and reducing energy consumption in transportation, promoting alternative fuels, and improving fuels.
- Fleet renewal.
- Gradual transition to electric transport.
- Improve public transportation system: expand metro, purchase modern buses, including electric buses, expand and optimize systems.

Public transportation

- Development of road infrastructure, including bicycle roads.
- Expand production of electric and environmentally friendly vehicles.
- Development of logistics systems.
- Strengthening control over the environmental condition of motor vehicles.

Railroad

- Phased electrification of railway lines.
- Renewal and modernization of rolling stock.

LULUCF:

- Afforestation and reforestation, improvement of agricultural soil fertility.
- Restoration of degraded pastures.
- Ensuring continuous growth of forest plantation areas through afforestation of non-forested areas, reforestation of degraded forest plantations, creation of buffer strips and park zones, introduction of greening standards in cities.

Waste:

- Improve MSW management system.
- Increase recycling and reuse rates.
- Implement separate collection and sorting and efficient recycling technologies.
- Implement land reclamation.

Assessment of the effectiveness of mitigation actions includes analysis of the progress of their impact on GHG levels and sustainable development. However, since the MRV system and the National Transparency System in Uzbekistan are in the stage of formation, there is currently no comprehensive system of monitoring of decarbonization measures both at the sectoral and national levels. There is a practice of periodic collection and submission of information at the stage of preparation of National

Communications and other documents, and it is impossible to monitor their effectiveness for a significant list of measures:

- Assessment of the effectiveness of actions is based on project documentation and expert judgment. Project documents do not always provide publicly available data on ex-ante and ex-post estimates of emission reductions, energy savings, and other progress indicators.
- There is no single interagency database of statistical information that includes indicators on GHG emissions, fuel and energy resource savings, etc.
- Analysis of the business practices of large GHG emitting companies revealed the lack of a consistent regulatory framework for the development of corporate carbon reporting principles, as well as adopted national methodologies for calculating emissions and emission factors. Emissions estimates are based on sectoral methodologies or consulting services, making it difficult to produce systematic estimates that are comparable with the national inventory system prepared in accordance with UNFCCC principles and procedures.
- Most GHG emitters do not have automatic systems for registering emissions of pollutants into the atmosphere.
- Effective economic mechanisms to reduce GHG emissions by specific companies do not work.

The functioning of an effective national MRV system will help to address these issues, provided that a systematic collection and analysis of data on applied decarbonization measures in different sectors is established and an annually updated database is organized.

2.19 Brief information on GHG emissions and removals. Projections of emissions and removals of GHGs, depending on circumstances.

Trends in total GHG emissions and removals

Based on the inventory results for Uzbekistan, the total GHG emissions in 2022 were as follows (Table 2.18):

- 209.613 Mt CO_2-eq, excluding LULUCF sector removals.
- 201.153 Mt CO_2-eq, including LULUCF sector removals.

Compared to the baseline 2010 level, total GHG emissions in 2022 increased by 20.9%, or 16.1% when including the LULUCF sector. Between 2010 and 2022, the lowest GHG emissions were observed in 2015 at 166.981 Mt CO_2-eq, while the highest emissions occurred in 2021 at 212.015 Mt CO_2-eq.

Table 2.18 GHG emissions by sector, million t CO_2-eq

Years	Energy	IPPU	Agriculture	Waste	Total	LULUCF	Total (including LULUCF)
1990	129.440	11.659	12.707	4.855	**158.661**	-16.060	**142.601**
1991	130.529	11.424	13.875	4.989	**160.817**	-14.776	**146.040**
1992	124.443	10.627	14.756	5.129	**154.955**	-15.145	**139.810**
1993	126.935	9.507	14.994	5.265	**156.702**	-15.073	**141.628**
1994	125.087	7.935	15.118	5.379	**153.518**	-15.079	**138.440**
1995	127.829	7.421	14.762	5.497	**155.509**	-14.659	**140.851**
1996	131.305	7.794	14.098	5.622	**158.819**	-9.687	**149.132**
1997	129.793	8.576	14.546	5.714	**158.629**	-10.275	**148.354**
1998	128.934	9.649	14.569	5.826	**158.978**	-8.893	**150.084**
1999	134.447	8.632	14.721	5.937	**163.736**	-10.407	**153.330**
2000	139.387	9.251	14.784	5.996	**169.418**	-8.790	**160.627**
2001	138.478	9.372	14.651	6.122	**168.624**	-7.935	**160.690**

Continuation of Table 2.18

Years	Energy	IPPU	Agriculture	Waste	Total	LULUCF	Total (including LULUCF)
2002	142.771	10.016	14.893	6.296	**173.976**	-4.419	**169.558**
2003	137.085	9.455	15.658	6.406	**168.604**	-5.783	**162.822**
2004	135.186	11.814	16.398	6.517	**169.914**	-6.572	**163.343**
2005	129.464	12.929	17.275	6.625	**166.293**	-1.972	**164.321**
2006	132.799	13.036	18.118	6.758	**170.71**	-1.431	**169.281**
2007	130.620	14.542	19.179	6.904	**171.245**	-0.970	**170.275**
2008	133.471	15.100	20.616	7.073	**176.259**	0.734	**176.993**
2009	132.188	12.828	22.029	7.267	**174.312**	0.448	**174.762**
2010	127.226	14.243	23.502	7.516	**172.487**	-0.168	**172.319**
2011	124.075	13.843	24.812	7.768	**170.497**	-1.644	**168.855**
2012	118.462	13.889	26.196	7.973	**166.519**	-2.157	**164.362**
2013	119.044	15.628	26.771	8.156	**169.599**	-1.647	**167.952**
2014	119.257	15.806	27.340	8.375	**170.778**	-4.077	**166.701**
2015	114.999	15.009	28.384	8.604	**166.979**	-3.896	**163.100**
2016	117.748	15.154	29.612	8.835	**171.349**	-3.049	**168.300**
2017	116.134	15.631	30.923	9.055	**171.743**	-1.880	**169.864**
2018	128.792	17.967	31.868	9.224	**187.851**	-1.316	**186.535**
2019	125.844	20.309	32.680	9.482	**188.315**	-1.960	**186.356**
2020	123.858	21.003	33.294	9.791	**187.946**	-2.989	**184.957**
2021	139.606	28.676	33.740	10.156	**212.178**	-4.530	**207.648**
2022	133.513	30.252	35.352	10.497	**209.614**	-8.460	**201.154**
$\Delta_{(1990\text{-}2022)}$	**+3.15%**	**+159.46%**	**+178.21%**	**+116.21%**	**+32.11%**	**-47.32%**	**+41.06%**
%, 2022	**66.37%**	**15.04%**	**17.57%**	**5.22%**	**104.21%**		
$\Delta_{(2010\text{-}2022)}$	**4.94%**	**99.14%**	**50.42%**	**39.67%**	**20.86%**	**50 -fold increase**	**16.09%**

In 2022, the GHG contribution to total emissions is (Mt CO_2-eq) excluding LULUCF (Figure 2.24):

- CO_2 - 135.55 (64.7%).
- CH_4 - 60,20 (28.7%).
- N_2O -12.74 (6.1%).
- HFCs -1.13 (0.5%).

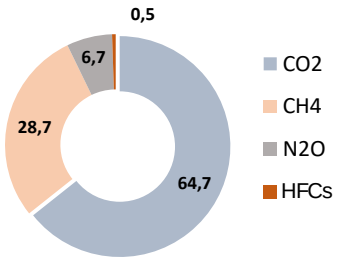


Figure 2.24 Structure of total GHG emissions by gases

Since 2010 was chosen as the base year for the NDC of the Republic of Uzbekistan, changes in GHG emissions were estimated for the period 2010-2022. During this period, the total emissions of all GHGs increased by 20.9%, including CO_2 emissions by 23.53%, N_2O by 41.95%, CH_4 by 9.51%, and HFCs by 62.56 times.

During this period, the share of the Energy sector in total GHG emissions decreased from 73.2% to 63.6%, while the shares of other sectors increased: IPPU from 9% to 14.5%, agriculture from 13.5% to 16.8%, and waste from 4.3% to 5%.

The main increase in emissions was observed in the period 2018-2022.

Between 2010 and 2022, GHG emissions by inventory sector changed as follows:

- In the Energy sector it increased by 4.94%.
- In the IPPU sector it increased by 99.1%.

- In the Agriculture sector it increased by 50.4%.
- In the Waste sector it increased by 36.7%.
- In the LULUCF sector increased by 50 times.

In the period 2010-2022, the highest growth rates of GHG emissions were observed in the IPPU sector, mainly due to the growth of industrial production in the Manufacture of Mineral Products category, and the lowest in the Energy sector, due to the introduction of new technologies and resource and energy saving policies.

The largest contribution to CO_2 emissions, 79.6%, comes from the Energy sector (fuel combustion) and 20.4% from the IPPU sector (glass, cement, ammonia, etc.).

The distribution of methane emissions by inventory sector is as follows: the Energy sector accounts for 41.6% (mainly due to methane leaks from gas systems in the oil and gas industry); 42.2% for the Agriculture sector (livestock); 16.1% for the Waste sector (decomposition of MSW in landfills, generation in wastewater); and the IPPU sector accounts for less than 0.1%.

The Agriculture sector is the largest contributor to N_2O emissions, accounting for 77.9%. This includes emissions from manure management and storage, as well as from cultivated land when nitrogen fertilizers are applied and the decomposition of crop residues in soils. The IPPU sector follows, contributing 13.3%, primarily from nitric acid production. The Waste sector accounts for 6.2%, with emissions generated in domestic wastewater. The Energy sector contributes 2.6%.

HFC emissions are exclusive to the IPPU sector, where they are primarily associated with the use of refrigerants in air conditioning and refrigeration systems.

2.20 Projections of GHG emissions and removals, as appropriate

Projections of GHG emissions to 2030 based on the results of the GHG inventory for the period 1990-2022 and estimates of the potential for GHG mitigation measures discussed below (Section 2.20.2).

With respect to the GHG emission projection, the flexibility clause in paragraph 95 of Decision 18/CMA.1 rules, procedures and guidelines was applied. As a result, the projection of GHG emissions under the three development scenarios covers the period up to 2030, which is the target year of the current NDC of Uzbekistan. As the country's climate change commitments are expected to be updated in 2025 and considering the process of developing the long-term low emission development strategy of Uzbekistan, it is planned to update the projections up to 2050 or 2060 taking into account the updated information in the context of preparing the BTR2.

Three scenarios have been developed to estimate GHG emissions for the perspective until 2030, using target indicators of sectoral programs and strategies, development trends of the main sectors of the country's economy, international and national expert forecasts of macroeconomic indicators:

1. Inertial (without measures, WOM scenario). Assumption: GHG emissions growth rates remain at current levels, energy consumption in economic sectors grows in proportion to GDP and population growth. The scenario does not assume the implementation of additional measures to reduce GHG emissions.
2. Realistic (scenario with existing measures, WM). Assumption: implementation of mitigation measures included in sectoral programs or priority projects that are being implemented or planned and financed in the near future. Growth rates of GHG emissions are reduced due to diversification of fuel consumption structure, reduction of natural gas consumption and increase of RES share in energy production.

3. **Ambitious** (scenario with additional measures, WAM). Assumption: Reduction of GHG emissions growth rates can be achieved as a result of implementation of "green economy" principles, improvement of energy efficiency, realization of the maximum potential for GHG emissions reduction in energy production, distribution and consumption. This option can be implemented with significant financial support from international financial institutions.

2.20.1. Methodology

The GHG Abatement Cost Model (GACMO)[197], which uses a bottom-up approach to estimating GHG emissions and estimates projected GHG emissions by major IPCC sectors and categories, adapted to national circumstances, was used for the calculations.

Model calculations of GHG emissions were based on:

- GHG inventory results (1990-2022).
- Data on current and projected fuel and electricity consumption in key sectors of the economy.
- Macroeconomic indicators (GDP and population growth).

The scenarios use the following assumptions about the growth rates of key macroeconomic indicators for the period 2022-2030. The forecast GDP growth rates are selected on the basis of the analysis of strategic documents for the short and long-term perspective and amount to approximately 6% per year in the period up to 2030. The forecast of annual population growth is adopted in accordance with the analytical report of the UN Department of Economic and Social Affairs of the UN Secretariat "World Population Prospects" 2022 (UN scenario variant "High")[198]. The annual population growth rate is 1.63% for the period 2022-2025 and 1.37% for the period 2025-2030.

According to the recommendations of the GACMO model, 2022, the last year of the current GHG inventory, is taken as the base year.

2.20.2. Capacity assessments

Estimates of GHG emission reduction potential were made for key sectors of the economy and used in the calculation of projected GHG emissions under the Realistic and Ambitious scenarios.

For the **Realistic** scenario, potential GHG emission reductions were estimated as a result of the completion of activities with guaranteed financing that are currently being implemented or are priority projects planned for the near future.

Based on the analysis of development programs and active investment projects, and consultations with national experts, the GHG emission reduction potential up to 2030 was estimated.

In the *power generation and transmission* sector, the GHG emission reduction potential is 30.75 Mt CO_2/year as a result of projects:

- Construction of new and expansion of existing TPPs based on CCGT and GTU technologies: 13.07 Mt CO_2/year.
- Construction of PVPPs (5.2 GW), WPPs (3.2 GW), installation of PV and small PVPPs (1.2 GW): 13.11 Mt CO_2/year.
- UZBEKGIDROENERGO JSC and PPP projects on construction of HPPs, micro- and small HPPs: 3.95 Mt CO_2/year.

[197] The Greenhouse Gas Abatement Cost Model has been developed through more than 20 years of research by the UNEP Climate Center in Copenhagen and is used by several countries to calculate emission projections https://unepccc.org/.
[198] United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Online Edition

– Development and modernization of trunk power grids: 0.46 Mt CO_2/year.

The CO_2 reduction potential from fuel and energy savings in the power and industrial sectors is estimated at 9.7 Mt CO_2.

In the buildings sector, the potential is 4.1 Mt CO_2, of which measures to improve the efficiency of heat supply systems will reduce GHG emissions by 0.55 Mt, and measures to improve the energy efficiency of social buildings is by 3.51 Mt CO_2.

In the water sector, the implementation of projects to modernize and improve the technical condition of pumping stations will reduce energy consumption for water supply and save 0.43 Mt CO_2/year.

In the transport sector, projects to improve the efficiency of railways and develop low-carbon public transport will reduce GHG emissions by 0.92 Mt CO_2/year.

In the chemical industry, the implementation of nitrous oxide emission reduction projects at three major plants under the NACAG initiative and the introduction of green technologies in fertilizer production will result in a reduction of 1.64 Mt $CO_{2\text{-eq}}$/year.

The use of sustainable forest and rangeland management policies and practices in mountain and valley dryland ecosystems will result in carbon sequestration. The potential for CO_2 sequestration by 2030 is estimated at 2.7 Mt CO_2/year.

According to the estimates, *the total GHG emission reduction potential* by 2030 under the realistic scenario is 50.04 Mt $CO_{2\text{-eq}}$ including CO_2 uptake by forests and 47.34 Mt CO_2-eq excluding uptake.

For the Ambitious scenario, potential assessments were conducted based on the target indicators of strategies and concepts for the development of systemically important sectors of the economy, i.e., mitigation measures and actions with a relatively high degree of uncertainty for implementation, which are planned for the future but have not yet been financed It should be noted that some of the capacity assessments made in the preparation of the 1BUR have not changed and are still valid.

Power production. The goals and directions of development of the power sector in the medium and long term, priorities and benchmarks are defined in the "Concept of power supply of Uzbekistan for 2020-2030". According to the document, it is planned to change the structure of generating capacities and to increase electricity generation by 2030 almost twice as much as in 2019.

The Concept envisages modernization and reconstruction of existing power plants, construction of new power plants using energy-efficient technologies, improvement of electricity metering systems, development of RES, especially solar and wind power, construction of the first nuclear power plant (NPP), as well as legislative reforms to improve tariff policy and ensure transition to the wholesale market. The 1BUR estimated GHG emission reductions based on the target parameters of the Concept, according to which the GHG emission potential is equal to 27.3 Mt CO_2-eq. Currently, in order to overcome the existing energy deficit, the country's efforts are focused on the rapid development of RES. By 2026, 27 RES projects with a total capacity of 13.9 GW and generation of 36.6 billion kWh[199] are planned to be implemented. On this basis, the potential calculations based on the Concept data have been revised, resulting in a GHG emission reduction potential of 37.0 Mt CO_2-eq.

In this scenario, the estimated reduction of CO_2 emissions as a result of saving fuel and energy resources in the power sector and industry is estimated at 9.7 Mt CO_2, since all strategic programs assume the implementation of a number of energy efficiency measures. Currently, in order to overcome the existing

[199] https://lex.uz/docs/6385720

energy deficit, the country's efforts are focused on the rapid development of RES.

Oil and gas industry. The priority tasks of the oil and gas industry for the future should be defined in the Concept of supplying the Republic of Uzbekistan with oil and gas products for 2020-2030:

- Increasing the production of hydrocarbons, including natural gas, to 62 billion m^3 by 2030, ensuring full satisfaction of the needs of economic sectors and the population, as well as the profitability of the company.
- Development of the transit potential of the gas transportation system through construction, reconstruction of gas pipelines and compressor stations, and increasing the volume of natural gas storage in underground gas storage facilities.
- Implement a system for monitoring and controlling gas flows (SCADA) and automated control systems at gas distribution stations.
- Reduction of natural gas losses during delivery to consumers through modernization and reconstruction of existing gas distribution stations and networks.
- Gradual transfer of gas supply facilities to private operators for the operation of gas distribution networks and related facilities, as well as for the sale of natural gas to consumers on a public-private partnership basis.

Considering that Uzbekneftegaz JSC has set targets to reduce direct and indirect GHG emissions by 25% by 2030, and that the industry has implemented several measures that have led to a significant reduction in leaks during gas transportation, the potential to reduce fugitive emissions in the future is 1 Mt CO_2-eq/year.

Industrial processes. In the main strategic documents “Strategy for Transition of the Republic of Uzbekistan to a Green Economy for 2019-2030”, “Strategy of Development of the New Uzbekistan for 2022-2026”, Strategy “Uzbekistan-2030” the goal is to increase the energy efficiency of the economy by at least 20% and more through the widespread use of clean and environmentally friendly technologies and industrial processes.

In terms of reducing GHG emissions, the construction materials, chemical and metallurgical industries are the most important.

In Uzbekistan, according to the Presidential Decree, all new cement production projects will use technologies based on the energy-saving “dry” method. This measure will ensure relative gas savings of 35-40% per ton of cement. By the end of 2025, the production of cement, including high quality and special types based on energy-saving technologies, will increase to 20.26 million tons. Thus, the production growth will be 6 million tons from the level of 2021. The use of “dry” process technologies will reduce GHG emissions by 0.699 Mt CO_2.

The chemical industry has a total nitric acid production capacity of 1.2 million tons/year. Nitrous oxide emissions from this sector account for 16% of the industrial emissions. The potential for reducing nitrous oxide emissions in the country is estimated at 2 Mt CO_2-eq/year.

In the *metallurgy*, JSC ”Almalyk MMC” has set energy transition targets for carbon neutrality to reduce GHG emissions by 15% (by 0.77 Mt CO_2-eq) by 2030.

The total emission reduction potential in the *Industrial processes* sector is 3.5 Mt CO_2-eq.

Transportation. Further development of Uzbekistan's economy implies growth of the transport sector and introduction of advanced, innovative technologies:

- Production of fuel, cars and other machinery that meet Euro-3, Euro-4 and Euro-5 environmental standards.

- Shifting up to 50% of freight transport to rail with electric traction.
- Use of up to 40-50% hybrid, electric and other vehicles.

On the one hand, the development of the sector implies an increase in the number of vehicles, on the other hand, the implementation of the above measures will, according to expert estimates, make it possible to limit the growth of GHG emissions and achieve their reduction by 2.5 Mt CO_2-eq/year.

Buildings. The buildings sector is one of the largest energy consumers in Uzbekistan. Converting the central heating supply of the city of Tashkent to a closed system, taking into account the introduction of modern resource-saving technologies, will reduce GHG emissions by 2.5 Mt CO_2-eq/year.

One of the key objectives defined in the Concept of Transition to Green Economy and Energy Saving in Industry[200] is to increase the energy efficiency of buildings and structures by 30% by 2030. The emission reduction potential of achieving this target is estimated at 3.78 Mt CO_2.

Since 01.01.2017, the use and sale of incandescent lamps with the power of more than 40 W is prohibited on the territory of the country (No. PKM-299, 2015). According to calculations, the reduction of CO_2 emissions will be about 1.4 Mt of CO_2.

Since 01.01.2016, new requirements for energy efficiency labeling of household appliances sold in the country have been introduced. The situation in Uzbekistan is characterized by a high level of household equipment with the most energy-intensive electrical appliances: TV sets, refrigerators and washing machines. The largest shares of imports are air conditioners, refrigerators, TV sets and electric heaters. Their imports and the volume of domestic production have also grown significantly. According to calculations, the energy saving potential in Uzbekistan in case of using the best available technologies for refrigerators and TV sets is about 1500 GWh/year, the estimated reduction of CO_2 emissions is 0.8 Mt/year.

In the buildings sector, the total CO_2 reduction potential is 8.48 Mt CO_2.

Water management. The main technical measures to reduce GHG emissions are related to the replacement of worn-out equipment and the reduction of energy consumption at mechanical irrigation pumping stations through the use of energy-efficient pumps. The "Concept of Water Sector Development for 2020-2030" envisages a reduction of the annual electricity consumption of pumping stations by 2 billion kWh by 2030. At the same time, the potential reduction in GHG emissions is estimated at 1.1 Mt CO_2-eq/year.

Forestry. Afforestation and reforestation are effective measures to mitigate climate change, as forests are an important GHG sinks. Since December 2018, the state program on eliminating the consequences of the drying up of the Aral Sea has been implemented. During this period, 1.6 million hectares of protective forest plantations have been established on the dried Aral Sea bottom. It is planned to increase the area to 2.5 million hectares by 2025. Within the framework of the government's decision on the creation of fast-growing plantations, it is planned to create paulownia plantations of 3.8 million seedlings on 5 thousand hectares by the end of 2024[201]. In the same period it is planned to expand the area of green parks by 1.2 thousand hectares within the framework of the program "Yashil Makon" ("Green Space")[202]. Reproduction of forests, rational use of forest fund lands, organization of protective plantations will allow to increase the full potential of CO_2 sequestration by 2030 up to 10.9 Mt CO_2.

Thus, *the maximum GHG emission reduction potential under the* ***Ambitious*** *scenario* is 74.2 Mt CO_2-eq

[200] https://lex.uz/ru/docs/6303233
[201] https://lex.uz/docs/4970986
[202] https://lex.uz/docs/5801449

(63.3 Mt CO_2-eq excluding uptake by forest plantations) (Figure 2.25).

The most likely scenario to be implemented is **Realistic**, as it implies the implementation of GHG emission reduction measures included in the strategic programs and plans with financing.

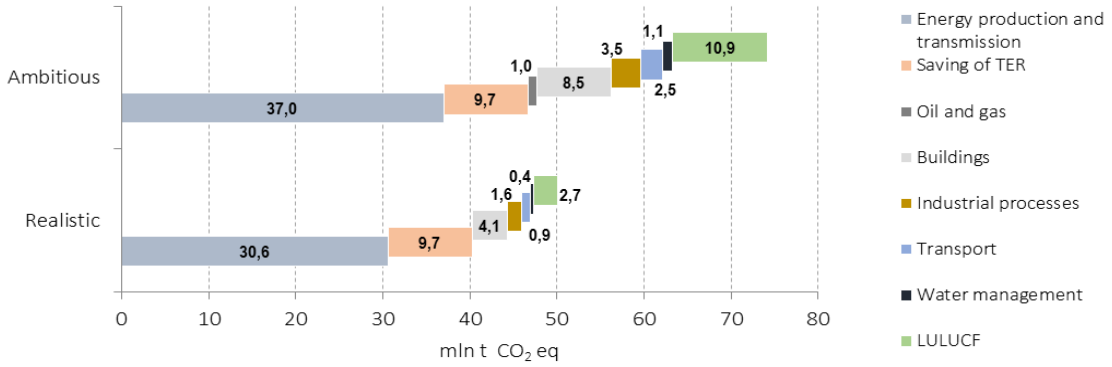


Figure 2.25 Emission reduction potential in key sectors of the economy

2.20.3. Projections for GHG emissions for the period up to 2030

The **Inertial** scenario estimates GHG emissions through 2030 according to trends in key sectors and categories as reported in the latest GHG inventory. It is calculated that total GHG emissions under this scenario could increase by 34% to about 280 Mt CO_2-eq by 2030.

Estimates for the **Realistic** scenario show a reduction in total GHG emissions by 2030 of about 16% compared to the Inertia Scenario and amount to about 234 Mt CO_2-eq, excluding removals in the LULUCF sector.

The **Ambitious** scenario allows GHG emissions to be contained (growth is projected to be less than 5% by 2030 relative to 2022), provided that the maximum GHG mitigation potential of approved and considered policies, prospective programs and projects is realized. Emissions reductions in 2030 compared to the **Inertial** scenario could be about 23%.
The results of the calculations for all three scenarios are summarized in Tables 2.19-2.21 and Figure 2.26.

Most of the programs and projects considered in the assessment of the GHG emission reduction potential under the **Realistic** and **Ambitious** scenarios assume the implementation of measures to improve energy efficiency, conserve fuel and energy resources, and expand the use of renewable energy sources in the electricity generation structure. As a result, the reduction in GHG emissions is mainly due to the reduction in CO_2 emissions from fossil fuel combustion activities. Large-scale projects and initiatives implemented in the country in the field of reforestation and sustainable land management increase the potential for CO_2 sequestration.

Table 2.19 Projected total GHG emissions up to 2030 (excluding LULUCF)

Forecast scenario	GHG emissions, Mt CO_2-eq			Change in GHG emissions, % by 2021	
	2021	2025	2030	2025	2030
Inertial	206.9	236.2	280.4	13%	34%
Realistic		218.6	233.5	4%	11%
Ambitious		212.4	217.1	1%	4%

Table 2.20 Projected of GHG emissions by inventory sectors, Mt CO_2-eq

Scenarios, sectors	2022	2025	2030
Inertial			
Energy	133.5	148.4	176.4
IPPU	30.3	39.3	53.1
Agriculture	35.4	37.5	39.4
Waste	10.5	11.0	11.5
Total excluding LULUCF	209.6	236.2	280.4
LULUCF	-8.5	-9.8	-11.3
Total including LULUCF	201.2	226.4	269.1
Realistic			
Energy	133.5	132.5	131.2
IPPU	30.3	37.7	51.5
Agriculture	35.4	37.5	39.4
Waste	10.5	11.0	11.5
Total excluding LULUCF	209.6	218.7	233.6
LULUCF	-8.5	-10.2	-14.0
Total including LULUCF	201.2	208.5	219.6
Ambitious			
Energy	133.5	126.3	115.1
IPPU	30.3	37.7	51.1
Agriculture	35.4	37.5	39.4
Waste	10.5	11.0	11.5
Total excluding LULUCF	209.6	212.5	217.1
LULUCF	-8.5	-15.4	-22.2
Total including LULUCF	201.2	197.2	195.0

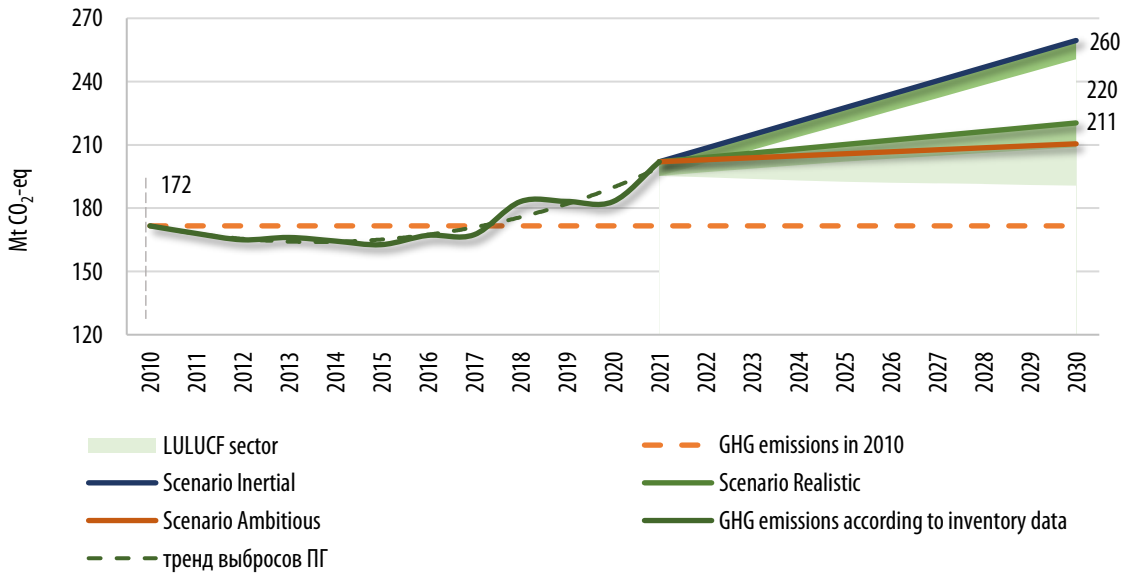


Figure 2.26 Forecast of GHG emissions up to 2030 under three scenarios

Thus, under the scenarios considered, the most significant reductions in CO_2 emissions and increases in CO_2 sequestration are expected, with smaller reductions in methane and nitrous oxide emissions (Table 2.21).

Table 2.21 Projected GHG emissions by gases, Mt

Scenarios, gases	2022	2025	2030
Inertial			
CO_2	135.6	158.1	195.3
CH_4	60.2	63.4	69.4
N_2O	12.7	13.1	13.6
HFCs	1.1	1.5	2.1
Total excluding LULUCF	209.6	236.2	280.4
LULUCF	-8.5	-9.8	-11.3
Total including LULUCF	201.2	226.4	269.1
Realistic			
CO_2	135.6	142.2	150.1
CH_4	60.2	63.4	69.4
N_2O	12.7	11.5	12.0
HFCs	1.1	1.5	2.1
Total excluding LULUCF	209.6	218.7	233.6
LULUCF	-8.5	-10.2	-14.0
Total including LULUCF	201.2	208.4	219.6
Ambitious			
CO_2	135.6	136.2	135.0
CH_4	60.2	63.2	68.4
N_2O	12.7	11.5	11.6
HFCs	1.1	1.5	2.1
Total excluding LULUCF	209.6	212.5	217.1
LULUCF	-8.5	-15.4	-22.2
Total including LULUCF	201.2	197.1	195.0

The growth trend in GHG emissions by 2030 under all scenarios is explained by the following main factors:

- Further development of energy-intensive economic sectors (transport, industry, construction).
- Population growth and increasing wealth.
- Increasing agricultural production, strengthening export potential and ensuring food security.
- Increased production and processing of fossil fuels (natural gas, coal, oil).

Relatively small values of the projected increase in total emissions under the scenarios with mitigation measures indicate that the country pays great attention to energy efficiency and energy saving, which is reflected in the implemented and developed governmental and sectoral strategies, programs and projects.

All considered scenarios assume a 4-34% increase in total GHG emissions by 2030 compared to 2022 levels.

The projected values of total GHG emissions relative to 2017 levels under all scenarios considered through 2030 are higher than the projected estimates of the 1BUR (2021). This is due to an increase in the growth rate of GHG emissions in key sectors of the inventory because of intensive development of economic sectors in the period after 2017. Total GHG emissions, according to the updated estimates,

increased by 22% (from 171.7 to 209.6 million tons of CO_2-eq) in the period 2017-2022, which is twice as much as the projected growth of emissions in this period according to the BUR data.

The GHG emission reduction potential estimated under the **Realistic** and **Ambitious** scenarios also slightly exceeds the corresponding values presented in the BUR, which is the result of an increase in the number of projects planned for implementation, including the expansion of the use of RES for electricity and heat generation.

Considering the use of the results of the future GHG emission estimation for the monitoring of the achievement of the NDC targets, the medium- and long-term projections are updated and extended to 2050-2060 under the assumptions of sustainable socio-economic development of a low-emission country.

3 INFORMATION RELATED TO CLIMATE CHANGE IMPACTS AND ADAPTATION UNDER ARTICLE 7 OF THE PARIS AGREEMENT

3.1 National circumstances, institutional arrangements and legal frameworks

The Republic of Uzbekistan is one of the most vulnerable countries in Central Asia to the effects of climate change. The rate of temperature increase in the country is higher than the global average. Every ten years, the air temperature increases by an average of 0.27°C.

The geographical location of the country in the closed arid Aral Sea basin determines its vulnerability to several climatic impacts, such as the intensification and recurrence of extreme climate events (droughts, floods, mudslides and avalanches) that threaten infrastructure, communities, livelihoods and ecosystems. According to the ND-GAIN Climate Change Vulnerability and Preparedness Index[203], Uzbekistan ranks 96th out of 191. In terms of risks of natural hazards (earthquakes, floods), the country ranks 111 out of 191 and is among the top 20 countries in the world in terms of exposure to drought and dust storms[204]. Over 7.6 million people are exposed to floods in Uzbekistan. The average annual damage from floods[205] is $395.6 million per year. Direct losses from floods are estimated at $2.8 billion with a 100-year recurrence period, representing almost 2.8% of the country's nominal GDP[206,207]. These phenomena are expected to increase in the face of climate change, especially in the mountainous regions of Uzbekistan.

The World Bank (2024) estimates the short-term economic costs associated with the physical impacts of climate change to be 1% of GDP by 2030, with the greatest impact of climate change on agriculture, followed by loss of water resources and biodiversity, reduced labor productivity, and increased weather hazards[208]. The impacts of climate change will affect the well-being and livelihoods of people in a variety of ways. By 2030, at least 8 million people across the country, in urban and rural areas, are expected to live in areas with very high climate risks[209].

If no action is taken to adapt to climate change, the size of the national economy will be 10% smaller by 2050, which could lead to significant reductions in employment and household income[210]. These factors underscore the urgent need to mainstream sectoral adaptation plans and integrate them into national strategies and action plans.

Adaptation to climate change is a priority component of Uzbekistan's commitments up to 2030. The adaptation objective of the NDC is to continue efforts to build adaptive capacity to reduce the risk of adverse impacts of climate change on various sectors of the economy, including the social sector and the Aral Sea region (Aral Sea coastal zone)[211].

The implementation of environmental measures, control functions and responsibilities for specific natural areas and directions are entrusted to several ministries and institutional actors, whose functions and actions are clearly defined. However, not all aspects of mitigation and adaptation and response measures have the same level of support and institutional responsibility. The activities of relevant institutions responsible for the preparation of National Communications on Climate Change on a

[203] Index N-GC. Rank countries by ND-GAIN Country Index, Vulnerability and Readiness. 2019.
[204] UNCCD, 2022 Sand and Dust Storms Compendium: Information and Guidance on Assessing and Addressing the Risks. Germany; 2022
[205] SDCR, 2023. World Bank Group. Uzbekistan: Country Report on Climate and Development. World Bank in Uzbekistan. Uzreport World
[206] TA-9878 REG. CAREC 2022/ Country Risk Profile: Uzbekistan / Development of a disaster risk transfer mechanism in SAREC countries. 2022
[207] WB-CAREC, 2022 Policy Dialogues- Green Growth and Climate Change in the Republic of Uzbekistan.
[208] A. Kustov.2023. ICMI Uzbekistan aims to develop global cooperation under the Sendai Framework Program. Tashkent, 2023
[209] CPEIR UNDP/AFD (2023) Climate Cost Review and Institutional Assessment on Climate Change: Uzbekistan
[210] TA-9878 REG. CAREC 2022/ Country Risk Profile: Uzbekistan / Development of a disaster risk transfer mechanism in SAREC countries. 2022
[211] PNS, 2024 UNEP/GEF/Uzhydromet Fourth National Communication of the Republic of Uzbekistan to the UNFCCC.

continuous basis, Biennial Transparency Reports and Greenhouse Gas Emission Inventories (Articles 4 and 12 of the UNFCCC) are regulated by the current legislation of the Republic of Uzbekistan

The main functions, mandates and roles of the relevant ministries and agencies in relation to climate change are summarized in Annex 1.

3.2 Legal framework

The country has adopted several fundamental laws, decrees and resolutions of the President and the Cabinet of Ministers of the Republic of Uzbekistan, initiated national strategies, programs, institutional reforms, implemented several measures and actions aimed at ensuring food security and sustainable green development in the long term.

The main objective of the Strategy for the transition of the Republic of Uzbekistan to a green economy by 2030, adopted in 2019 to meet the commitments under the Paris Agreement, is to achieve sustainable economic progress that contributes to social development, reduction of GHG emissions, climate and environmental sustainability, through the integration of green economy principles in the ongoing structural reforms.

Some of the laws, policies, and plans related to climate change adaptation for key sectors in Uzbekistan that were used in the analysis in this chapter are summarized in Table 3.1 below.

Table 3.1 Key legislation, strategies and plans related to climate change adaptation in Uzbekistan

Document number	Name
No. ZRU-491 dated 02.10.2018	On ratification of the Paris Agreement
No. ZRU-537 dated 10.05.2019	On public-private partnership
No. PKM- 83 dated 21.02.2022	On additional measures to accelerate the implementation of the national Sustainable Development Goals and Targets for the period up to 2030
No. PP-4477 dated 04.10.2019	Strategy of Transition of the Republic of Uzbekistan to a Green Economy until 2030
No. UP-158 dated 09.11.2023	On the Development Strategy of Uzbekistan until 2030[212]. Emphasizes the need to modernize the agricultural sector, including the introduction of climate-smart practices and improved institutional efficiency
No. PKM-362 dated 11.08.2023	On development and effective implementation of the National Action Plan on Climate Change and Disaster Risks[213]
No. UP-6024 dated 10.07.2020	On approval of the Concept of water sector development in the Republic of Uzbekistan for 2020-2030[214]
No. PP-300 dated 09.11.2023 and PD-158 dated 09.11.2023	On measures on qualitative and timely implementation of the Strategy "Uzbekistan-2030" and on approval of the Strategy "Uzbekistan-2030"[215]
No. UP-5853 dated 10.23.2019	On Approval of the Strategy of Development of Agriculture of the Republic of Uzbekistan for 2020-2030[216]

[212] https://lex.uz/docs/6600413
[213] https://lex.uz/docs/6566032
[214] https://lex.uz/docs/4892946
[215] https://lex.uz/uz/docs/6600415
[216] https://lex.uz/docs/4567337

Continuation of Table 3.1

Document number	Name
No. PKM-299 dated 04.12.2019	On Measures to Implement the Sendai Framework for Disaster Risk Reduction 2015-2030 in the Republic of Uzbekistan[217]
No. PPP-233 dated 24.06.2024	On Measures to Create a Climate-resilient Agroecosystem and Increase the Resilience of Agricultural Producers to the Risks Associated with Climate change[218]
No. PP-4273 dated 09.04.2019	On Additional Measures to Ensure Openness and Transparency of Public Administration and To Improve The Statistical Capacity Of The Country
National State of the Environment Report 2024	Provides an Overview of the Current State of the Environment, Highlighting key Areas Affected by Climate Change and the Effectiveness of Existing Adaptation Measures[219]
No. UP-36 dated 16.02.2024	On Additional Measures to Ensure Food Security in the Republic Examines the Relationship Between Climate Change Adaptation and Food Security, Providing Data on Agricultural Resilience and Adaptive Capacity[220]
No. UP-6024 dated 10.07.2020	On approval of the Concept of water sector development in the Republic of Uzbekistan for 2020-2030[221]
No. PP-5005 dated 02.24.2021	On Approval of the Strategy of Water Resources Management and Irrigation Sector Development in the Republic of Uzbekistan for 2021-2023[222]
No. PMM-484 dated 01.05.2019	Strategy for the Conservation of Biological Diversity in the Republic of Uzbekistan Until 2028
No. UP- 5863 dated 31.10.2019	On Approval of the Concept of Environmental Protection of the Republic of Uzbekistan Until 2030
No. UP-5863 dated 31.10.2019	On Approval of the Concept of Environmental Protection of the Republic of Uzbekistan Until 2030
No. UP-106 dated 04.08.2024	On Establishment of the Climate Council Under the President of the Republic of Uzbekistan
No. PP-436 dated 02.12.2022	On Measures to Improve the Effectiveness of Reforms Aimed at Transition of the Republic of Uzbekistan to a Green Economy by 2030
No. PPP-71 dated 13.02.2024	On Additional Measures to Ensure Counteraction to Degradation of Agricultural Lands, Increase of Soil Humus Content and Productivity
No. UP-199 dated 23.11.2023	On Measures to Further Increase the Greening of the Republic and Ensure Environmental Sustainability Through Consistent Implementation of the National Project Green Territory
No. PP-120 dated 08.02.2022	On Approval of the Program of Development of Livestock Breeding and its Branches in the Republic of Uzbekistan for 2022
No. PKM-50 dated 02.02.2023	On Approval of the Regulations on the Forms of Monitoring, Assessment, Reporting on Measures to Combat Land Degradation and Publication of Their Results

These legislative documents define the strategic priorities, sectoral objectives and operational frameworks required for effective adaptation to climate change. They also define the roles and responsibilities of different government agencies to ensure coordinated and consistent implementation of adaptation measures.

[217] https://lex.uz/docs/4283785
[218] https://lex.uz/docs/6982708
[219] https://www.iisd.org/publications/report/uzbekistan-state-of-the-environment
[220] https://lex.uz/uz/docs/6802700
[221] https://lex.uz/docs/4892946
[222] https://lex.uz/docs/3159825

3.3 Climate impacts, risks and vulnerabilities, as appropriate

Impacts of climate change

According to the WMO[223], the period from 2011 to 2020 was the hottest decade on record. And the years from 2015 to 2020 were the six hottest years on record. In first place was 2016, which saw the natural warming phenomenon of El Niño, followed by 2019 and 2020. Meanwhile, the average annual temperatures for the last three years were only slightly different. Since the 1980s, each decade has been warmer than the previous one. The amount of heat-trapping GHGs in the atmosphere remains at record highs, and the long lifetime of carbon dioxide, the main gas, ensures that the planet will continue to warm in the future.

Meteorological observations in Uzbekistan since the 1950s have a high density, which allows a more detailed assessment of climatic changes over the territory for the last 70 years, as well as the rate and significance of the ongoing warming. To assess the ongoing changes, station data was used depending on specific conditions, both in terms of physiographic natural characteristics (desert, foothill, mountainous areas, watersheds) and in the context of anthropogenic impact on climate (zone of influence of the Aral Sea desiccation, irrigated and rainfed lands, growing cities, historically inhabited oases, etc.)[224,225].

Virtually the entire territory of Uzbekistan is exposed to various types of particularly dangerous climatic phenomena. These include extreme temperatures, mudflows and avalanches inherent in mountainous and foothill areas, droughts and dust storms. The highest increase in Tmax was observed in the Aral Sea region (2.9°C), where, due to the disappearance of the Aral Sea, the former coastal zone has shifted to a desert zone, followed by the northern part of Karakalpakstan (2.2°C) and the Khorezm region (1.9°C)[226].

According to IPCC assessments, one of the main climate risks for Central Asia is an increase in the frequency of droughts due to water scarcity. The future development of Uzbekistan is closely linked to the availability and security of water resources[227].

The available water resources of Uzbekistan, which are necessary to meet the needs for drinking water, agriculture, industry and hydropower generation, are under threat. Cyclical fluctuations in river flows and long periods of low water levels complicate the economic use of water sources and can lead to several negative environmental and economic consequences and challenges[228]. According to the UN, the Central Asian countries lose up to $2 billion annually due to water scarcity and inefficient use of water resources. The economic damage could eventually reach 11% of the region's GDP[229].

Table 3.2 presents the results of the climate risk assessment linked to vulnerability by NDC sector, and constructs the priority rankings agreed upon through stakeholder discussions and dialogues.

[223] https://wmo.int/news/media-centre/2020-was-one-of-three-warmest-years-record

[224] V.E. Chub (2007). Climate change and its impact on hydrometeorological processes, agriculture and water resources of the Republic of Uzbekistan. UzHydromet, NIIGMI

[225] V.E Chub. (2001). Climate change and its impact on the potential of natural resources of Uzbekistan. UzHydromet, NIIGMI

[226] Spektorman T.Yu. Estimation of possible extreme values of air temperature and precipitation on the territory of Uzbekistan for conditions of climatic scenario. : Bulletin, issue No. 5.- Tashkent: SANIGMI, 2002.- C. 75-82

[227] https://www.ipcc.ch/languages-2/russian/publications-russian/

[228] NIGMI (2017). Final report on NIIR A-7-021: Creation of information-analytical database of lakes on the territory of Uzbekistan as a basis for the development of integrated environmental monitoring of limnic systems. Executor-in-Charge V.N. Talskikh.

[229] CPEIR UNDP/AFD (2023) Climate Cost Review and Institutional Assessment on Climate Change: Uzbekistan

Table 3.2 Assessment of climate risks to economic sectors, population and ecosystem

Risk description	Existence of risk	Probability (2030s)	Consequence	Significance of risk
Agriculture				
Increasing climate change raises the biological water needs of crops and the overall water demand of the agricultural sector (by 5–6% and 10–12% by 2039 and 2059, respectively, depending on the scenario). Given the existing water resource deficit, this could cause significant damage and threaten the country's food security.	Yes	Moderate	Catastrophic	Serious
Extreme droughts reduce river flows and increase water deficits, forcing farmers to reduce the amount of land they cultivate. As a result, farmers lose income and agricultural production, and the country's economy suffers.	Yes	Very likely	Catastrophic	Serious
Increasing climate change, droughts, and frequent low-water events are leading to higher river water mineralization (in the downstream Amudarya, mineralization reaches 1.5–1.8 g/L, with hardness exceeding the MPC by a factor of two), causing irrigated crops to suffer and accelerating soil salinization.	Yes	Very likely	Serious	Serious
Increasing climate change is reducing pasture productivity and feeding capacity due to high temperatures and droughts or abnormally low winter-spring rainfall, threatening the sustainability of pastoralists' and farmers' livelihoods.	Yes	Very likely	Serious	Serious
Rising air temperatures increase heat stress on animals, reducing weight gain, raising the risk of livestock diseases, and decreasing the income of pastoralists and farmers, ultimately impacting the well-being of rural communities.	Yes	Very likely	Serious	Serious
Climate change is also driving the emergence and spread of new pathogens and pests, reducing food production and further harming rural livelihoods.	Yes	Moderate	Average	high
Gradual changes in climate and precipitation patterns, including an increase in extreme rainfall events, increase the risk of landslides, leading to loss of fertile topsoil and increased water erosion.	Yes	Very likely	Serious	high
The increase in extreme weather events and variability of weather conditions (heat waves, strong winds, etc.) make the management of croplands, pastures and infrastructure more difficult, causing greater damage to crops and production and leading to socio-economic losses.	Yes	Very likely	Serious	high
Positive effect				
The increase in climate change, the lengthening of the vegetation period, the shifting of the dates of the onset of spring frosts is favorable for early varieties of potatoes, vegetables and melons, the increase in CO_2 in the atmosphere is favorable for photosynthesis.	Yes	Moderate	Minor	Medium
Increased climate change, longer grazing seasons and improved overwintering conditions for livestock due to higher temperatures in distant pastures.	Yes	Moderate	Minor	Medium
Increasing climate change, global warming creates favorable conditions for more heat-loving crops (cotton, pomegranate, persimmon, figs), reducing the area of vineyards covered for winter.	Yes	Moderate	Minor	Medium

Continuation of Table 3.2

Risk description	Existence of risk	Probability (2030s)	Consequence	Significance of risk
Water sector, water resources				
Increasing climate change and more frequent droughts are leading to periods of low water availability, reducing the country's water resources from 63.02 km³ to 54.2 km³, of which 49.0 km³ is used for irrigation. This decline negatively impacts the water sector and all water users.	Yes	Very likely	Catastrophic	Serious
Under the high-emission scenario (RCP8.5), water resources are projected to decrease by 20–33% by the end of the century, affecting all categories of water consumers and users.	Yes	probably	Catastrophic	Serious
Climate change is also altering the annual river flow regime, shifting peak floods to earlier periods, which increases water deficits during the irrigation season (July–August) and negatively impacts irrigated agriculture.	Yes	probably	Serious	Serious
Rising water scarcity due to climate change will intensify competition among different water users, disproportionately affecting the most vulnerable populations, particularly the poor.	Yes	probably	Serious	Serious
Extreme weather events and climate change-induced disruptions in agricultural production will drive up food prices and cause shortages, leading to socio-economic losses.	Yes	probably	Average	High
Additionally, rising temperatures and prolonged droughts reduce dissolved oxygen levels in water bodies and impair their natural purification capacity, degrading conditions for fish farming and reducing fishermen's incomes.	Yes	Moderate	Average	High
Health care				
Increasing climate change, more frequent heat waves, extreme temperatures worsen the living conditions of the population, the risk of morbidity increases (the number of cases of acute intestinal infections increases by 10-13% for every 1-2ºC increase in maximum temperature).	Yes	Moderate	Average	High
The increase in annual mean temperature and the duration of heat waves will cause heat stress, especially in urban areas and outdoors, with negative impacts on public health.	Yes	Moderate	Average	High
Increasing climate change and associated deterioration of drinking water quality increases the risk of acute intestinal infections, which are already among the leading infectious diseases in Uzbekistan.	Yes	Moderate	Serious	Serious
Increasing climate change and dust storms worsen the living conditions of the population: during a dust and sandstorm in November 2021 in Tashkent, the dust concentration was >30 MPC (about 700 ambulance calls were related to breathing difficulties).	Yes	Moderate	Serious	High
Increasing climate change and extreme events are leading to more natural disasters, putting lives at risk.	Yes	Moderate	Serious	High
Biodiversity				
Increasing climate change and extreme events are increasing the risk of fires in the lowlands and reedbeds of wetland ecosystems in the southern Aral Sea region.	Yes	Moderate	Average	High
Increasing climate change is leading to more frequent locust outbreaks and termite infestations in Karakalpakstan.	Yes	Probably	Average	High
Heat waves, droughts and climate change are reducing nectar secretion in flowering plants, endangering both insect-pollinated plants and the insects themselves.	No	It's unlikely	Minor	High
Abnormally hot periods caused by climate change reduce transpiration cooling in plants, lower CO_2 concentrations in leaf tissues, and reduce photosynthesis, leading to irreversible plant damage.	Yes	Moderate	Minor	High

Continuation of Table 3.2

Risk description	Existence of risk	Probability (2030s)	Consequence	Significance of risk
Increased wind activity (e.g. dust storms) due to climate change accelerates soil deflation, reducing soil fertility and negatively impacting biodiversity.	Yes	Probably	Minor	High
Climate change, droughts and the drying up of deltaic water bodies (such as the lower reaches of the Amudarya in 1999-2000 and 2008) complicate conditions for migratory birds, forcing them to change their migration routes.	Yes	Probably	Average	High
Increasing climate change, along with more frequent low flows and droughts, is altering aquatic biocoenoses, shifting the biological classification of water quality in small rivers from class I-II ("very clean-pure") to class III ("moderately polluted").	Yes	Moderate	Minor	High
Intensification of eutrophication in limnic ecosystems due to deterioration of water quality in low-water years leads to abnormal transformations of aquatic biocenoses (as observed in the Mezhdurechenskaya system of water bodies in the Amudarya delta- Shegekul, Sarbas, Muynak Bay).	Yes	Probably	Average	High
Increasing salinity (up to 1000 mg/L and beyond) due to climate change, especially in low-water years (e.g. 1986, 1989, 1997, 2000, 2001, 2008), favors the development of brackish water elements of flora and fauna in estuarine bio-hydrocenoses.	Yes	Probably	Average	High
Increasing climate change, more frequent droughts and low water levels increase the amplitude of water level fluctuations in reservoirs and lakes, especially in lowland reservoirs, which negatively affecting aquatic vegetation and fish resources.	Yes	Probably	Average	High
Tourism				
Increasing climate change, increase in extreme temperatures and heat waves reduce the climatic resources of tourism in the summer period for the plains and foothills of the Republic of Uzbekistan. According to the hard scenario RCP8.5, almost all summer months become vulnerable for tourism in the future.	Yes	Moderate	Average	High
Increasing climate change and warming cause further reduction and degradation of snow cover, which reduces the duration of the ski tourism period.	Yes	Moderate	Average	High
Buildings Sector				
Increasing climate change and warming contribute to the growth of building cooling costs: according to the severe scenario RCP8.5, cooling energy degree days will exceed heating energy degree days in most of the territory of Uzbekistan by 2080-2099.	Yes	Moderate	Average	High

Source: from 4NC, 2024 based on CTF Guidelines et al.

3.3.1. Assessment of vulnerability of water resources to climate change

Methodology and sources of information

The assessment of vulnerability of water resources to climate change impacts is given and described in detail in 4NC of the Republic of Uzbekistan on Climate Change (2024). To assess the impacts and vulnerability to climate change, information from official sources of line ministries, the Agency of Statistics under the President of the Republic of Uzbekistan, the Ministry of Agriculture, the Ministry of Water Resources[230] , etc., as well as international guidelines of the IPCC, UN FAO, etc. was collected and systematized. Additional sources were scientific publications, reviews and reports of the WB, FAO/GEF, ADB, UNDP, EU, GIZ and others.

For the vulnerability assessment, the territory of the territory of the country was divided into 5 economic planning zones based on natural-climatic and water management zoning (Figure 3.1).

[230] ISTSAUZR (2009). Supplement to the National Framework Program of the Republic of Uzbekistan

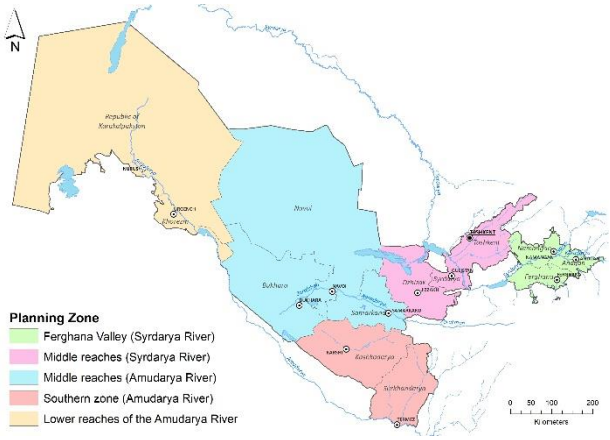


Figure 3.1 Water management division by planning zones in the Amudarya and Syrdarya river basins

River basin	Amudarya			Syrdarya	
Planning area	Lowlands	Middle course	Verkhovye/Southern part of the country	Fergana Valley	Middle course
Admin. regions.	Karakalpakstan Khorezm	Bukhara Navoiy Samarkand	Kashkadarya Surkhandarya	Andijan Namangan Fergana	Jizzakh Syrdarya Tashkent

Vulnerability of water resources

The actual water resources available for use are fully determined by the water availability of rivers in a given year. At present, the available water limit practically does not exceed 59.2 km^3/year.

The average volume of water used for irrigation and other needs in Uzbekistan was 51.2 billion m^3 in 2020 and 43.2 billion m^3 in 2021, mostly from transboundary rivers. Due to increasing drought intensity and climate variability, the inflow to the Tuyamuyun have fluctuated between 27 and 60 billion m^3/year over the past 25 years, with an average annual inflow of about 40 billion m^3 and a minimum of 27 billion m^3 in 2001[231].

The most reliable and tested system of complex predictive modeling, SWAT+, was used to assess the impact of expected climatic changes on runoff in the Amudarya and Syrdarya river basins. The available water resources and the flow regime in the Syrdarya and Amudarya basins depend significantly on the expected climatic changes.

Possible changes in runoff by river basin

Under the mildest RCP2.6 scenario, the projections do not predict significant changes in river water availability relative to the baseline period (slight decrease in the Amudarya basin, slight increase in the Syrdarya basin). Under the RCP4.5 scenario, a significant decrease in available water resources is expected in all river basins by the middle of the current century. Under all scenarios, the flood peak is expected to change to an earlier time, resulting in an increased water deficit in the months of July-August.

The analysis of the changes in the flow of the Syrdarya River in its upper reaches confirms the expected reduction of the Syrdarya River flow by 6-9% by 2039 under each climate scenario: by 6% under RCP8.5, by 7% under RCP4.5, and by 9% under RCP2.6, due to reduced precipitation and increased evapotranspiration. After 2039, however, runoff is expected to increase under the RCP2.6 scenario,

[231] 4NC, 2024

reaching 26.8 km^3 in 2099, an increase of 2% over the current annual average. For the remaining climate scenarios, runoff is expected to decrease sequentially, by 9.6% by 2099 under RCP4.5 and by 17% by 2099 under RCP8.5.

Impact of climate change on mountain glaciation

According to UNEP and the World Glacier Monitoring Service, the area of glaciers in the Tien Shan has decreased by 25-30% over the last 100 years. Sustained degradation of glacier fields in the Syrdarya and Amudarya basins is confirmed by TERRA-MODIS satellite imagery.

According to the estimates of scientific reviews and working papers on forecasting glacier change in the highlands of the Amu Darya basin, a 38-50% reduction of glaciers is expected by 2050, depending on the climate scenario. Accordingly, it can be expected that additional runoff in the Amudarya, caused not by changes in precipitation but by irreversible glacier melt, will behave as follows:

- Under the RCP2.6 scenario, glacier degradation rates will peak in 2040-2049, then begin to decrease. By 2050, the volume of glaciers will decrease by 38% and by 77% by 2099.
- Under the RCP4.5 scenario, the rate of glacier degradation will increase until 2050-2059, then start to decrease, but not due to improved climatic conditions, but due to catastrophic reduction of glacier volume.
- Tien Shan glaciers located in the high-mountainous part of the Syrdarya basin will be depleted even faster, as they are at lower elevations.

Expected changes in evapotranspiration and crop water consumption

Global warming causes an increase in potential evapotranspiration. Under the RCP4.5 scenario, the expected increases in evapotranspiration are 4-4.5% by 2039 and 7-8% by 2059.

In the lower reaches of the Amu Darya, the increase is higher, reaching 5-6% by 2039 and 11% by 2059 (12.5% in Muynak district). The biological norms of crop water demand under the RCP4.5 scenario are expected to increase by 2.5-5% by 2039 and by 5.5-10% by 2059. The largest increases in water demand are projected for winter wheat and perennial crops (orchards, vineyards, alfalfa). More intensive growth is expected in the Amu Darya basin than in the Syrdarya basin.

3.3.2. Assessment of vulnerability of the Agriculture sector to climate change

Agriculture is a vital economic sector that provides employment and is the main source of income for rural communities that are particularly vulnerable to climate change. In recent years, the agricultural sector has faced serious climate challenges related to extreme temperatures and water scarcity, which are causing reduced agricultural yields and economic losses, threatening people's livelihoods and a country's food security[232].

Methodology and sources of information

Vulnerability is a function of multiple components, including sensitivity or susceptibility to adverse conditions and the ability to cope and adapt (IPCC, 2021). This concept is used by the IPCC in its Sixth Assessment Report, where vulnerability is “the extent to which a system is susceptible or unable to cope with the adverse impacts of climate change, including climate variability and extremes”. This approach is adopted in Uzbekistan as a methodological framework for assessing system vulnerability[233] .

The methodological framework adopted is the composite index approach, commonly known as the IPCC

[232] V.E. Chub (2007). Climate change and its impact on hydrometeorological processes, agriculture and water resources of the Republic of Uzbekistan. UzHydromet, NIIGMI

[233] GEF/UNEP project “Uzbekistan: Preparation of the Fourth National Communication under the UNFCCC”, 2024

Climate Change Vulnerability Index. The assessment was based on 18 most significant indicators, which were normalized from 0 to 1 for comparability, depending on the possible types of functional relationships between the indicators and vulnerability. The assessment of impacts and vulnerability to climate change was based on multi-year observational data from 50 meteorological stations of UzHydromet, as well as information from official sources, manuals, guides and global tools of IPCC, UN FAO, etc. (Table 3.3).

Table 3.3 Main indicators and components of vulnerability

Components of vulnerability	Description of indicators
Exposure	Climatic factors for the baseline period: trends in climatic indicators (magnitude and speed of climatic changes); identification of areas with the most dramatic changes in indicators.
	Natural conditions that increase the impact of climate change: salinity of irrigation water, proportion of land subject to secondary salinization and erosion, degradation of pastures, level of soil fertility.
Sensitivity	Social and demographic factors that determine sensitivity to climate change: share (%) of rural population, population density, arable land per capita, share (%) of irrigated land, specific volume of water used for irrigation.
Adaptive capacity	Capacity of the system to cope with adverse impacts: labor force participation rate, GDP per capita, level of education and share of population with specialized agricultural education, level of infrastructure and financing of adaptation measures, availability of institutional support and technologies, yields of major crops.

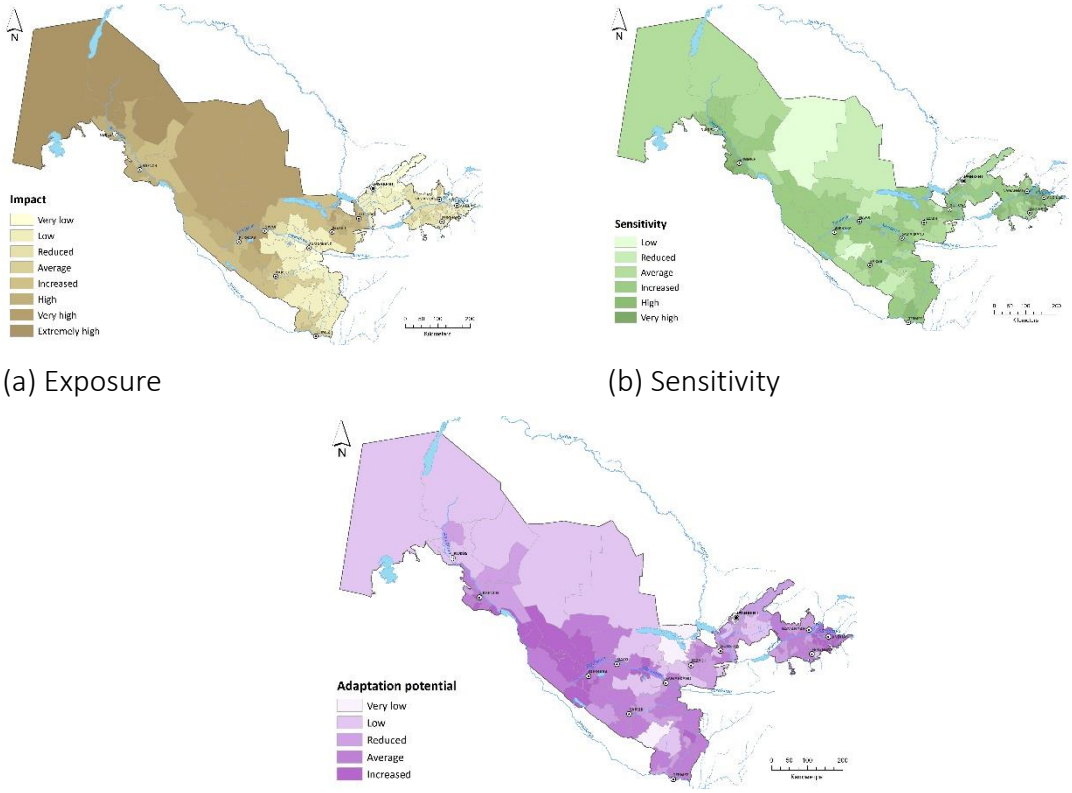
Vulnerability assessment by combined index showed that agriculture in the Amu Darya river basin is more vulnerable to climate change than in the Syrdarya river basin (Tab. 3.4 and Fig. 3.2).

The calculations performed (4NC,2024) show that 38% of the territory of Uzbekistan is characterized by a high and very high level of vulnerability, 54% by a medium and high level, and only 8% of the territory is in the zone of low and partially low vulnerability.

Table 3.4 Ranking of the territory of Uzbekistan by composite index (4NC, 2024)

Planning area	Territory ranking by vulnerability, %					
	Low	Moderate	Average	Elevated	High	Very high
Amudarya River Basin						
Southern zone	8	12	51	29		
Middle course		6	62	14	17	
Lowlands			4	16	44	36
Syrdarya river basin						
Fergana Valley		13	68	13	6	
Middle course	1	38	40	21		
Average for Uzbekistan	1	7	37	17	24	14

There are 4.1 million people (17% of the rural population) living under conditions of low and moderate vulnerability of agriculture to climate change, 17.5 million people (70%) experience average and elevated vulnerability, 2.8 million people (11%) suffer from high vulnerability and 400,000 people (2% of the rural population) suffer from very high vulnerability.



(a) Exposure (b) Sensitivity

c) Adaptive capacity

Figure 3.2 Ranking of the territory of Uzbekistan by vulnerability components (according to IPCC)

3.4 Hazards related to climate change

As noted above, according to the ND-GAIN index of vulnerability and preparedness of countries to climate change[234], Uzbekistan ranks 96th out of 191[235]. As for the risk of natural hazards (earthquakes, floods), it ranks 111 out of 191. And it is among the top 20 countries in the world in terms of exposure to drought and dust storms[236].

Extreme air temperatures. The extremity of the thermal regime on the territory of Uzbekistan due to global climate change is intensified due to: (i) an increase in summer air temperatures and (ii) an increase in the frequency of air temperatures above 42°C, 44°C and 46°C.

Drought is one of the dominant dangerous hydrometeorological phenomena in Uzbekistan, negatively affecting all segments of the population, key sectors of the economy, and the environment. The arid climate and regular high temperatures mean that droughts are becoming an increasingly frequent phenomenon: in the 1980s and 1990s there was an average of one drought every five years, and between 2000 and 2012 there were four episodes.

The phenomenon of intense dry weather, known as "Garmsil", often develops in the region. The phenomenon of airborne drought of dry winds is most pronounced in July.

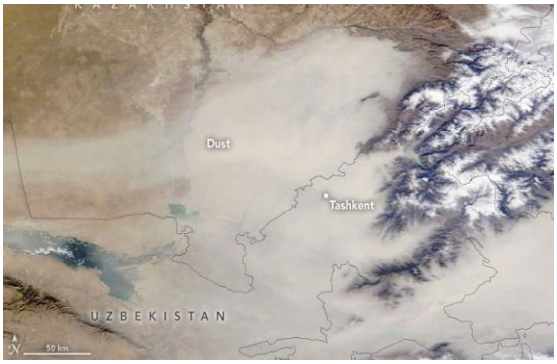
The SPEI assessment of hydrological droughts indicates that under the mild RCP4.5 scenario, the number

[234] Index N-GC (2019). Rank countries by ND-GAIN Country Index, Vulnerability and Readiness. https://gain.nd.edu/our-work/country-index/
[235] WB-CAREC (2022). Policy Dialogues - Green Growth and Climate Change in the Republic of Uzbekistan
[236] UNCCD (2022). Sand and Dust Storms Compendium: Information and Guidance on Assessing and Addressing the Risks. Germany

of droughts in the Fergana Valley and the Middle Syrdarya may double in the period 2040–2059. Under the severe RCP8.5 scenario, these areas will experience severe and extreme droughts in the latter half of the century. In the lower reaches of the Amudarya River, drought is already observed in 9 out of 20 years, and under both scenarios, drought is expected to be constant in the future. In the southern zone of the country, under both RCP4.5 and RCP8.5, 17–18 dry years out of 20 are anticipated in the period 2040–2059.

Mudflow-flood events, which are characteristic of Uzbekistan and the Central Asian region, are often transboundary. During the observation period from 1887 to 2022, 4,072 cases of mudslides were registered in Uzbekistan. In fact, all rivers, including temporary watercourses, in the mountain and foothill areas are prone to debris flows. The average annual number of mudflow events has increased from 39 events per year (2000-2019) to over 58 events (2003-2022). Under each of the RCP climate scenarios, the risk of debris flows could increase by one and a half times compared to the baseline period.

Sand and dust storms (SDSs). The Republic of Karakalpakstan, located at the epicenter of the Aral Sea crisis, is highly vulnerable to SDSs, with significant areas of potential sources such as the Aralkum Salt Desert. More than 100,000 tons of salt and fine dust, containing various chemicals and poisons, are transported annually from the dried seabed[237]. This adversely affects all living beings. In the composition of Aral dust, sulfate salts make up 25–48%, chloride salts 18–30%, and carbonate salts 10–20%[238]. Salt dust plumes rising from the bottom of the Aral Sea extend 400 km in length and 40 km in width[239] (Figs. 3.3-3.4).



Source: https://centralasia.media/news:1742991?from=rss

Figure 3.3 Uzbekistan, MODIS TERRA, November 2021

Source:https://mytashkent.uz/2018/05/27/v-nukuse-solyanaya-burya/

Figure 3.4 Salt and dust storm, Nukus, Karakalpakstan, May 2018

In recent years, SDSs have been observed not only in the flat desert and steppe areas of the country, but also in the densely populated foothills. In the last century, SDSs of short duration (up to 3 hours) were mainly observed, but in the last decade, the number of storms lasting 3 to 7 hours has increased by an average of 10%.

Avalanches. In the last decade 2011-2021 all avalanche activity indices show a decreasing trend: the snow height in the areas of the avalanche stations Chimgan (1,640 m) and Kamchik (2,145 m) decreases, and the number of days with snow decreases significantly. The avalanche activity index will decrease by

[237] https://www.iisd.org/system/files/2024-02/uzbekistan-state-of-the-environment-ru.pdf
[238] https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?end=2022
[239] https://www.undp.org/sites/g/files/zskgke326/files/migration/uz/3217b24.pdf

almost 2 times in the study areas by the end of the century, but the danger of avalanches will not disappear.

3.5 Priorities and barriers to adaptation

Adaptation is a priority component of Uzbekistan's commitments in NDC1 (2017) and NDC2 (2021), in line with Articles 2.1 and 7.1 of the Paris Agreement.

Uzbekistan continues its initiatives and programs to build adaptive capacity to reduce the risks and impacts of climate change in key sectors of the economy and in the Aral Sea region.

The adaptation priorities in the NDC1 (2017) for the period 2020-2030 include the following specific actions by thematic areas and sectors: (i) agriculture and water sector; (ii) social sector; (iii) Aral disaster mitigation: (v) ecosystems, and (v) strategic infrastructure and production systems.

In the updated NDC2 (2021), the areas of adaptation and resilience include eight adaptation priorities: water, agriculture, infrastructure, biodiversity and ecosystems, forests, health, coastal zones and disaster risk management. NDC2 is linked to the national SDGs, and to the socio-economic development goals (No. PKM-841 dated 20.10.2018).

The highlighted areas of adaptation are therefore of high priority and global importance for the future development and security of the country. Currently, the country is actively promoting adaptation planning processes and integration into national development plans in the context of the post-Paris climate process and the implementation of NDCs.

In 2024, the Government of Uzbekistan approved and launched:

- National Agriculture Adaptation Plan for Climate Change (NAP, 2024), with financial support from the GCF and coordination by UNDP-Uzbekistan.
- National Program on Adaptation of Agriculture to Climate Change and Mitigation of Negative Impacts of the Sphere on Climate until 2026, aimed at implementation of priority actions and measures on adaptation of the agri-food sector and irrigated agriculture (No. PP-233 dated 24.06. 2024).

The priority actions and objectives of the Strategy “Uzbekistan- 2030”[240] include the following tasks:

- Increasing the level of early warning of dangerous hydrometeorological phenomena up to 100%, the level of reliability of mountain river flow forecasts up to 98%.
- Increasing the level of reliability of agrometeorological forecasts of crop development and yields up to 96%.
- Creation of 600,000 hectares of green areas- protective forest plantations as a measure against desertification, drought, dust and sandstorms and temperature rise.
- Creation of an additional 600 thousand hectares of green areas at the bottom of the dried-up Aral Sea, bringing their total volume to 2.6 million hectares or 80% of the territory.
- Implementation of projects funded by GCF and GEF, totaling $300 million, based on programs aimed at biodiversity conservation, climate change mitigation, and soil erosion prevention.

Several sectoral strategies and plans contribute to the harmonious promotion of Uzbekistan's sustainable and inclusive approach, including the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030, the State Program for Environmental Protection for the period 2018-2022 (2018) and other nationwide programs and plans.

[240] https://gov.uz/en/pages/2030_strategy

The main priorities of the Water Sector Development Concept for 2020-2030 are aimed at expanding the use of water-saving irrigation technologies, modernizing and ensuring the technical safety of reservoirs, hydrosystems and other irrigation and drainage infrastructure, with the wide introduction of innovations, energy-saving and energy-efficient technologies, ICT and automation of water control and metering to improve irrigation services and sustainable water supply for all sectors of the economy.

Key gaps and constraints for adaptation

Barriers and impediments to the implementation of adaptation were considered as part of the implementation strategy of the NAP and the National Program on Adaptation of Agriculture to Climate Change based on the guidelines and regulations of the IPCC, UNFCCC UNDP, GCF and FAO.

Uzbekistan has accumulated significant experience in sustainable water and land management, water conservation and agriculture. The agricultural policy of the country is aimed at further deepening of reforms, institutional transformation and expansion of innovations, resource conservation and transfer of climate-smart technologies to local land and water users.

During the preparation of 4NC Uzbekistan (2024), extensive consultations and discussions were held with relevant institutions, NGOs, farmers and local communities to assess adaptation gaps and constraints to adaptation and measures to address them in key areas (Table 3.5).

Table 3.5 Key gaps and constraints to adaptation and measures to overcome them in key areas

Gaps/problems	Measures to overcome
Coordination mechanisms and institutional capacity	
Insufficient institutional capacity and cross-sectoral coordination for adaptation and carbon sequestration in grasslands and forests	- Strengthen coordination mechanisms, legal, regulatory, institutional structures and planning frameworks. - Integrating CSA approaches into strategies, policies and sectoral programs up to 2030 and partnering with the private sector, NGOs and other stakeholders. - Research on selection of new varieties for carbon farming, evaluation of the effectiveness of measures to reduce GHG emissions. - Human capital development, adaptation of carbon farming technologies.
Lack of knowledge, skills and public awareness of adaptation on climate impacts	- National knowledge-sharing platforms established/expanded and their interaction with the subregional platform ensured. - Institutional mechanisms to share knowledge and support local partnerships (pasture-user groups, etc.). - Develop mechanisms for transfer of knowledge and skills on adaptation and drought prevention, introducing approaches from FAO, WB, GIZ and others. - Knowledge networks and platforms, ICTs for private community information access, communication and learning support. - Development of training modules and training programs on CSA, organization of gender-sensitive roundtables, capacity building of institutions to collect data for M&E.
Insufficient dissemination of new CSA technologies in community projects	- Track the progress of adaptation processes to the impacts of climate change. - Mobilize resources for the dissemination of CSA/ SLM practices and IWRM technologies for water conservation and water saving within the framework of sectoral programs and action plans.
Insufficient integration of international approaches and instruments into local adaptation plans and the M&E system	- Expand initiatives and networks to build adaptive capacity for rapid response and prevention of drought and water scarcity risks. - Integration of global and regional approaches and tools (IWRM, CSA and SLM) into local adaptation plans, and M&E- verification and tracking of adaptation progress. - Preparation of a regional Pasture carbon sequestration project for funding from the GCF.

Continuation of Table 3.5

Gaps/problems	Measures to overcome
Institutional and financial arrangements	
Shortcomings in the system of financial mechanisms- credit and access to markets	- Organization of social safety net (grants, support payments, provision of seeds, seedlings). - Promoting payments or/and rewards for ecosystem services. - Access to finance through loans and microcredits. - Access to different forms of insurance.
Monitoring and evaluation of CSA practices	
Disadvantages of the M&E system	- Creation and development of a real-time M&E system based on international recommendations on climate change adaptation. - Develop the soil-water-vegetation-cover-yield system on reference plots, carbon polygons, using the latest tools and methods of assessment in different agro-climatic zones and categories of land use. - Establishment of a national M&E data collection system and implementation of information technology.

The analysis shows that coordination mechanisms and planning of climate-resilient approaches and actions are still not sufficiently integrated into national programs and action plans. There are several unexploited opportunities to further increase adaptive capacity, improve resource and water conservation, and preserve ecosystem functions and services and livelihoods in the Aral Sea region.

The needs for priority adaptation actions and measures identified through consultations and discussions with the target groups are summarized in Table 3.6.

Table 3.6 Needs for adaptation actions by priority areas

Priorities	Adaptation actions
Ensuring food security of the population	- Improve the crop placement system by introducing drought resistant crops. - Achieving at least two harvests in one season. - Introduction of scientifically based crop rotation system and development of new trends in agriculture (Organic, Global GP, etc.). - Introduction of innovative tillage technologies (mini-till, no-till, etc.). - The scientifically based efficient use of pasture and rainfed land. - Development of modern greenhouse agriculture. - Production of organic fertilizers using modern technologies. - Innovation and applied research to improve livestock and crop productivity.
Rational use of water and land resources	- Widespread adoption of water-saving technologies (drip irrigation, sprinklers, etc.). - Expanding water conservation incentive mechanisms. - Activate programs to share surface and groundwater. - Modernization, construction and reconstruction of irrigation and reclamation facilities. - Increasing the efficiency of pumping stations in the Ministry of Water Resources system. - Equipping with means of water accounting and real-time monitoring. - Implementation of the system of good agricultural and environmental practices (GAEP). - Simplification of the mechanism of allocation of land for agriculture, protection of the right to lease land and improvement of the procedure of its use as collateral.
Development of breeding and seed production of agricultural crops	- Expand the scope of crop breeding and seed production research. - Establish breeding and seed production of drought-resistant, salt-resistant and non-traditional crops. - Increasing the number of drought-resistant varieties of fruit species and grapevines in in vitro laboratories and nurseries. - Improving nitrogen accumulation technologies by introducing legume genes into cereal crops, genetic improvement of nitrogen-fixing microbes and carriers. - Creation of seed clusters under PPP conditions.

Continuation of Table 3.6

Priorities	Adaptation actions
Ecosystems and biodiversity	- Assess and verify the defensibility of existing defenses in risk areas, including a feasibility analysis of new investments in coastal protection works and defenses, and mudflow
Development of science, education, information	- Promote science, agricultural education and training. - Establish a coordinating center for information and advisory services on environmentally
Accelerating integration of science and practice into national programs and plans for the efficient use of water, land and resources	- Attracting IFI funds and grants for the implementation of smart and digital agricultural technologies. - Organization of training of specialists of agricultural universities in the direction of Smart and Digital Agriculture. - Strengthening the material and technical base of research institutes, modernizing scientific laboratories and providing modern equipment. - Development of methods to improve irrigation techniques and technologies, taking into account the availability of water in the region. - Increasing the number of meteorological and hydrometric stations to improve the monitoring of rainfall, watersheds, etc. - Development of digital databases and studies of hydrographic basins and groundwater characteristics, etc.

3.6 Adaptation strategies, policies, plans, targets and actions in national policies and strategies

Adaptation plans, strategies, programs, measures and actions to integrate adaptation into national policies presented in this report are based on recently adopted documents (NAP, 2024; 4NC, 2024, etc.). These policy documents were developed within the framework of the Climate Change Agenda and the National Strategy for Transition to Green Economy in Uzbekistan, based on the IPCC Guidelines and Regulations and other sources (WB, GCF, GEF, UNEP, UNDP, UNDP, FAO, GIZ, etc.).

3.6.1. National adaptation strategies and action plans

The adopted long-term strategies, regulatory and institutional frameworks, nationwide programs and action plans confirm Uzbekistan's commitment to advance climate change adaptation in all sectors of the economy and spheres of life. The main priorities and adaptation targets by economic sectors are summarized in Table 3.1. Since 2021, the Government of Uzbekistan together with UNDP and the Green Climate Fund has initiated the preparation of a NAP for key sectors of the economy to identify and mitigate climate change risks and opportunities for adaptation measures.

The National Program for Agricultural Adaptation to Climate Change and Mitigation of Its Negative Impacts (NAP) approved by Presidential Decree (No. PP-233 dated 24.06.2024)[241] ensures the implementation of adaptation measures and actions to reduce risks and increase resilience to climate change, including gender aspects and capacity building.

A Climate Council on Climate Change Mitigation and Adaptation has been established. The working body of the Council is the National Center for Climate Change of the Ministry of Environment.

The Concept of Water Sector Development of the Republic of Uzbekistan for 2020-2030 sets the task of introducing water-saving technologies on at least 50% of the 4.3 million ha of irrigated land in the country.

The National Action Plan on Climate Change and Disaster Risks (NAP) and the Roadmap for its implementation[242] approved by the Cabinet of Ministers (No. PKM-362 dated 11.08.2023) are aimed at implementing a set of measures to reduce disaster risks and increase resilience to climate change. An

[241] https://lex.uz/ru/docs/6982708
[242] https://lex.uz/docs/6566032

Interdepartmental Council for Coordination of NAP Actions has been established. The working body of the Council is the National Center on Climate Change under the Ministry of Environment.

The Strategy for Achieving Gender Equality until 2030[243] approved by the Decree of the Senate of the Oliy Majlis (No. PC-297-IV dated 28.05.2021) is aimed at maintaining equal participation of women and men in all spheres of life and activities of the society, including politics, law, culture, education, science, sports, mitigation and adaptation activities.

Strategies, policies and action plans for biodiversity conservation, environmental protection and livelihood security are integrated into the climate agenda of the Republic of Uzbekistan and the priority goals of the SDGs:

- Biodiversity Conservation Strategy to 2028[244].
- National Concept of Environmental Protection of the Republic of Uzbekistan until 2030[245].
- Strategy to achieve the goals of the Sendai Framework for Disaster Risk Reduction, covering 2015-2030.
- National Action Plan on Climate Change and Disaster Risks to 2030[246].

The MSW Management Strategy for 2019-2028[247] aims to create an effective system for the collection, transportation, processing and disposal of municipal solid waste, to prevent its harmful effects on public health and the environment and to implement the polluter-pays principle.

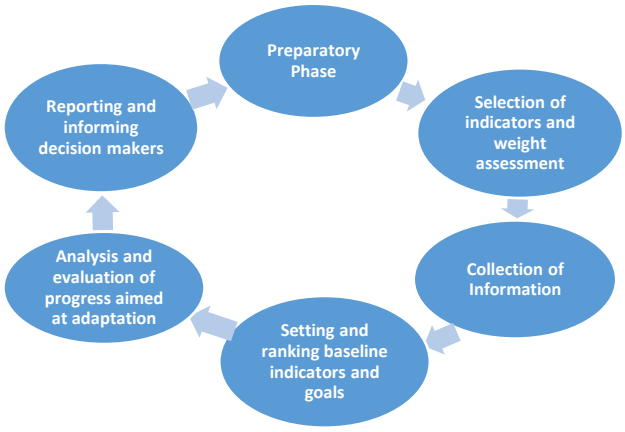
The Government of Uzbekistan and civil society pay great attention to solving problems related to the Aral Sea disaster. Under the auspices of the UN, the Multipartner Trust Fund (MTF) on Human Security for the Aral Sea Region has been established, which provides for the implementation of a comprehensive program of actions related to overcoming the Aral Sea crisis, through the implementation of afforestation and other measures. By 2026, forest plantations are expected to increase to 2.5 million ha (or almost 80% of the dried seabed area) (WECOOP, 2023).

On September 19, 2017, the 72nd session of the UN General Assembly adopted a special resolution "On declaring the Aral Sea region as a zone of environmental innovation and technology".

3.6.2. Sector focus

Methodological approaches and indicators for monitoring the adaptation process

To assess adaptation progress, 1BTR used the UNFCCC Guidelines for the preparation of BTR for non-Annex I countries, as well as FAO's guidance on the Tracking Adaptation in Agricultural Sectors (TAAS) framework, which examines adaptation processes and outcomes in six interrelated steps (Figure 3.5).



Source: UN FAO Guide to tracking adaptation in agriculture [2017]

Figure 3.5 A continuous, step-by-step process of adaptation to climate change

[243] https://lex.uz/ru/docs/5466725
[244] https://lex.uz/docs/4372841
[245] https://old.lex.uz/docs/4574010?ONDATE=20.01.2024
[246] https://lex.uz/docs/6566032
[247] https://lex.uz/docs/4291733

The FAO TAAS methodology examines adaptation processes and outcomes at national and local levels and provides a consistent and flexible list of indicators across 4 action areas.

Table 3.7 List of indicators by adaptation action area

Scope	Description of indicators
Natural resources and ecosystems	Reflect the state of the environment and its interaction with agriculture. Provide information on the impacts of natural resources and ecosystems on agricultural activities, as well as on the (potentially unintended) consequences of adaptation actions.
Agricultural production	Aim to monitor the interactions between natural resources, production and the impacts of climate change.
Socio-economic	Reflect the facilitation of access to markets (resources, products, credit, insurance, etc.), information and basic services, and the promotion of livelihoods and social protection for rural populations.
Institutions and policies	Determine the capacity of institutions, the degree of coordination between institutional structures (for the effectiveness of actions to build the adaptive capacity of the agri-food sector and strategies for adaptation to IR and climate risk management).

3.7 Progress in the implementation of adaptation measures and actions

According to Article 7(3) of the Convention, progress in the preparation and submission of documents to the UNFCCC demonstrates a Party's willingness to contribute to the collective process of learning and understanding for action on adaptation to climate change. Adaptation is generally non-linear and, in all cases, an iterative process.

Adaptation measures encompass a broad range of tasks and actions aimed at protecting communities from the adverse effects of climate change, such as extreme droughts and hydro-meteorological hazards linked to changes in global air temperature. These measures also seek to enhance the resilience of strategic infrastructure and ecosystems, preserve agrobiodiversity, and mitigate the harmful effects of the Aral Sea disaster on both the environment and the livelihoods of millions of people in the region. Achieving these goals will require substantial support from UN institutions, other international organizations, and development partner countries.

Progress made and results achieved

In recent years, Uzbekistan has implemented and is implementing investment projects, grants and technical assistance projects, government programs and action plans, which are included in the First CSD Update Report (2021), 4NC (2024) and NAP (2024), as well as in the country reviews of international institutions and partners: WB, ADB, EBRD, donors and development agencies.

3.7.1. Efficient use of water resources

At present, there are real opportunities for the country to maintain food security and meet the needs of other sectors of the economy and the population through technologies that increase water productivity while reducing water consumption. The Decree of the President of Uzbekistan “On urgent measures to improve the efficiency of use of water resources”[248] testifies to the special attention and priority given to measures to improve the efficiency of water use:

→ In the water sector, with the assistance and support of the WB, ADB, EU and climate funds and development partners, systematic activities are undertaken to construct and rehabilitate drinking

[248] https://lex.uz/ru/docs/6420842

water supply and sanitation infrastructure, and to modernize and rehabilitate irrigation and drainage infrastructure.

→ In the agricultural sector, measures for land reclamation and the introduction of climate-resilient SLM/CSA practices have been implemented with the participation of farms, clusters and local communities. By the end of 2023, 30% of the total area of irrigated land is equipped with water-saving technologies[249].

In 2023, a new financing system was adopted to introduce water-saving technologies in agriculture in Uzbekistan[250]. For clusters and farms, a preferential credit line is created for 5 years with a 2-year grace period and an interest rate of 14% per year. For the next three years, the practice of subsidizing 15% of the cost of agricultural machinery and 30% of the cost of laser levelers will be continued. After 2026, land and water taxes for areas without laser leveling will be significantly increased.

3.7.2. Green development of Uzbekistan

The main goal of green development in Uzbekistan is to achieve environmental security and sustainable development. In order to mitigate the consequences of the ecological disaster, reduce sandstorms, improve the ecosystem and create sources of income for local communities, reforestation of the dried Aral Sea bed on an area of 2 million hectares is ongoing.

To support rural development, a number of government programs have been launched since 2017: “Obod Makhalla”, “Obod Kishlak”, “Every Family is an Entrepreneur”, “Youth is Our Future”, “Yashil Makon” (Green Land), and others. Under the Yashil Makon program, 200 million tree and shrub seedlings are planted annually in the country's settlements with the aim of increasing the area of green zones from 8% to 30%. This ambitious project aims to plant 1 billion trees and shrubs by 2026. The program is featured on the UN e-Platform as a model project for achieving SDG, and was the basis for the unanimously adopted UN General Assembly resolution of August 13, 2024, “Promoting sustainable forest management, including afforestation and reforestation of degraded lands, including in drylands, as an effective response to environmental challenges”.

Implementation of these programs will accelerate Uzbekistan's transition to a green agri-food economy and ensure economic growth in the long term. The assessment of progress in climate change adaptation achieved by 2023 (according to UN FAO, TAAS, 2017) is presented in Table 3.10.

3.7.3. Projects to support the adaptation of agriculture and water management to climate change

Since 2021, the country has been implementing the UNDP/MES project “Improving Integrated Early Warning System to Enhance Resilience of Communities in Uzbekistan to Natural Hazards Caused by Climate Change” with the support from GCF as an important component of the climate risk management system. The joint AF/UNDP/Uzhydromet project “Enhancing Resilience of Farming Communities to Climate Change in the Drylands of Uzbekistan” on testing and implementation of a wide range of climate risk adaptation measures in the Aral Sea region was recently completed.

Other successful examples include the South Karakalpakstan Water Resources Management Improvement Project, which aims to improve water and land use efficiency, and the Uzbekistan Agriculture Modernization Project, which aims to increase agricultural productivity, create a high value chain in horticulture, and support local infrastructure for climate change adaptation.

[249] https://cabar.asia/ru/v-uzbekistane-vnedryayut-novye-tehnologii-poliva-selhozugodij
[250] h ttps://www.gazeta.uz/ru/politics/

General list of recently completed active and planned projects in support of climate change adaptation and resilience building (presented in Annex 5).

3.8 Monitoring and evaluation of adaptation measures and actions

3.8.1. Methodological approaches

In the context of the implementation of the Paris Agreement and transparency reporting, the UNFCCC has developed several guidelines and methodologies on monitoring and evaluation approaches and indicators, tracking adaptation in different sectors and areas. According to the IPCC AR- 6, monitoring and evaluation is defined as "the systematic process of collecting, analyzing and using information to assess the progress of adaptation and evaluate its impacts during and after implementation".

In accordance with the guidelines of the IPCC, UN FAO, GCF, WB and others, the M&E system of climate change adaptation processes is monitored through meaningful adaptation mechanisms, criteria and indicators:

- Mechanisms for monitoring and evaluating adaptation:
  - ***Assessing effectiveness***: monitoring allows policy makers and stakeholders to assess the effectiveness of adaptation measures in reducing vulnerability and building resilience to the impacts of climate change.
  - ***Tracking progress*** on adaptation over time is used to identify successes and areas for improvement.
  - ***Resource allocation***: monitoring data informs decision-making processes, allowing resources to be allocated to the most effective adaptation strategies.
  - ***Learning and knowledge sharing***: Monitoring facilitates learning from past experiences and sharing of best practices across sectors and regions.
  - ***Adaptive*** management supports adaptive management approaches by providing timely feedback to adjust strategies based on emerging challenges and opportunities.
- Key evaluation and reporting milestones:
  - ***Monitoring***: measuring the progress and outcomes of adaptation actions, and assessing their impact on reducing vulnerability.
  - ***Evaluation*****:** analyzing the results of implemented measures to know the status of adaptation for decision-making.
  - ***Training*****:** advancing knowledge of system implementation and development; needs and experiences.
  - ***Accountability*****:** reporting to stakeholders on progress and/or results; and participation in international reports.
  - ***Adaptation management*****:** checking compliance with policies, plans or activities and adjusting the course of action accordingly.

To identify indicators and criteria for measuring adaptation progress, the IPCC guidelines and manuals were also used and additional research was conducted on the experiences and approaches used in a number of countries (such as Panama, Andorra, Guyana, etc.) within the framework of UNFCCC reporting. This allowed for the development of adaptation indicators based on key criteria for assessing and measuring adaptation progress (Table 3.8).

Table 3.8 Criteria for assessing and measuring adaptation progress

	Difficulty of measurement
Moderate	Data is fully available online to create a baseline.
	This is verifiable by the responsible person.
	Information is collected by the appropriate organization.
Difficult on the ground	Detailed data analysis to avoid double counting.
	Validation of data through field visits to ensure sustainability of the indicator.
	Economic and technical resource requirements.
	Lack of trained staff and technology to collect/analyze data.
	Explore progress and experiences in applying international adaptation methodologies using local approaches.
Difficult to measure or evaluate accurately	Sectoral actors do not conduct this type of measurement, or the methodology is not clearly defined and tested. However, this data is difficult to collect.

Source: IPCC AR-6, 1BTR et al.

- Adaptation indicators and data sources:
  - Used to monitor progress and measure the effectiveness of the implementation of adaptation policies, strategies and actions[251].
  - Fundamentally linked to adaptation and development policies and objectives.
  - Quantify, standardize, and communicate complex and disparate data and information to policy makers and the public[252].

3.8.2. Results of adaptation monitoring by criteria and adaptation indicators

The data requirements and information used to monitor and measure adaptation based on the assessment criteria and adaptation indicators are systematized in Table 3.9.

Table 3.9 Results of monitoring and measuring adaptation progress by adaptation indicators

No.	Indicator	Methodology Data collection	Approach	Source of information	Difficulty of measurement
1	Proportion of population with specialized agricultural education	Statistical data	A measure of adaptation to climate change	Primary data (Goskomstat)	Moderate
2	Level of funding for adaptation measures	Administrative records, survey			
3	Availability of climate-resilient agricultural technologies and institutional support	Surveys	Result of adaptation to climate change	Primary data	Moderate
4	Number of climate change adaptation projects completed	Administrative records, survey	Measure of adaptation to climate change	Primary data	Moderate
5	Crop yields in different years	Statistical data	Result of adaptation to climate change	Primary data (Goskomstat)	Moderate
6	Number of planning tools that integrate climate risks and adaptation to climate change	Administrative records	A measure of adaptation to climate change	Secondary data	Moderate

[251] FAO UN, 2017. Tracking adaptation in agricultural sectors. Climate change adaptation indicators, Rpme, Italy, 2017

[252] P.D. Brooks et al (2011) Non-linear feedbacks between climate change, hydrologic partitioning, plant available water, and carbon cycling in montane forests. AGU Fall Meeting Presentations (Invited) Abstract GC34A-08.

Continuation of Table 3.9

No.	Indicator	Methodology Data collection	Approach	Source of information	Difficulty of measurement
7	Beneficiaries vulnerable to climate change with support to improve livelihoods and income sources	Survey	A measure of adaptation to climate change	Primary data	Moderate
8	Financial capacity of the population, which allows to implement innovations	Survey	Measure of adaptation to climate change	Primary data	Moderate
9	Number of beneficiaries adopting climate-resilient practices	Survey	Result of adaptation to climate change	Primary data	Moderate
10	Producers and crop acreage insured against losses due to extreme weather events	Administrative records	A measure of adaptation to climate change	Secondary data	Moderate
11	Number of people with increased and improved knowledge on climate change adaptation	Administrative records	Result of adaptation to climate change	Primary data	Moderate
12	Number of visits and interactions with the climate portal	Registration on the site	A measure of adaptation to climate change	Secondary data	Moderate

3.8.3. Results of tracking financial support for adaptation

Uzbekistan is a country with a dynamically developing economy, significant industrial potential and a rich resource base, as well as a rapidly growing population. However, the deficit of water resources can radically change the current situation. Therefore, saving this resource is an urgent task in order to maintain not only a sustainable agricultural complex, but also the entire ecosystem of the country.

At present, there are real conditions for the expansion of advanced technologies and practices in water and agriculture that contribute to the sustainable growth of land productivity, so that the country can ensure food security, the needs of all sectors of the economy and the population.

Methodological approach and sources of information

The UNFCCC Guidelines for the Preparation of BTRs for Non-Annex I Countries have been adopted as the methodological framework for tracking financial support for adaptation. This methodology provides a framework for transparency in accordance with Article 13 of the Paris Agreement (Decision 18/CMA.1).

To assess the impact of financial support for adaptation, data and project documents from national and regional programs, grants, technical assistance and investment projects implemented in the country were collected and updated, with a particular focus on the period 2021-2023.

Sources of information include: official government documents and agency/department summaries; official websites of ministries, institutions, and statistical agencies; donor climate profiles; international platforms[253] and national funds; media portals; NGOs; and data, analytical reviews, and reports from local governance structures.

Table 3.10 provides information on international donor project funding by sector.

The analysis of the tracking results shows that the largest financial flows go to agriculture- 36.2%, and strategic infrastructure, which mainly covers the water sector (drinking water supply, irrigation and drainage infrastructure, including SCADA systems, ITC systems, E&E and other equipment) - 30.4%,

[253] In accordance with the No. UP-196 dated 17.11.2023 from 01.12.2023 the minimum wage of 1,050,000 UZS/month is established. https://lex.uz/docs/6665687?ONDATE=01.02.2024%2000

followed by the water sector- 17.6%, and over 15.8% of all financial contributions from international donors go to the social sector, environment and mitigation of the Aral Sea crisis.

Table 3.10 Tracking adaptation progress by NDC sector

Sectors	Unit	Selected projects		Total
		Adaptation	Related projects	
Water management	USD	203 445 657.00	397 300 000.00	600 745 657.00
	%	12.8	21.6	17.6
Infrastructure	USD	252 900 000.00	787 704 000.00	1 040 604 000.00
	%	16.0	42.9	30.4
Agriculture	USD	983 730 000.00	254 062 339.00	1 237 792 339.00
	%	62.1	13.8	36.2
Social sphere	USD	134 386 146.00	373 501 229.00	507 887 375.00
	%	8.5	20.3	14.8
Ecology	USD	3 776 941.00	17 879 655.00	21 656 596.00
	%	0.2	1.0	0.6
Mitigation of the Aral Sea crisis	USD	5 600 000.00	7 239 613.00	12 839 613.00
	%	0.4	0.4	0.4
Total		1 583 838 744.00	1 837 686 836.00	3 421 525 580.00

Progress in adaptation support by source of funding is shown in Table 3.11.

Table 3.11 Tracking adaptation progress by funding source

Funding source	Unit	Selected projects		Total
		Adaptation	Adjacent projects	
EBRD	USD	202 000 000.00	-	202 000 000.00
	%	12.8		5.9
WB	USD	113 200 000.00	1 058 430 000.00	1 171 630 000.00
	%	7.1	57.6	34.2
ADB	USD	424 728 833.00	503 250 000.00	927 978 833.00
	%	26.8	27.4	27.1
Multiple funding	USD	831 824 541.00	267 630 101.00	1 099 454 642.00
	%	52.5	14.6	32.13
The Government of Japan	USD	2 345 568.00		2 345 568.00
	%	0.1		0.07
Swiss Agency for Development and Cooperation	USD	138 000.00	-	138 000.00
	%	0.01		0.00
South Korea	USD	368 000.00	3 126 000.00	3 494 000.00
	%	0.02	0.2	0.1
MPTF-Aral Sea Region	USD	1 403 667.00	-	1 403 667.00
	%	0.1		0.04
GCF	USD	7 830 135.00	-	7 830 135.00
	%	0.5		0.23
UNDP	USD	-	767 396.00	767 396.00
	%		0.04	0.02

Continuation of Table 3.11

Funding source	Unit	Selected projects		Total
		Adaptation	Adjacent projects	
Finnish Ministry of Foreign Affairs	USD	-	106 000.00	106 000.00
	%		0.01	0.00
USAID	USD	-	315 000.00	315 000.00
	%		0.02	0.01
European Commission	USD	-	4 062 339.00	4 062 339.00
	%		0.2	0.12
Total	USD	1 583 838 744.00	1 837 686 836.00	3 421 525 580.00

As the adaptation tracking results show, the largest donors are the World Bank, the Asian Development Bank, and multiple funding (co-financing by a group of donors), which invested 34.2%, 24.1%, and 32.1% of the funds in Uzbekistan's adaptation, respectively. Funding from UNDP, EBRD, FAO, GIZ and GCF ranged from 0.01 to 0.12%.

3.9 Prevention, minimization and elimination of loss and damage associated with the impacts of climate change

The Paris Agreement (Article 8) recognizes the importance of preventing, minimizing and addressing loss and damage associated with the adverse effects of climate change, both extreme and slow-onset events, and the role of a country's sustainable development in reducing the risk of loss and damage. According to the IPCC (6th Assessment Report), the hazards, exposure and vulnerability associated with climate change generate impacts and risks that may exceed adaptive capacity and lead to loss and damage. Current global warming is already causing widespread, unevenly distributed losses and impacts that exacerbate poverty and vulnerability, particularly in developing countries.

3.9.1. Approaches, methods and classifications

Virtually the entire territory of Uzbekistan is subject to climate-related phenomena such as extreme temperatures, droughts, floods, avalanches and dust storms, which threaten the stability of the country and the lives of its people.

According to the UNFCCC-IPCC classification, extreme climate-related events recorded in the country are divided into extreme events and slow-onset events.

In Uzbekistan, emergencies are divided into local, regional, republican and transboundary, depending on the causes (sources) of their occurrence, the number of people affected, the material damage and the extent of territorial coverage. The classification of ES adopted in accordance with the Decree of the Cabinet of Ministers of the Republic of Uzbekistan (No. PKM-455 dated 27.10.1998) is presented in Table 3.12.

The collection of loss and damage data, as well as the review of historical climate change trends and hazard events, allows for a timely and comparable assessment of the impact of climate events on resources and livelihoods, and, among other things, for the appropriate design of public policies, the development of climate risk prevention plans, and the enhancement of adaptive capacity.

Table 3.12 Classification of emergencies adopted in Uzbekistan

Classification of emergencies	Number of victims (persons)	Violation of living conditions (persons)	Material damage (minimum wage)[254]	Emergency zone
Local	no more than 10	no more than 100	Not more than 1 thousand	Does not exceed the boundaries of a settlement, city, county, or region
Regional	10-500 people	100-500	1.0 thousand- 0.5 million	
Republican	>500	>500	>more than 0.5 million	Going outside the region
Transboundary	The emergency goes beyond the borders of the country, or occurred abroad but affects the territory of Uzbekistan			

3.9.2. Overview of economic losses and damage

As noted above, disasters in Uzbekistan can significantly affect the stability and development of the republic, as well as the livelihoods of its people and the environment.

According to World Bank[255], UNISDR and CAREC, economic losses from natural disasters in Uzbekistan average $92 million per year. Economic losses from a disaster with a recurrence interval of once every five years could be approximately $177 million. A disaster with a recurrence interval of once every 200 years could result in losses more than $2 billion.

Over 100 years, economic losses from floods have amounted to $2,800 million. The average annual number of people affected is $2,800 million, and the average annual number of people affected is 220,000; the frequency of an event in which flood damage exceeds insurance coverage is 1 in 5[256]. CAREC-REG (2022) estimates that the average annual flood damage in Uzbekistan is $395.6 million/year, but the western and eastern regions of the country record higher losses: in the west, the average annual damage is $65.2 million in Karakalpakstan and $55.7 million in Khorezm region; in the east, the average annual damage reaches $60.7 million and $47.2 million in Andijan and Namangan regions. According to the available data, the number of people affected for the period 1900-2019 reached 600,000, with damages amounting to about $74.2 million (4NC, 2024).

Uzbekistan's mountainous and foothill regions are at high risk of landslides, which account for 10-12% of the total damage caused by natural disasters. Over the past 80 years, more than 2,600 cases of large debris flows have been recorded[257].

3.9.3. Institutional and legal framework

Uzbekistan is vulnerable to many natural hazards, including earthquakes, floods, mudslides, landslides, droughts, and other disasters. Several ministries, agencies and organizations are involved in disaster risk financing (according to the Law of the Republic of Uzbekistan “On Protection of the Population and Territory against Natural and Technogenic Emergencies” and information on the websites of the Ministry of Emergency Situations and the Ministry of Economy and Finance.

[254] In accordance with the No. UP-196 dated 17.11.2023 from 01.12.2023 the minimum wage of 1,050,000 UZS/month is established. https://lex.uz/docs/6665687?ONDATE=01.02.2024%2000

[255] WB. National Note on Disaster Risk Financing: Republic of Uzbekistan

[256] TA-9878 REG. Country risk profile. 2022

[257] Pusch, 2004

The Cabinet of Ministers of the Republic of Uzbekistan ensures the creation of reserves of material and financial resources to be used after disasters, determines the procedure for their use, carries out financial and resource provision of forces and means of organizations and control over activities on management and prevention of disaster risks. The Ministry of Emergency Situations and the Ministry of Economic Development, which are responsible for disaster relief, formation of reserves and financing of liquidation activities from the Reserve Fund of the Cabinet of Ministers of the Republic of Uzbekistan, coordinate and control measures and actions of relevant ministries and institutions.

Other sectoral ministries and departments, including the Ministry of Health, the Ministry of Agriculture, the Ministry of Water Resources, the State Committee on Geology and Mineral Resources, the State Committee on Architecture and Construction, state agencies, organizations, industrial enterprises and other organizations (JSC Uzbekenergo, JSC Uzbekneftegaz, SE Uzmakhsusimpex), as well as insurance companies, the Red Cross Society, etc., are involved in activities related to natural events.

Legal framework. Disaster risk management and disaster risk financing are governed by the following legal instruments:

- The Law “On the Protection of Population and Territories from Natural and Technogenic Emergency Situations”.
- The Budget Code, Annual state budget laws.
- The Law “On Insurance Activities” and subordinate acts, including the Regulation “On the Licensing of Insurance Activities of Insurers and Insurance Brokers”.
- Other subordinate acts include the Resolution “On Further Improvement of the State System for Emergency Prevention and Response in the Republic of Uzbekistan” and the Resolution “On the Creation of a Unified System for Monitoring, Information Exchange, and Forecasting Natural, Technogenic, and Environmental Emergency Situations”, among others.

3.9.4. Indicators of loss and damage

Available information and data on economic and non-economic losses caused by extreme and slow-onset climate change events were analyzed to select and construct the indicator scale. In addition, consultations and discussions were held with experts and representatives of government, scientific institutions and civil society.

The loss and damage indicators are presented in Table 3.13, indicating the source of information needed, the complexity of the measurement and the data collection requirements.

The analysis shows that progress has been made in adaptation planning and implementation through smart and robust approaches and tools for climate-resilient governance and CSA technologies, transparency M&E systems, digital databases, platforms and information hubs. The key drivers for scaling up adaptation are the effectiveness of knowledge and extension services, the level of education of gender groups and households, including awareness of climate change and adaptation measures, and strengthened cross-sectoral partnerships.

Promoting CSA practices implemented at a large scale will provide opportunities to mainstream inclusive adaptation measures into sectoral, institutional and policy processes and agendas to reduce climate risks for the poor and vulnerable (4NC, 2024).

Table 3.13 Assessing the needs and complexity of measuring progress on loss and damage indicators

No	Indicator	Methodology Data collection	Approach	Source of information	Difficulty of measurement
1	Area affected by catastrophic climate-related events	Administrative records	Extreme events	Secondary data	Complex
2	Number of families that received compensation for damage caused by an extreme hydrometeorological phenomenon	Administrative records	Management	Secondary data	Complex
3	Adverse hydrometeorological phenomena that caused losses and damage to the economic sector	Survey	Adverse events	Primary data	Complex measure or estimation accuracy
4	Number of municipalities affected by extreme weather events	Statistical records	Extreme events	Secondary data	Moderate
5	Budget allocated to extreme weather events.	Administrative records	Extreme events	Primary data	Moderate
6	Economic losses due to climate change related pests and/or diseases	Administrative records	Extreme events	Primary data	Complex measure or estimation accuracy
7	Livestock deaths due to climate-related adverse conditions	Statistical records	Extreme and slow-moving events	Secondary data	Complex
8	Losses and damage to production due to adverse hydrometeorological phenomena	Statistical records	Adverse climate-related phenomena	Secondary data	Complex
9	Damage to vital infrastructure caused by weather events.	Administrative records	Extreme events	Secondary data	Complex
10	Number of homes affected by climate events	Statistical records	Extreme events	Secondary data	Moderate

3.10 Collaboration, best practices, experiences and lessons learned

International cooperation is becoming an important support to enhance the adaptive capacity of the Republic of Uzbekistan in the context of increasing climate change and challenges. In this context, it is very important to expand cooperation and exchange of knowledge, resources and experiences in order to promote strategic priorities and adaptation policies and achieve progress in the implementation of the Paris Agreement.

3.10.1. Regional context

The Republic of Uzbekistan occupies a favorable geo-strategic position in Central Asia for the establishment of international economic relations and cooperation. The historical Great Silk Road passes through the territory of the Republic, and the routes leading from Europe and the Middle East to the Asia-Pacific region cross here.

The Republic borders five Central Asian countries and shares transboundary biomes- hayfields, pastures, forests, wetlands, as well as glaciers and water sources. The amount of carbon stored by transboundary biomes depends on their condition. Actions to restore ecosystems in one country will ensure their sustainable functioning within its territory and benefit the livelihood system outside the country. Central Asian countries are the most vulnerable to climate change in the Eastern Europe and Central Asia region. According to[258], land degradation in Central Asia is estimated at 4-10% of cropland, 27-68% of

[258] Quillérou et al., 2016

pastureland, and 1-8% of forests. Projections of climate change impacts predict a variety of threats, including extreme temperatures, glacial retreat, disruptions in precipitation and snowmelt that alter the hydrology of mountain rivers, leading to water shortages, droughts and floods[259].

The Republic is located at the Central Asian crossroads of international transport routes in the west-east and north-south directions and can become an important link in the development of transport and logistics in Central Asia, including participation in the implementation of the "One Belt, One Road" initiative. Coordinated work of the current member countries of the Bank and Uzbekistan on the development of transport and logistics infrastructure will lead to increased transport connectivity of the region with actively developing markets of Asian countries (Iran, Turkey, Pakistan, Afghanistan, India).

3.10.2. International treaties and obligations of Uzbekistan

Participation of Uzbekistan in the global climate agenda and international programs initiated by UNDP, UNEP, Rio Conventions and international agreements ensures consistent development and integration of the country into the global process of adaptation to climate change, provides access to green economy, climate-resilient and smart technologies, information networks and financial sources. In this regard, international financial organizations, multilateral funds for international cooperation, development agencies and UN systems are of global significance and play a crucial role in the implementation of initiatives to promote climate-resilient development of Uzbekistan.

The Republic acceded to the United Nations Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the United Nations Convention on the Right to the Non-Navigational Use of Transboundary Watercourses, and in 1999 signed the Partnership and Cooperation Agreement between the Republic of Uzbekistan and the European Communities and their Member States.

The Republic of Uzbekistan has signed several intergovernmental agreements with Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan on the management of water resources in the Aral Sea basin, which has provided an important impetus for strengthening cooperation among Central Asian countries. These cooperation efforts are conditioned by the specific geographical location of these countries, their transportation links, the need to jointly develop the region's water and energy resources, and to overcome the consequences of the Aral Sea disaster[260].

It is estimated (CAREC, 2020) that regional cooperation can be beneficial for cost reduction and resource efficiency, replication and scaling up of best practices, knowledge, technology and capacity building, scaling up of innovation and climate finance with private sector participation.

By strengthening collective action to mitigate climate risks, cooperation can also unlock the potential of the region as a whole for coordinated expansion and integration into climate-resilient governance and inclusive development. Joint policies and actions provide a strong foundation for comprehensive regional cooperation and institutional development[261].

The country has implemented and is implementing large-scale investment projects and nationwide programs and activities on adaptation and mitigation of climate change at all levels, and continues to actively support regional initiatives of the International Fund for the Saving of the Aral Sea (IFAS), especially in the Aral Sea region.

[259] USAID, ENVSEC, 2017, WB, 2022, 2014, etc.
[260] V. Sokolov, IFAS, UNDP, 2007
[261] WB, 2002

A country can offer a variety of development solutions and interventions- experiences, best practices, innovative policies, technologies and resources that have proven to be cost-effective, valuable and reliable, and have a high potential for mutual exchange on a large scale. These elements of the governance model ensure close interaction, both between regulators and regulated, as well as with individual observers.

The analysis shows that international technical assistance implemented in Uzbekistan is aimed at supporting the development of water and agricultural policies, institutional reforms, and is focused on the development of adaptive capacity, expansion of the knowledge system, training and education of target groups; demonstration of advanced technologies and methods of water conservation and preservation of productivity (services) of ecosystems. Investments in water and agriculture will include a combination of technical and institutional measures and advisory services, as well as support for the development of institutional reforms and training programmes, of which up to 60% will be for the rehabilitation and modernization of irrigation and drainage infrastructure and E&E systems.

Uzbekistan actively participates in regional and trans-boundary programs and projects aimed at trans-boundary cooperation and partnership in climate change adaptation and mitigation, integration and dissemination of best technologies, etc. (4NC, 2024).

3.10.3. Attracting financial resources

The Republic of Uzbekistan actively cooperates with international financial institutions (WB, ADB, EBRD, IDB, EIB), GEF, UNDP, UNEP and development agencies (AFD, JICA, GIZ, USAID, KOICA) for practical cooperation and exchange of experience. Numerous international funds (Adaptation Fund, Green Climate Fund, UN agencies, EU and others) play a key role in financing climate change and adaptation/mitigation projects to climate challenges, natural risks and hazards, with intellectual capacity building to support the development of mutually beneficial cooperation and collaboration between Central Asian countries and development partners. The World Bank Group, the Asian Development Bank, and Japan are the largest OECD donors in Uzbekistan[262].

The World Bank Group[263] is focusing on improving infrastructure efficiency, access to social services, the competitiveness of the Government of Uzbekistan and its economic diversification program, and supporting the response to the COVID-19 crisis. The WB's Country Partnership Framework 2022-2026 focuses on supporting the green transition in coordination with other development partners and stakeholders. In particular, the Bank seeks to invest in landscape restoration, water security and climate-smart agriculture, as well as building resilience to natural disasters.

The EBRD's strategic priorities under the Country Partnership Program for 2024-2029 are:

- Supporting decarbonization, the creation of green cities and the efficient use of water and renewable energy.
- Develop the private sector and promote employment, skills, inclusion and digital transformation.
- Promoting economic governance, improving the business climate and enhancing infrastructure connectivity.

The key priorities of ADB's new strategy for 2024-2028 are to support reforms in Uzbekistan to facilitate the transition to a green economy, promote private sector development and competitiveness, and

[262]OECD DAC (OECD) Development Assistance Committee of the International Economic Organization of developed countries that recognize the principles of representative democracy and free market economy.
[263]https://uzbekistan.un.org/sites/default/files/2021-01/UZB-%20DFA_ru_final%20%281%29.pdf

encourage investment in human capital. The strategy is consistent with the government's priorities outlined in Uzbekistan's new long-term development plan, known as Uzbekistan 2030, by strengthening food systems against the impacts of climate change and biodiversity loss.

UNDP implements mostly medium scale projects and provides small grants through the GEF and the Adaptation Fund, focusing on improving energy efficiency in buildings. FAO supports projects related to forests, agriculture and climate.

In the current 2024 mission of the Green Climate Fund (Ms. Nonhlanhla Zindela, Deputy Director, GCF and Mr. M. Surkov, Head of Department, EECA), strategic discussions were held with the National Climate Change Center of the Ministry of Environment on systematization and expansion of the project portfolio and technical aspects of developing a national climate finance program in Uzbekistan. The fund aims to mobilize large-scale finance to invest in low-emission and climate-resilient development. The country financing program under development aims to support the sectors of the economy most vulnerable to adverse events such as water scarcity, desertification, and dust storms, as well as energy efficiency, air quality, and climate resilience of cities and districts. Special attention will be paid to the project to establish the Climate Technology Expo Hub in Muynak, proposed by President Shavkat Mirziyoyev at COP-28 in Dubai in 2023.

The national program is presented at the upcoming 29th Conference of the Parties to the UN Framework Convention on Climate Change in Baku, Azerbaijan.

EU cooperation with Uzbekistan focuses on rural and agricultural development, including horticulture, irrigation, water management, livestock, vocational training, and public administration reform and improvement. Through the EU's Investment Facility for Central Asia (IFCA)[264], the European Investment Bank (EIB) and bilateral partners channel funds for rural and agricultural development.

Active cooperation is developing with Saudi Arabia, Kuwait and Turkey, and other South Asian countries. Uzbekistan has great potential for effective interaction with development agencies of the Persian Gulf countries (Saudi Arabia, UAE, Kuwait and Qatar).

The review confirms that mutually beneficial interregional and regional cooperation has great potential and opportunities to overcome and stabilize vulnerability at local and national levels and to generate co-benefits from adaptation and mitigation, especially carbon sequestration in desert and foothill pastures and mountainous provinces of the country. A review of drainless basins[265] and lakes in Central Asia in terms of current and future water management confirms that successful adaptation to climate change requires regional and transboundary programs and projects supported by local governments and international donors with inclusive and climate-resilient approaches.

3.11 Gender and climate change

Uzbekistan is one of the most vulnerable countries to the effects of climate change and natural disasters. Rural women suffer the most because they have limited access to practices and technologies that facilitate successful adaptation to climate change, and because they have to spend considerable time providing their families with fresh water and firewood, which are becoming increasingly scarce due to water shortages and shrinking forests.

[264] The IFCA is the EU's blended investment instrument for Central Asia, designed to co-finance vital social and economic infrastructure investment projects that benefit society as a whole.

[265] Uzbekistan and the EAEU (2021). Prospects and potential effects of economic integration. Reports and Working Papers 21/2. https://eabr.org/upload/EDB_2021_Report_Uzbekistan_and_the_EAEU_rus.pdf

An important aspect is the negative impact of climate change on the health of the population- difficulties in accessing quality drinking water, the effects of heat waves on the cardiovascular system, dust storms on the eyes and respiratory system- increasing women's responsibility for the health of children and the elderly.

Empowering women and promoting gender equality can yield results in many areas, including food and economic security and health. It can also lead to greener decisions at the household and national levels.

4 INFORMATION ON FINANCIAL ASSISTANCE, TECHNOLOGY DEVELOPMENT AND TRANSFER, AND CAPACITY-BUILDING SUPPORT PROVIDED AND MOBILIZED UNDER ARTICLES 9-11 OF THE PARIS AGREEMENT

This section provides information on national circumstances and institutional arrangements for climate finance, the results of statistical analysis of public and international finance, and highlights policies and actions undertaken for technology transfer and capacity building, as well as mitigation and adaptation needs.

4.1 National circumstances and institutional arrangements

The country is currently on the path of major economic reforms, as mentioned above. The national context and institutional arrangements regarding mitigation and adaptation measures are presented in Sections 2-3.

Climate change issues are integrated into the key strategic documents of the country: the New Uzbekistan Development Strategy for 2022-2026 (2022) and the Strategy "Uzbekistan – 2030" (2023).

Each sector of the economy of Uzbekistan has its own strategic documents, which define the main directions of development, priorities, key reforms necessary to achieve the goals in the medium and long term:

- Agricultural Development Strategy for 2020-2030[266].
- Water and Irrigation Sector Development Strategy for 2021-2023[267].
- Innovation development strategy for 2022-2026[268].
- Gender Equality Strategy 2030[269].
- Green Economy Transition Strategy 2019-2030[270].
- Biodiversity Strategy 2019-2028 [271].
- Municipal Solid Waste Management Strategy 2019-2028[272].

The NDC of Uzbekistan envisages a 35% reduction in the carbon intensity of GDP by 2030 compared to the 2010 levels. To achieve this, the country is implementing measures to transition to a green economy, develop renewable energy, and improve energy efficiency [273].

One of the key steps taken by Uzbekistan in the area of climate change adaptation was the adoption of the Presidential Decree "On measures to create a climate-resilient agro-ecosystem and increase the resilience of agricultural producers to climate risks"[274]. It approved the National Agricultural Adaptation Program, which aims to reduce the sector's negative impact on the climate. The program includes measures to adapt the agricultural sector and promote sustainable practices among producers. To accelerate the transition of agriculture to sustainable practices, agreements have been signed to obtain grants for the implementation of these measures:

- Program "Expansion of Agricultural Practices Adapted to Climate Change and Climate Change Mitigation in Uzbekistan" jointly with the UN Green Climate Fund in the amount of $200 million.

[266] https://lex.uz/ru/docs/4567337
[267] https://lex.uz/ru/docs/5307921
[268] https://lex.uz/uz/docs/6102464
[269] https://lex.uz/ru/docs/5466725
[270] https://lex.uz/ru/docs/4539506
[271] https://lex.uz/docs/4372841
[272] https://lex.uz/docs/4291733
[273] https://lex.uz/ru/docs/4539506
[274] https://www.lex.uz/ru/docs/6982708

- The European Union for 27 million euros, the Global Environment Facility for $10 million.
- The German Society for International Cooperation (GIZ) project “Environmentally Sustainable Development of the Aral Sea Region” for 12 million euros.
- Climate change-related projects in agriculture with the GEF and the UN FAO for $25 million.
- The project “Rehabilitation of Sustainable Forest Landscapes in Uzbekistan” with the participation of the World Bank for rehabilitation and management of tree landscapes will attract concessional loan funds in the amount of $116.5 million.
- From the State Budget for 2024, the Ministry of Ecology, Environmental Protection and Climate Change has been allocated 100 billion UZS for the expenses of the national project “Yashil Makon” and 40 billion UZS for the creation of protective forest plantations.

In addition to the above documents, the government is in the process of developing the Climate Change Strategy 2030 and comprehensive National Adaptation Plans. Currently at the stage of discussion and adoption is:

- Law “On the limitation of GHG emissions”. It will ensure systemic control over economic activities that result in GHG emissions, create a legal framework for reducing GHG emissions and regulating carbon units. The law will become an important tool for fulfilling international obligations, supporting environmental reforms, improving the state of the environment and contributing to the achievement of SDGs in the country.
- Uzbekistan's long-term strategy for low-carbon development until 2050, which aims to achieve sustainable economic growth while reducing GHG emissions, minimizing environmental impacts, respectively improving the quality of life of the population and meeting international climate commitments. The main objectives and directions of this strategy include:
  - Reduce GHG emissions: Uzbekistan aims to significantly reduce CO_2 emissions in key sectors of the economy and achieve carbon neutrality by 2050.
  - RES development: Transition to solar and wind energy, with the aim to increase the share of RES to 25% by 2030 and beyond.
  - Energy efficiency and infrastructure modernization: Deploy energy-efficient technologies and modernize the energy system to reduce losses and increase efficiency.
  - Developing a green economy: Develop clean technologies, green finance and sustainable agriculture.
  - Adaptation to climate change: Measures to improve water management and protect against climate risks.
  - Reduce dependence on hydrocarbons: Reducing the use of oil and gas, increasing the share of clean energy.
  - Electrification of transportation: Switch to electric vehicles to reduce emissions and improve air quality.
  - Uzbekistan plans to actively cooperate with international organizations and financial institutions to attract investment in low-carbon technologies and projects. This includes the use of green finance and participation in global climate initiatives.

One of the key levers in the implementation of climate change mitigation and adaptation actions is ensuring their financial support, which includes funds from the state budget, state trust funds, extra-budgetary funds of ministries and agencies, and attracting international investment.

Climate finance is mainly aimed at implementing measures to reduce GHG emissions, increase GHG absorption, reduce vulnerability, maintain and increase the resilience of human and ecological systems to the adverse effects of climate change.

The following financing mechanisms have been launched or are being developed and tested in the country:

Green Budgeting. Committed to achieving the SDGs and implementing climate change mitigation measures, the Government of Uzbekistan has started to implement (i) budget labeling for 16 national SDGs and (ii) climate labeling from 2019[275]. Green budget issues are reflected in the Presidential Decree PP-436 dated 02.12.2022, as priority areas for the assessment of domestic green financial flows.

To introduce green budgeting tools, the IEF, with the support of UNDP and AFD, developed a methodology for climate labeling of government budget expenditures[276]. The results of the labeling, showing the estimates of budget expenditures that have an impact on climate change, are published annually in the "Budget for Citizens" and are available to the general public. This labeling is not presented in a systematic way, and to become an effective tool towards the achievement of the SDGs and the green transition, it should be implemented on a permanent basis.

In 2023, Uzbekistan's first "Review of Public Climate Expenditure and Institutional Assessment"[277] was prepared to analyze and determine the extent to which climate change issues are integrated into the country's policies and reflected in the state budget.

The analysis of green budgeting assessments shows that in the period 2020-2022, 10-11% of Uzbekistan's budget (2-3% of GDP) be allocated to climate-friendly activities, mainly in the agriculture, transport and water sectors. About 95% of these funds are focused on adaptation to climate change. Expenditures with negative climate impacts decreased from 0.9% to 0.6% of the budget (0.2-0.1% of GDP), which are mainly expenditures to support mining.

The Climate Change Budget Integration Index (CCBII) points to the need to further integrate climate concerns into the budget system. To this end, the following measures are proposed[278]: the introduction of a climate budget labeling model, the continuation of program budgeting reforms, the use of climate criteria for project appraisal and allocation, and the establishment of a framework for climate-focused budget discussions. There are also plans to develop a green tax package to be reflected in the draft budget, including shifting the tax burden on businesses and households to activities that lead to pollution and resource waste.

The National Taxonomy of Green Economy in Uzbekistan, approved by the Cabinet of Ministers Resolution No. PKM-561 of October 25, 2023, serves as an important tool for climate finance and implementation of the Green Economy Transition Strategy for 2019-2030. This taxonomy defines criteria for classifying green activities, which contributes to better targeting investments in sustainable projects and initiatives and promotes financial transparency in green finance. The National Green Taxonomy of Uzbekistan for classification of green activities in the country is being developed by the Ministry of Economy and Finance of the Republic of Uzbekistan with the support of the World Bank and other international organizations. Currently, the "experimental" stage of the taxonomy is being implemented; according to the government's decision, the implementation of the National Taxonomy should take place by the end of this year.

Uzbekistan is actively introducing green finance as a key part of its development strategy (No. PP-436 dated 02.12.2022). The need to introduce green bonds is due to the deficit of investments in sustainable

[275] https://www.gazeta.uz/ru/2024/05/08/green-budget/

[276] Information on testing the methodology of labeling green expenditures in the framework of the state budget execution for 2023

[277] https://www.undp.org/ru/uzbekistan/publications/gosudarstvennykh-raskhodov-i-institucionalnaya-ocenka-v-oblasti-izmeneniya-klimata-uzbekistan#

[278] "Climate Cost Review and Institutional Assessment on Climate Change: Uzbekistan", IFE, UNDP, AFD, 2023

infrastructure, which is estimated at USD 6 billion annually. It is estimated at USD 6 billion annually. Public funding cannot fully cover this need, so the government is seeking to attract private capital, both domestic and foreign. One of the main environmental problems is the Energy sector's dependence on natural gas, which is the main source of GHG emissions.

The country's financial markets also face challenges: the dominance of state-owned companies and banks, the lack of institutional investors, and low activity in the credit markets. The first bond issues were an important step in the development of the capital market, but the potential remains untapped.

Uzbekistan has significant potential to reduce GHG emissions by increasing the share of renewable energy sources, especially solar energy.

Recent large-scale solar and wind power generation projects have been realized using investment capital. Such projects are currently financed through conventional loans rather than green loans or bonds, but debt instruments can help refinance existing loans. Including such future projects in a green bond program seems a feasible goal.

Despite reforms in the financial sector, Uzbekistan's capital market remains weak, with limited supply and demand for securities. State-owned banks, which are preparing for privatization, are actively considering green bonds as a tool to attract funding from institutional investors focused on environmental, social and governance (ESG) responsibility. Uzbekistan has significant potential to reduce GHG emissions by increasing the share of renewable energy sources, especially solar energy. This contributes to strengthening energy security and modernizing infrastructure in the energy and transport sectors.

Since 2021, the country has issued several thematic bonds, including sovereign and corporate green bonds, raising funds to modernize buildings and introducing water-saving technologies. In October 2023, Uzbekistan launched its first green Eurobonds on the London Stock Exchange and registered for the first time an issue of corporate green bonds for projects in the green economy. Details are provided in section 4.3.

Recent institutional, legal and regulatory reforms, such as the Capital Market Development Program 2021-2023[279], have liberalized Uzbekistan's financial sector, but it still suffers from inefficient market facilitation and limited supply of and demand for securities.

There is currently no regulatory framework for Islamic finance in Uzbekistan, but there are indications that there is significant demand for Islamic financial products. Green sukuk, a Shariah-compliant bond-like instrument, can be an additional financing tool for both public administration and corporate entities.

Agricultural Insurance (Agroinsurance). Uzbekistan faces increased agricultural risks due to climate change. These risks threaten sustainable development, the well-being of farmers and the country's food security. One of the key tools for adapting the agricultural sector (crop and livestock production) to climate change is insurance. Agroinsurance will contribute to the financial stability of agricultural enterprises, the growth of rural employment and the well-being of the rural population. Issues related to agroinsurance are addressed in the following documents[280,281]:

- Presidential Decree “On Establishment of the State Joint Stock Insurance Company Uzagrosugurta” (1997)[282].

[279] https://lex.uz/ru/docs/5371145
[280] https://www.agro.uz/ru/11-0358/
[281]ttps://www.norma.uz/novoe_v_zakonodatelstve/kak_podgotovyat_selskoe_hozyaystvo_k_izmeneniyu_klimata
[282] https://lex.uz/docs/358410

- Resolution of the Cabinet of Ministers "On Issues of Organization of Activity of State Joint Stock Insurance Company Uzagrosugurta" (1997)[283].
- Cabinet of Ministers Resolution "On Measures to Improve the System of Insurance of Future Raw Cotton and Grain Spike Crops" (2019)[284].
- Resolution of the Cabinet of Ministers "On Approval of the Regulation on the Procedure of Livestock Insurance in Households and Economic Entities Operating in the Direction of Livestock Production" (2019)[285].
- Presidential Decree on Measures to Build a Climate Resilient Agroecosystem and Increase the Resilience of Agricultural Producers to Climate Change Risks (2024)[286].
- Internal documents of Uzagrosugurta Insurance Company (JSC).

The current legal framework deals with the procedure for conducting certain types of agricultural insurance and does not have a basic legal document[287].

Resources are mobilized through carbon trading and carbon taxes. On June 21, 2024, Uzbekistan became the first country in the world to receive payment from the World Bank for carbon emission reductions through a policy credit program. This pioneering project, the Innovative Carbon Application for Energy Transition (ICRAFT), was created to help Uzbekistan implement energy efficiency measures, phase out energy subsidies, and transition to cleaner energy sources. The World Bank's Transformational Carbon Fund (TCAF) awarded Uzbekistan a $7.5 million grant for successfully reducing carbon emissions by 500,000 tons through the ICRAFT project. These emission reductions have been independently verified[288].

Public-Private Partnership. In 2019, Uzbekistan adopted the Law on Public-Private Partnership[289], which created a legal framework for the development and implementation of PPPs. The law regulates the processes of selecting private partners, allocating risks and obligations, and protecting the interests of investors.

In addition, the Agency for the Development of Public-Private Partnerships was established in 2018 under the Ministry of Finance of Uzbekistan[290] (now the Ministry of Economy and Finance). It plays a key role in coordinating and promoting PPP projects.

Uzbekistan is actively developing PPPs in the Energy sector, especially in renewable energy projects. The country cooperates with international private investors to build solar and wind power plants.

In the transport and logistics sector, PPPs enable the modernization of infrastructure such as airports, railways and public roads, improving transport connectivity and safety.

In the agriculture and water sector, modernization of irrigation systems and water resources management, including the introduction of advanced technologies for drip and rain irrigation, automation and digitalization of water resources management. Projects to rehabilitate and reconstruct canals and pumping stations.

[283] https://lex.uz/docs/493052?ONDATE=06.03.1997
[284] https://lex.uz/docs/4379352
[285] https://lex.uz/docs/4532761?ONDATE=05.04.2022&ONDATE2=30.09.2019&action=compare
[286] https://lex.uz/ru/docs/6982708
[287] https://www.agro.uz/ru/11-0358/
[288] https://www.worldbank.org/en/news/press-release/2024/06/21/uzbekistan-receives-7-5-million-in-carbon-credits-for-enabling-half-a-million-tons-of-emissions-reduction
[289] https://lex.uz/ru/docs/4329272
[290] https://lex.uz/docs/4104709

The institutional framework for addressing climate change in Uzbekistan includes a wide range of government, civil society, education, and research institutions (Sections 1-4). This section reviews some of the structures from the perspective of climate finance, technology transfer and capacity building.

The Presidential Decree[291] established the **Climate Council under the President of the Republic of Uzbekistan.** The Climate Council is the highest advisory body of the President of the Republic of Uzbekistan on climate change mitigation and adaptation. The Council aims to effectively implement the commitments made by the Republic of Uzbekistan under the Paris Agreement, including accelerating the transition to a low-carbon economy and improving the welfare of citizens. One of the objectives of the Council is to "...facilitate the provision of resources and financing, including investment attraction, to support the implementation of climate change mitigation and adaptation projects, including green technologies, research and innovation".

Organizations responsible for policy development and implementation:

According to the Government Decision[292,293], **the Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan** is responsible for the development and implementation of policies in the field of IR, ecology and environmental protection (biodiversity, waste/solid waste management) and afforestation. Ministry of Ecology, Environmental Protection and Climate Change. The Ministry currently includes Uzgidromet, the Forestry Agency and the Tourism Agency. The Central Asian University of Environmental Studies and Climate Change and the National Center for Green Transformation and Climate Change Adaptation have been established under the Ministry.

The Ministry of Economy and Finance is responsible for: the development and implementation of economic and fiscal policies, as well as budget preparation and execution in cooperation with other government agencies. It coordinates activities to promote a green economy and reduce GHG emissions, acting as a working body of the Ministry of Water Management.

The Ministry of Economy and Finance is the responsible organization for the implementation of measures to transition to a green economy, is responsible for (i) reducing the carbon intensity of GDP; (ii) ensuring that environmental aspects are taken into account in all sectors of the economy; (iii) coordinating and implementing GHG emission reduction projects in the sectors of the national economy; (iv) *developing financial mechanisms to support the green economy, mobilizing financial resources through climate finance and providing information on climate finance to Uzhydromet under the UNFCCC.*

In 2021, the Interagency Council for Coordination of Measures for Transition to a Green Economy was established to oversee the implementation of the strategy and conduct monitoring.

The Ministry of Economy and Finance is the national authority for the transparency system, coordinating the collection and control of GHG information in accordance with the requirements of the MRV system.

Monitoring of the country's overall economic goals and plans related to climate change, including the NDC, the Strategy for the Transition to a Green Economy, the Green Growth Program and the Action Plan, is carried out by the Ministry of Economy and Finance through periodic reports and indicators of the results of the measures implemented. As the country generally monitors the financial resources and performance of international projects, climate change projects are not singled out, as this work is currently in the process of implementation, including the green taxonomy.

[291] https://www.lex.uz/uz/docs/7044889
[292] https://lex.uz/ru/docs/6479185
[293] https://lex.uz/ru/docs/6479136

Government agencies responsible for regulating and managing assets in specific areas related to climate change:

- Ministry of Energy.
- Ministry of Investment, Industry and Trade.
- Ministry of Agriculture.
- Ministry of Water Resources.
- Ministry of Construction, Housing and Communal Services.
- Ministry of Transport.
- Forestry Agency under the Ministry of Ecology, Environment and Climate Change.
- Ministry of Disaster Management.
- Ministry of Health.

The institutional framework for climate change in Uzbekistan also includes a wide range of civil society institutions and organizations, as well as educational and research institutions that are responsible for research/education, public awareness and other activities in the field of combating climate change:

- Local authorities.
- Non-governmental organizations.
- Research institute.
- Universities.
- Development partners.
- (UNDP, AFD, ADB, WB, GIZ, etc.).

Innovative development and technology transfer are an important part of climate change mitigation and adaptation measures.

The institutional structure in the field of education, science and innovation is reflected in the governmental decision[294], which presents the Regulation of the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan, the Regulation of the Agency for Innovative Development under the Ministry of Higher Education, Science and Innovation and the Regulation on adhesion of innovative development under the Ministry of Higher Education, Science and Innovation. In general, the Cabinet of Ministers has the following powers in the field of science, technology and innovation[295]:

- Provides realization of the main directions of the sphere of science and scientific activity.
- Approves priority areas of science and technology development.
- Ensures the formation of the infrastructure of the sphere of science and scientific activity and its efficient operation.
- Approves the procedure for assessing the achievement of target indicators in the implementation of state scientific programs.
- Defines measures to ensure close integration of science, education and production.
- Determines the order of financing of the sphere of science and scientific activity, as well as the order of organization of funds with state participation.
- Provides social protection and incentives for individuals engaged in scientific activities.
- Determines the procedure for awarding scientific degrees and scientific titles.
- Defines measures of popularization in the information sphere.

[294] https://lex.uz/docs/7054560#7058206

[295] https://unece.org/sites/default/files/2021-03/STI%20gap%20analysis_Uzbekistan_Report_Nodira%20Kurbanbaeva_RUS.pdf

The Ministry of Higher Education, Science and Innovation is responsible for the development of higher education, science and innovation in the country[296].

The main functions of the Ministry include:

1. Development and implementation of educational policy: the Ministry determines the strategy and priorities in the field of higher education and science, develops state programs and standards.
2. Management of higher education institutions: It supervises the activities of universities and institutes and ensures their accreditation and licensing.
3. Scientific research: The Ministry supports and finances scientific projects, promotes the integration of science and education, and cooperation with international scientific organizations.
4. Innovation and Technology: It stimulates the development of innovative technologies and their introduction into the educational process and industry.
5. Teacher training and professional development: The Ministry organizes retraining and professional development programs for teaching staff.

The Ministry is actively working to modernize Uzbekistan's education system to meet international standards and the needs of the country's economy.

In order to ensure the implementation of the Decision of the President of the Republic of Uzbekistan "On organizational measures for implementation of the Strategy of innovative development of the Republic of Uzbekistan for 2022-2026" No. PQ-307 dated 06.07.2022, as well as to implement the Strategy of innovative development of the Republic of Uzbekistan for 2022-2026, the roadmap on implementation of the Strategy of innovative development of the Republic of Uzbekistan for 2024-2025 was adopted. This document is aimed at strengthening innovation activity, stimulation of scientific research and introduction of advanced technologies in various sectors of the economy. The main goals of the roadmap include:

1. Supporting R&D activities: increasing investment in R&D, creating and improving research infrastructure, and supporting domestic scientific personnel.
2. Development of the innovation ecosystem: promotion of commercialization of scientific developments, creation of conditions for startups and innovative companies, improvement of conditions for introduction of new technologies in industry and other spheres.
3. Digitalization and technological solutions: strengthening of digitalization processes in the public and private sectors, application of modern technologies to improve the efficiency of public administration and services.
4. Education and training: creation of programs for training specialists in the field of high technologies, development of cooperation between educational institutions and industry, introduction of modern teaching methods.
5. International cooperation: attraction of international experience, foreign investors and specialists, as well as participation in international projects for knowledge and technology exchange.

[296] https://lex.uz/docs/7054560#7058206

4.2 Basic assumptions, definitions and methodologies

The methodological approach presented in the UNFCCC guidelines for the preparation of BTR for Non-Annex I Countries was used to organize and present the information collected on climate finance in the country, capacity building actions and technology transfer in the field of climate change. This methodology provides a framework to facilitate transparency in accordance with Article 13 of the Paris Agreement (Decision 18/CMA.1). In particular, the annex of this guide provides guidance on reporting data on support, including financing, capacity building and technology transfer, in accordance with Articles 9-11 of the Paris Agreement. In addition, the tables approved by Decision 5/CMA.3 were used.

In general, the methodological approach to the preparation of this chapter, includes:

- Study of the guidelines for the preparation of the BTR and relevant decisions of the Conference of the Parties, preparation of the content of the section, preparation of tables for distribution to key Ministries and agencies for information gathering.
- Identify international organizations providing financial, capacity building and technology transfer assistance.
- Identify sources of information: websites of ministries, agencies, donors, platforms, Investment Programs, publications including climate finance assessments.
- Collecting and organizing information from various sources as required by the guidelines to make information comparable and improve accuracy in assessing the assistance received.
- Verification of information through cross-referencing to reduce uncertainty in the information and calculations made. This verification is done through inquiries and consultations with organizations involved in project and program implementation.

The exchange rate of the Central Bank of the Republic of Uzbekistan on January 1, 2024, which was 1USD= 12,338.77 UZS, was used to convert funds into national currency[297].

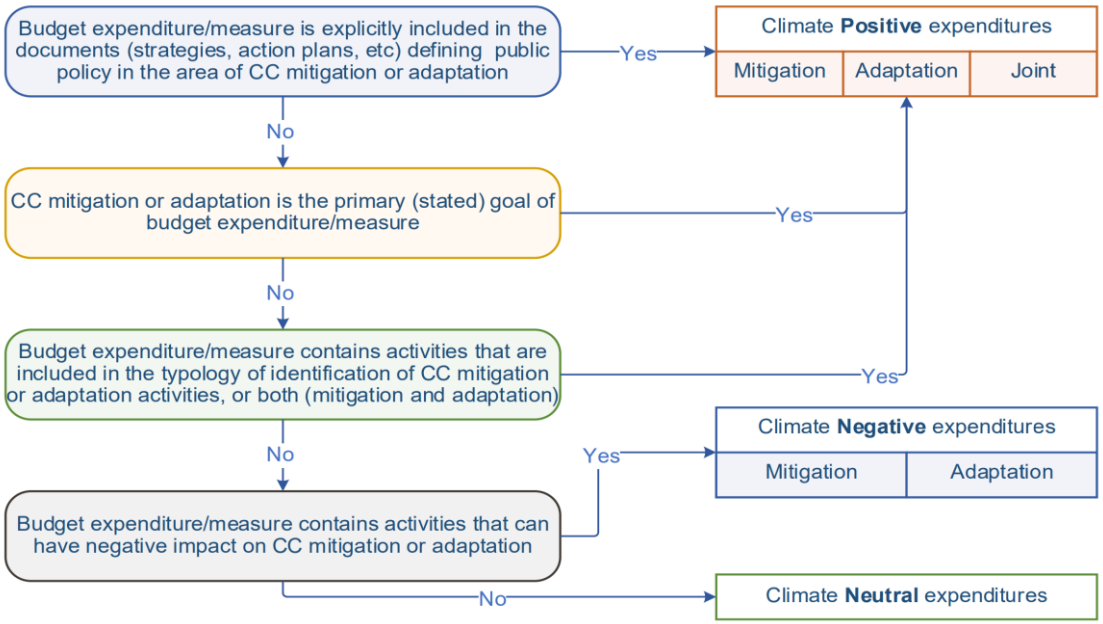
In the current reporting period, information is evaluated for the period 2021-2023, in the following areas:

1. About the financial support received, including:

1a Climate budgeting is the process of incorporating climate change mitigation and adaptation objectives into government budgets. Recognizing the need to assess climate budgeting, the Ministry of Economy and Finance, with support from UNDP and AFD, developed a climate budget marking methodology[298] (Figure 4.1.) and assessed climate budgeting against national strategic priorities, budget practices and organizational decisions. The results were published in the Citizens' Budget 2022-2024[299,300,301] and in the Climate Change Public Expenditure and Institutional Assessment Review[302].

Two criteria were used to assess climate change mitigation and adaptation budget expenditures: (1) purpose of the expenditure: whether the funds were intended to mitigate or adapt to climate change was considered; (2) impact of the expenditure: the actual impact of the expenditure, including both positive and negative effects on the climate, was assessed, regardless of the stated objectives. Expenditures that met at least one of these criteria were considered climate change related.

[297] https://bank.uz/currency/archive/1-1-2024
[298] https://www.undp.org/ru/uzbekistan/news/gosudarstvennykh-raskhodov-i-institucionalnaya-ocenka-v-oblasti-izmeneniya-klimata-uzbekistan
[299] https://admin.openbudget.uz/media/post_attachments/Budjet_22_P_ru_hqLTgq6.pdf
[300] https://api.mf.uz/media/document_files/Budjet_23_ru.pdf
[301] https://api.mf.uz/media/document_files/Budjet_P_24_ru.pdf
[302]https://www.undp.org/ru/uzbekistan/news/gosudarstvennykh-raskhodov-i-institucionalnaya-ocenka-v-oblasti-izmeneniya-klimata-uzbekistan



Source: Climate Cost Review and Institutional Assessment on Climate Change: Uzbekistan, 2023

Figure 4.1 Schematic diagram of the process of determining budgetary climate expenditures

Climate expenditures were categorized according to two criteria: (1) Type: mitigation, adaptation, or combined. (2) Significance: positive, negative or neutral climate impacts.

This classification is based on international practice, including methodologies for tracking climate finance by multilateral development banks (MDBs), and includes a typology of climate change interventions and their criteria.

For this assessment, only expenditures from the state budget of Uzbekistan were considered, while state trust funds and financial resources spent on the implementation of projects (programs) attracted from external sources were not considered.

1b **International financial support.** In Uzbekistan, when monitoring the implementation of projects, the category of "climate projects" was not singled out. Currently, work is underway in this direction, including the introduction of a green taxonomy. Therefore, international support for the period 2021-2023 was assessed based on the analysis of projects selected from the International Aid Transparency Initiative (IATI)[303], Organization for Economic Cooperation and Development (OECD)[304] and donor and partner websites (Box 4.1). As the above sources generally provide information on economic sectors, a selection criterion was set that corresponds to the economic sectors reflected in the national NDC (energy, transport, buildings, waste, industry, agriculture and water management, disaster risk mitigation, Aral Sea crisis mitigation, and ecosystem improvement). Then, for the accounting to be most objective, projects were categorized according to the Rio markers[305] Box 4.2.

Most sites do not have the accumulated information required for reporting, it is in scattered form and requires review of project documents such as project document, technical reports, audit reports (this is a time consuming and labor-intensive process).

[303] IATI is the International Aid Transparency Initiative, which aims to increase transparency about development and humanitarian aid resources and results in the fight against poverty and crises. https://iatistandard.org/en/

[304] https://web-archive.oecd.org/

305 https://www.studocu.com/en-gb/document/middlesex-university-london/web-applications-and-databases/revised-climate-marker-handbook-final/55533947

Box 4.1

Major donors and partners financing climate projects and programs
GEF- Global Environment Facility
GCF- Green Climate Fund
AF- Adaptation Fund
UNEP- United Nations Environment Program
UNDP- United Nations Development Program
FAO- Food and Agriculture Organization of the United Nations
ADB- Asian Development Bank
WB- World Bank
EBRD- European Bank for Reconstruction and Development
IDB- Islamic Development Bank
EC- European Commission
AFD- French Development Agency
GIZ- German Society for Technical Development
KOICA- Korea International Cooperation Agency
EAKPF- E-Asia and Knowledge Partnership Fund of the Republic of Korea
JAICA- Japan International Cooperation Agency
JFPR- Japan Fund for Prosperous and Resilient Asia and the Pacific
TAGF-SPA- Spanish Cooperation Fund for Technical Assistance
SDC- Swiss Development Agency
USAID- United States Agency for International Development
PRC Fund- PRC Poverty Reduction and Regional Cooperation Fund
United Kingdom Fund for Asian Regional Trade and Connectivity
The Government of the Russian Federation
The Government of Canada

Box 4.2

The Rio marker criteria are:
Climate change (mitigation): tracks funding for projects that reduce GHG emissions or increase carbon sequestration (RES development, energy efficiency, and emission reduction in the transport sector, etc.).
Climate change (adaptation): tracks funding for climate change adaptation projects. Includes projects that promote resilience of infrastructure, agriculture and water supply in a changing climate.
Biodiversity: tracks funding for biodiversity conservation and sustainable use projects. Such projects include protecting natural ecosystems, conserving forests, restoring ecosystems, and maintaining populations of rare and endangered species.
Combating desertification: tracks projects aimed at preventing land degradation, especially in areas prone to desertification. Examples include sustainable land management, soil restoration, and the adoption of agricultural practices that maintain soil fertility.

As a result, an assessment was made for projects that were ongoing during this reporting period and for projects with information on support received during the reporting period:

- On grant and repayable assistance (grants, technical assistance, loans) by type of assistance (mitigation, adaptation, cross-sectoral activities). Projects with mixed funding were categorized as loan projects, as most project funding is in the form of loans and the amounts spent from the different sources were not actually available.
- Estimates by donor for the whole period.
- Assessment by the economic sector as reflected in the NDC: energy (buildings, generation, distribution, energy efficiency in various economic sectors, including the water sector), waste (wastewater and municipal solid waste), agriculture and water management, drinking water supply, disaster risk reduction, transport, Aral Sea crisis mitigation, environmental protection.

The above calculations do not include PPP projects, as there is no information on them in “open” access, as required by the guidelines. PPP projects are analyzed in the following sectors: energy, water, transport and environment.

Regional projects are also not included in the calculations as country and year information is not provided.

Projects are included in the CTF table.

1c Public-Private Partnership. As part of the preparation of this report, the register of implemented PPP projects was reviewed[306]. The projects from the register of implemented projects were (1) identified by economic sector; (2) identified by RIO markers (the analysis is provided for all projects); (3) a table is provided in the annex listing the projects with a value of USD 5 million and above.

These projects are not included in the CTF table because they do not have funding by year and there is no way to provide information on the funds spent.

1d Resources mobilized through carbon trading and carbon taxes. Presented only in the narrative section of the project, as available information does not conform to CTF formats.

1e Green bonds. Presented only in the narrative portion of the project as available information does not conform to CTF formats.

2. The financial support needed. This is a more labor-intensive process that takes more time. To date, there has been no regular assessment of climate finance needs in the country. Estimates of financial needs for mitigation and adaptation are provided in World Bank studies supported by the Government of Uzbekistan and published in Uzbekistan: Country Report on Climate and Development (2023)[307]. These investments cover all technologies involved in all parts of the energy value chain, including power and hydrogen, as well as end-use sectors: buildings, industry, and transport (machinery, appliances, conventional cars, and electric motors).

The information contained in this publication does not allow for the completion of the tables required by the CTF training manual, so this section provides available general information in text form.

3. Information on support provided for technological development and transfer. At present, it is difficult to provide complete information on technology transfer. Therefore, this report provides general information on the situation in the country in this area, based on the databases of the following international sources:
   - IMF:- https://www.imf.org/en/Home
   - ITC Trademap- https://www.trademap.org/Index.aspx
   - WIPO- https://www.wipo.int/portal/en/index.html
   - Technology Transfer and Innovation for Low-Carbon Development. International Development in Focus. Washington, DC: World Bank- https://openknowledge.worldbank.org/entities/publication/ba95cb2c-6db5-5a29-bcad-36d97cb988ac

   The following estimates are provided:
   - Imports of low-carbon technology products to Uzbekistan.
   - Imports of low-carbon technology products to Uzbekistan by trading countries.
   - Exports of low carbon technology products from Uzbekistan.
   - Uzbekistan's trade balance in low-carbon technology products.
   - International position of Uzbekistan in the Global Innovation Index 2023.
   - Nomenclature of imports of low-carbon technological products in Uzbekistan in value terms in 2019-2023 (thousands of USD).

[306] https://www.pppda.uz/ru/%d0%b3%d0%bb%d0%b0%d0%b2%d0%bd%d0%b0%d1%8f
[307] https://www.vsemirnyjbank.org/ru/country/uzbekistan/publication/ccdr

- Nomenclature of imports of low-carbon technological products to Uzbekistan in volume terms in 2019-2023.
- International positions of Uzbekistan in the Global Innovation Index 2023 based on GDP per capita in PPP terms.
- Components used to assess Uzbekistan's position in the Global Innovation Index 2023.

Percentage of projects with technology transfer activities by type of activity derived from the list of projects in Annex 5.

A table in CTF format is also presented with information on assistance received in technology development and transfer. These projects were collected and analyzed based on the analysis of projects selected from the International Aid Transparency Initiative (IATI) databases[308], the Organization for Economic Cooperation and Development (OECD)[309] and donor and partner websites.

4. The need for priority technologies for adaptation in Uzbekistan is presented in text form, based on the analysis of international databases mentioned above. CTF tables are not presented due to lack of necessary information.

5. Information on assistance received for capacity building. A table in CTF format provides information on capacity-building assistance received by Parties in technology development and transfer. These projects were collected and analyzed based on an analysis of projects selected from the International Aid Transparency Initiative (IATI) databases[310], the Organization for Economic Cooperation and Development (OECD)[311] and websites of donors and partners. This table contains all projects with capacity building activities.

   Separate information on capacity building projects is provided in the text, based on information from the OECD database (as an example).

6. Detailed information on required capacity building support is not provided due to insufficient data.

4.3 Information on financial support received and required under Article 9 of the Paris Agreement

In this report, Uzbekistan's climate finance has been assessed as support received from the country's budget and attracting international funds in the form of grants, loans, technical assistance, PPP funds, green bonds, and funds mobilized through carbon trading and carbon taxes. General estimates of the support required from the World Bank are also provided.

The support received from the national budget was taken into account in the assessment of climate budgeting carried out by the Ministry of Economy and Finance of the Republic of Uzbekistan with the support of UNDP and AFD[312,313,314]. The summary table is presented in Table 4.1.

Given the country's focus on expanding the use of RES, conserving natural resources in all sectors of the economy, and increasing the resilience of the national economy to natural disasters, the state budget

[308] IATI is the International Aid Transparency Initiative, which aims to increase transparency about development and humanitarian aid resources and results in the fight against poverty and crises. https://iatistandard.org/en/
[309] https://web-archive.oecd.org/
[310] IATI is the International Aid Transparency Initiative, which aims to increase transparency about development and humanitarian aid resources and results in the fight against poverty and crises. https://iatistandard.org/en/
[311] https://web-archive.oecd.org/
[312] https://admin.openbudget.uz/media/post_attachments/Budjet_22_P_ru_hqLTgq6.pdf
[313] https://api.mf.uz/media/document_files/Budjet_23_ru.pdf
[314] https://api.mf.uz/media/document_files/Budjet_P_24_ru.pdf

Table 4.1 Expenditures having a positive impact on climate by sector, million UZS

Sector within functional classification	Group within functional classification	2020	2021	2022	2023*	2024 (forecast)
General public services	General public services	289.4	1 442.10	4 233.70	6 124.90	4 795.80
Economic issues	Agriculture, forestry, fishing and hunting	6 402.70	8 212.80	13 618.00	11 233.30	9 862.00
	Transportation	5 073.20	2 607.60	3 509.70	8 036.40	6 284.20
	Economic affairs (not included in other groups)	0.3	9.50	153.50	2 114.70	1 646.30
Environmental protection	Environmental protection (not included in other groups)	242.3	317.80	0.90	284.90	158.70
Housing and utilities	Water supply	2 000.70	3 017.00	3 193.60	9 970.90	9 140.70
	Street lighting	155.4	174.20	212.80	438.30m	236.10
	Housing and community services not included in other categories	170.2	431.60	805.40	1 636.50	1 290.40
Social protection	Coastal development expenditure	180.1	129.30	11.90	152.70	16.50
	Social protection not included in other categories	364.7	468.00	563.00	631.60	729.40

Sources: “Budget for Citizens: Implementation in 2021”, UNDP, Ministry of Economy and Finance of the Republic of Uzbekistan, Tashkent-2022
Budget for Citizens: Implementation in 2022, UNDP, Ministry of Economy and Finance of the Republic of Uzbekistan, Tashkent-2023
Budget for Citizens: Implementation in 2023, UNDP, Ministry of Economy and Finance of the Republic of Uzbekistan, Tashkent-2023
Budget for Citizens: Implementation in 2024, UNDP, Ministry of Economy and Finance of the Republic of Uzbekistan, Tashkent-2023
Climate Cost Review and Institutional Assessment of Climate Change: Uzbekistan, UNDP, Ministry of Economy and Finance of the Republic of Uzbekistan, AFD, Tashkent-2023
* According to the Ministry of Economy and Finance of the Republic of Uzbekistan

expenditures for implementing the approved measures are also growing (Figure 4.2).

In the period considered, 2020-2024, climate-friendly budget expenditures (Figure 4.3) show an annual percentage growth in absolute terms from 2020 to 2023. In 2024, there is a decrease in total expenditure compared to 2023 (but it should be noted that these estimates are projections)[315].

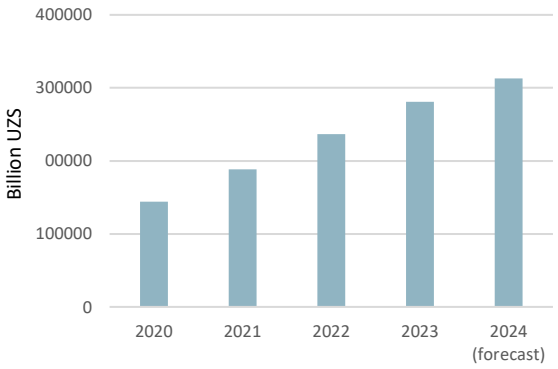


Figure 4.2 Dynamics of state budget expenditure on climate change mitigation and adaptation for 2020-2024

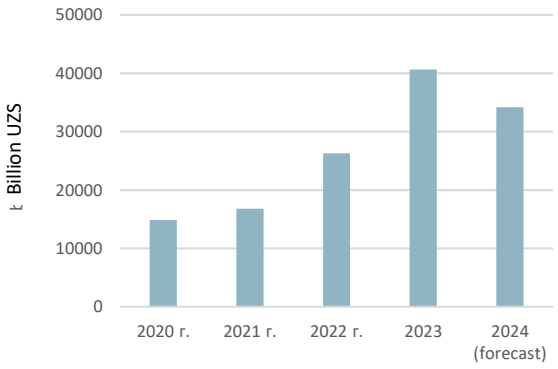


Figure 4.3 Dynamics of climate budgeting expenditures that have a positive impact on climate in the period 2020-2024

The analysis of climate-positive costs by type for the period 2020-2024 (Figure 4.4) shows that the largest group is the costs of adaptation measures, ranging from 90 to 97%. The share of mitigation measures varies from year to year in the range of 1.4 to 7.2%, while measures with mixed (combined) effects have a slight increase from 1 to 2.7%. For the period considered in this document, the measures are summarized by type of cost in Table 4.2.

The evaluation of the expenditure was based on whether an action/activity of a budget line has a climate impact and whether this impact is positive, negative or neutral (Figure 4.5).

Climate positive expenditures are aimed at mitigating and adapting to climate change (reforestation, deployment of low carbon technologies, energy efficiency programs, renewable energy and measures to improve water use).

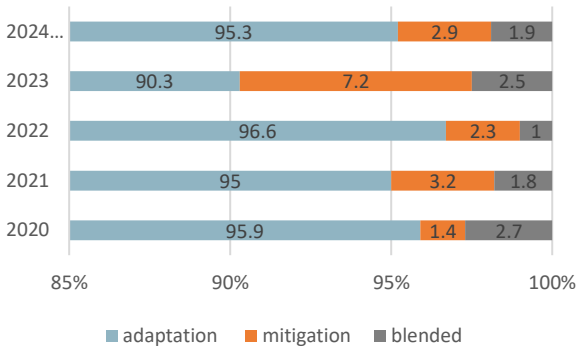


Figure 4.4 Climate costs by type for the period 2020-2024

Table 4.2 Measures and actions realized at the expense of budgetary funds nature of costs

Type of costs	Measures and actions
Adaptation	– Application of water-saving irrigation technologies (drip irrigation). – Creation of reservoirs to collect water resources coming from Tajikistan and Kyrgyzstan in the fall-winter period for hydropower needs. – Shift from water-intensive crops (e.g. cotton) to less water-intensive crops. – Laser mapping of agricultural land.

[315] https://api.mf.uz/media/document_files/Budjet_P_24_ru.pdf

Continuation of Table 4.2

Adaptation	– Provision of drinking water for settlements and cities and green needs. – Reforestation, afforestation, agroforestry, economic development. – Management of extreme weather events and development of early warning systems for climate-related hazards, etc.
Mitigation	– Investments in modernization and reconstruction of heat and power plants. – Construction of small hydropower plants, solar power plants, and wind farms (renewable energy infrastructure). – Development of electric vehicles, including for public transportation, and construction of energy-efficient, and low-carbon buildings. – Equipping public, commercial, administrative and residential buildings with rooftop PV systems to generate electricity for the grid. – Equipping residential and community facilities with solar water heaters for heating and hot water supply. – Developing biogas plants on livestock farms to reduce methane emissions.
Mixed effect	– Consideration of issues of rational use of water resources, expansion of afforestation on the dried Aral Sea bed in order to reduce desertification, improve microclimate, reduce GHG emissions, adapt to drought by creating greenhouses for growing seedlings of products under the national program at the expense of carbon sequestration. – Irrigation pumping using solar photovoltaic systems and the introduction of sustainable livestock production for heat and electricity generation using livestock manure (methane emissions) in biogas plants with associated biofertilizer production to improve the fertility of fodder crops resulted in reduced use of mineral fertilizers, water conservation, drought resilience and pasture restoration, and restoration of landscape vegetation.

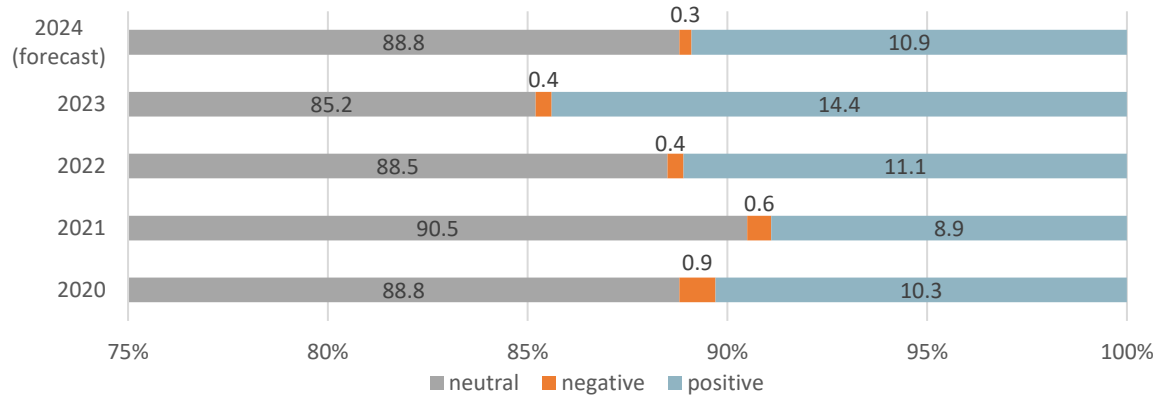


Figure 4.5 Estimation of climate expenditure from budget financing by type of climate impact

Negative climate costs increase GHG emissions or increase vulnerability to climate change (projects related to coal mining, extraction or consumption; use of internal combustion engine transportation; inefficient waste management, especially landfills without gas capture systems; fossil fuel subsidies and projects that increase water consumption in arid climates).

Most of the climate-negative spending was in the mining, manufacturing, and construction sectors of the economy.

Neutral climate expenditures have a climate impact but are not directly linked to climate change. When the climate impact of a budget item is unclear and its content is too general, such expenditures can be considered neutral.

As can be seen in Figure 4.5, the predominant portion is estimated to be neutral 85-90.5%, positive from 8.9 to 14.4%, negative from 0.3 to 0.9% of their total climate costs. The highest positive costs occurred

in 2023, the lowest negative costs in 2024.

The following is a list of financial assistance received from external sources. This section includes information on support in the form of grants and repayable financial assistance for climate change received from external sources through multilateral and bilateral channels from 2021 to 2023 (presented in electronic reporting). A notable challenge is the scarcity of information on funds received by year. Currently, only 57% of the reviewed projects include this crucial detail. This limitation hinders the ability to provide a comprehensive assessment for the period under review. Some projects and programs lack even basic information, such as total funding, in the public domain. This is particularly evident in the case of regional projects.

According to the above methodology, a list of about 120 active projects in the period 2021-2023 was collected and analyzed. This total number of projects includes nine regional projects. However, they were excluded from the CTF tables because the information provided in "open" sources on these projects is not separated by country and year. The total value of the projects listed was more than 12.3 billion USD, and the majority of these projects have a duration of more than five years. Of these, 51% are mitigation projects, 23% are adaptation projects, and 26% are related projects (Figure 4.6). A significant amount is allocated to projects aimed at reducing GHG emissions, amounting to 10 billion USD. Adaptation initiatives receive 1.6 billion USD, while related projects, including adaptation and mitigation, receive 1.9 billion USD (Figure 4.7). Of the total number of projects, 55% are loans, 38% grants, and 7% technical assistance projects (Figure 4.8). Projects with a combination of financing sources were classified as loan projects, as the majority of their financing is typically obtained through loans.

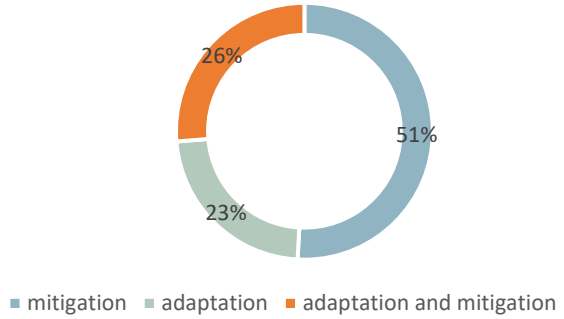


Figure 4.6 The following is a breakdown of the number of projects implemented from 2021 to 2023, categorized by mitigation, adaptation, and related initiatives.

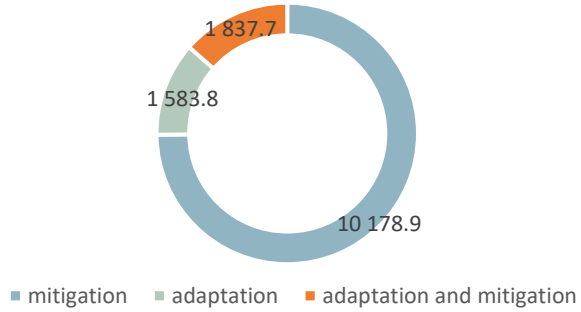


Figure 4.7 The following is a list of the ratio of funds (in millions of USD) of all projects under implementation in the period 2021-2023 by mitigation, adaptation, and related category

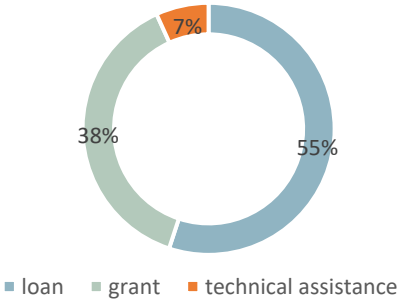


Figure 4.8 Distribution of the number of projects with different types of funding

Figure 4.9 illustrates the distribution of projects by category and financing source. It demonstrates that the largest number of mitigation initiatives are funded by loan funds, while adaptation initiatives are primarily financed by grants and technical assistance. The assessment of the distribution of financial assistance by areas of international support received demonstrates a broad coverage of different activities (Figure 4.10). The Energy sector receives the highest number of initiatives, accounting for 36% of the total, followed by multi-sector projects (22%) and agriculture, water, and forestry sector projects (21%). Multi-sector projects typically aim to enhance infrastructure in the waste, energy efficiency in the agriculture, and water sectors.

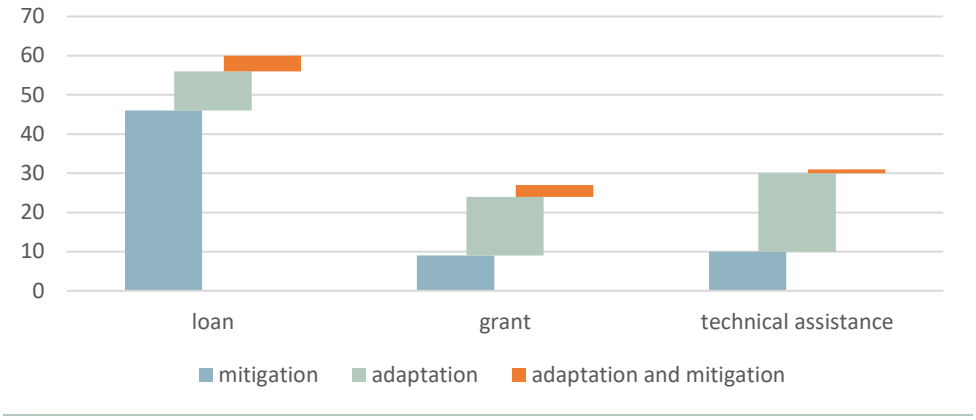


Figure 4.9 Distribution of the number of projects by category and types of funding

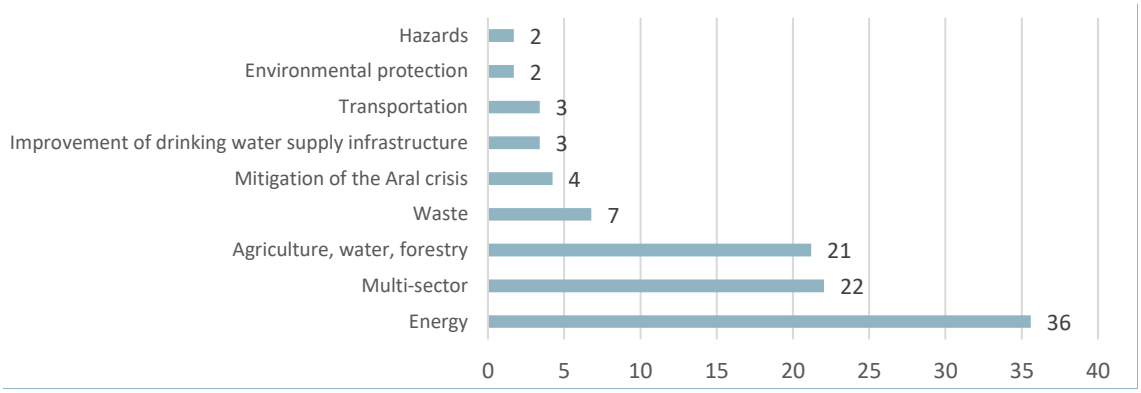


Figure 4.10 Distribution by areas of international support received (%)

As previously indicated, of the total number of projects, only 57% have the information required by the "Guidelines for BTR preparation"[316]. The following is an assessment based on these projects. For projects with detailed information, support received for the period 2021-2023 amounted to more than 1.0 billion USD. The support received initiatives by category and form of financing are presented in Table 4.3, with the following objectives: (1) GHG emission reductions for 2021-2023 amounted to approximately 762.3 million USD, of which 82% were loans; (2) adaptation spent about 148.6 million USD, of which 47% were grants and 37% were loans; and (3) related areas 187 million USD (55% were grants and 40% were loans).

[316] https://unfccc.int/sites/default/files/resource/ETF%20Handbook-Edt2_RU.pdf

Table 4.3 Funding received the period 2021-2023 by projects with detailed information (USD)

	2021	2022	2023	2021-2023
Mitigation	162 030 225	368 425 273	231 840 240	762 295 737
Adaptation	28 520 784	55 783 335	64 291 079	148 595 198
Adaptation and mitigation	57 713 052	48 291 628	81 038 811	187 043 491
Total	248 264 061	472 500 236	377 170 129	1 097 934 427

According to IATI data, the primary source of financial support for Uzbekistan's climate projects from 2021 to 2023 was provided by prominent organizations such as the Asian Development Bank (USD 653.0 million), the World Bank (USD 277.7 million), the Agence Française de Développement (USD 248.4 million), the Islamic Development Bank (USD 54.7 million), and the GEF Secretariat (USD 16.7 million) (Table 4.4).

Table 4.4 Sovereign green bonds issued by Uzbekistan in 2021-2024

Type/year	Quantity	Terms and conditions	Applicable law and listing	Utilization of revenues
SDG government bonds July 2021	235 million USD (in UZS)	Placed for 3 years at the rate of 14% p.a. (coupon payment)	London Stock Exchange	SDG projects: education (4), water management (6), health (3), clean transportation (11), pollution control (11), natural resource management (15), and clean energy (7).
Green bonds October 2023	4.25 trillion UZS (348 million USD)	Placed for 3 years at the rate of 16.25% p.a. (coupon payment)	London Stock Exchange	Implement priority projects in line with the national green economy taxonomy
SDG Eurobonds May 2024.	1.49 bln USD (600 million USD, 3 trillion UZS and 600 million euros)	Posted on 7 years at 7.125%; 3 years at 16.624%; 3 years at 5.375% per annum (coupon payment)	London Stock Exchange	Projects addressing national SDGs: education (4), water management (6), health (3), clean transportation (11), pollution control (11), natural resource management (15) and clean energy (7).

Source: UNDP, Uzbekistan

Green bonds. Beginning in 2019, the country has issued a series of thematic bonds, as outlined in Table 4.4. This includes a sovereign sustainability bond, also known as a "sustainability goals bond", issued in 2021. Additionally, two green bonds have been issued, one sovereign and one corporate, in 2023[317]. In October 2023, Uzbekistan successfully placed USD 660 million in Eurobonds and submitted its first green sovereign Eurobonds worth UZS 4.25 trillion on the London Stock Exchange. The proceeds from these green bonds will be used to finance environmentally oriented projects, including the introduction of water-saving technologies, the expansion of railway and metro and transportation systems, sanitation initiatives for human settlements, and the creation of protective forests to combat wind erosion and improve water bodies[318]. The National Agency for Perspective Projects registered an issue of green bonds of JSC "Company for Refinancing Mortgage of Uzbekistan" for 50 billion UZS in 2024[319]. This issue was the first official green bond, issued based on amendments and additions made in June 2024 to the Rules of securities emission and state registration of issues of equity securities (reg. No. 2000-10 dated 7.06.2024) and the Methodological requirements for placement and circulation of corporate bonds for projects aimed at development of green economy, approved by the Agency. The funds raised from this bond issue will be used to finance the modernization of buildings. The Company will achieve green goals by financing and/or refinancing green renovation loans provided by commercial

[317] https://www.oecd.org/ru/publications/2023/12/financing-uzbekistan-s-green-transition_6ebf6b94.htm
[318] 2023 Uzbek CCA Update_Final.pdf (un.org)
[319] https://www.uzdaily.uz/ru/v-uzbekistane-zaregistrirovali-vypusk-zelenykh-obligatsii/

banks. The Company will also create opportunities for bank customers to carry out renovation work using energy-efficient building materials. The Company's inaugural green corporate bonds received a positive external assessment from the AIFC Green Finance Center for compliance with the International Capital Markets Association's green bond principles and a certificate of compliance with green standards for the underlying program of this issue.

Resources mobilized through carbon trading and carbon taxes are pursuing opportunities under Article 6 of the Paris Agreement. On June 21, 2024, Uzbekistan made history as the first country to receive a payment from the World Bank for reducing carbon emissions under the policy credit program. The Innovative Carbon Application for Energy Transition (ICRAFT) project was designed to support Uzbekistan in implementing energy efficiency measures, phasing out energy subsidies, and transitioning to cleaner energy sources. The World Bank's Transformational Carbon Fund (TCAF) awarded Uzbekistan a $7.5 million grant for successfully reducing carbon emissions by 500,000 tons under the ICRAFT project. These emission reductions have been independently verified[320].

Public-private partnerships (PPPs) in Uzbekistan are a vital tool for attracting investment and technology to key sectors of the economy. PPPs effectively co-finance projects, reducing the burden on the state budget and attracting private sector resources and expertise. To assess the contribution of PPP projects to climate finance, projects on energy, transportation, and water infrastructure improvement were selected from the list of PPP registry.

Table 4.5 presents the amount of climate finance in Uzbekistan in 2021-2023 by reporting organizations in the IATI database.

In PPPs, private partners are responsible for the financing, design, construction and operation of facilities, allowing the government to reduce budgetary costs and focus on strategic management and regulation.

Table 4.5 Volume of financing of climate projects in Uzbekistan in 2021-2023 by reporting organizations

Reporting organization	Million USD
Asian Development Bank	653.0
The World Bank	277.7
Agence Française de Développement	248.4
Islamic Development Bank	54.7
GEF Secretariat	16.7
Switzerland- Swiss Agency for Development and Cooperation (SDC)	4.0
United Nations Development Programme (UNDP)	3.9
Food and Agriculture Organization	3.5
Global Green Growth Institute (GGGI)	1.4
CGIAR	1.1
United States Agency for International Development (USAID)	0.7
United Nations Educational, Scientific and Cultural Organization (UNESCO)	0.6
Swedish International Development Cooperation Agency (SIDA)	0.4
United States Department of State	0.2
Federal Foreign Office of Germany	0.1
United Nations Environment Programme (UNEP)	0.1

Source: IATI

[320] https://www.worldbank.org/en/news/press-release/2024/06/21/uzbekistan-receives-7-5-million-in-carbon-credits-for-enabling-half-a-million- tons-cutting-discharges)

As part of the preparation of this report, the register of PPP projects under implementation was reviewed[321]. The list of PPP Projects is provided in Annex 4.3. PPP projects started to be implemented in 2019 in the Energy sector. For the sectors under consideration (energy, transport, water management, ecology and environmental protection), projects are being implemented for a total amount of 17374.42 million USD (Table 4.6), of which energy projects account for more than 90% of the total amount. However, water resources management projects account for 80% of the total number of projects.

Table 4.6 PPP projects by sectors under consideration as of 1.01.2024

Sethor	Number of projects	Amount, million USD*
Energy	42	16 966.44
Water resources management	460	33.91
Ecology and environmental protection	46	291.64
Transportation	1	81.59
Total	550	17374.42

* Central Bank rate as of 1.01.2024 1USD=12338.77 UZS

Figure 4.11 clearly shows the financing dynamics of PPP projects by sector for the period 2019-2023. There was an increase in the number of active projects from year to year for all sectors, except for the transport sector. The transport sector started to have projects in 2022, but for a total amount of more than 82 million USD. PPP projects are typically designed for a long-term period of 10-20 years.

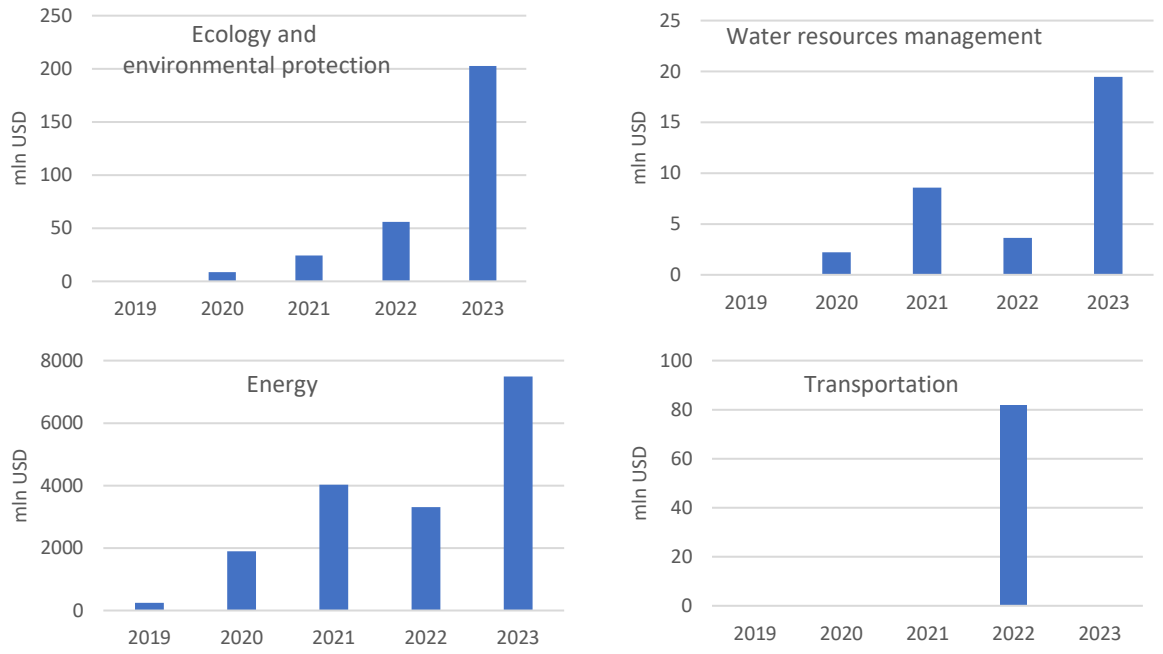


Figure 4.11 Evolution of funding for PPP projects by sector over the period 2019-2024.

The Energy sector is targeted at developing RES projects. The transport sector is modernizing and managing Samarkand International Airport. The water resources management sector is installing and operating irrigation systems and pumping stations.

Required funding. The World Bank has determined that UDS 341 billion will be required for climate change mitigation and decarbonization over the period 2023-2060. This estimation is based on

[321] https://www.pppda.uz/ru/%d0%b3%d0%bb%d0%b0%d0%b2%d0%bd%d0%b0%d1%8f

consultations with key ministries and agencies and is supported by the government.[322] These investments cover all technologies involved in all parts of the energy value chain, including power and hydrogen, as well as end-use sectors: buildings, industry and transportation (machinery, appliances, conventional cars and electric vehicles, boilers and heat pumps, building energy efficiency, etc.). The private sector is set to invest more than 60% of the required funds, while government support programs will determine the allocation of public sector expenditures.

Adapting to climate change will require significant investments in the renewal of irrigation and drainage systems in the country. Old infrastructure causes overloading of water resources and soils, which degrades their quality. Poor water management and inefficient drainage systems lead to land degradation, reduced fertility, and lower yields. Half of the irrigated land is subject to salinization, which is higher than average in Central Asia, and more than 500,000 hectares are waterlogged. To modernize infrastructure, investments of about 6 billion USD by 2030 are required. We will also invest 1.5 billion USD at the farm level to improve water use efficiency, bringing the baseline investment to 7.5 billion USD. Additional costs of 1.2 billion USD for adaptation will help mitigate climate impacts and fully modernize the irrigation system, bringing the total budget to 8.7 billion USD.

Gaps and needs in the preparation of this section.
Lack of information:

- The national project monitoring system in Uzbekistan does not yet include criteria for identifying and categorizing climate projects, which creates several obstacles for comprehensive assessment and accounting of climate initiatives. The lack of such criteria makes it difficult to identify projects aimed at mitigation or adaptation and reduces the transparency of monitoring their effectiveness.

  To solve this problem, clear standards and labeling of climate projects are needed to systematize their accounting. The introduction of a classification system for climate projects based on the green taxonomy will allow Uzbekistan not only to track the results of climate measures more accurately, but also to facilitate the attraction of international financing for projects aimed at transition to a green economy and water resources management. Creating a set of criteria for such projects will make it possible to distinguish both unconditional climate projects that are implemented at the expense of domestic resources and conditional ones that require international support.

  This labeling will provide greater transparency in monitoring and allow for the integration of data on national projects with international climate registers. Thus, it will be possible to more accurately account for Uzbekistan's contribution to the achievement of global climate goals and fulfillment of Paris Agreement commitments.

- The international project monitoring system is a tool that provides a comprehensive overview of financial resources received for climate projects. International databases often lack unified information on the financial resources received for climate projects, especially considering all sources of funding and donors for specific periods. This hampers our ability to comprehensively analyze the contributions of financial institutions, including development banks, climate funds, and private investors.

  Data banks consolidating this information have been created and are being developed. However, it is essential that such a system take into account amounts, uses, project-specific reporting, and the granularity of funding for each donor.

[322] https://documents1.worldbank.org/curated/en/099111423124532434/pdf/P1790680e5fb890b808f570f046c76bbe10.pdf

– There is a clear need for a labeling/criteria system to define “conditional” and “unconditional” climate actions and projects. To address these issues, a system of criteria must be developed that will take into account local conditions and needs.

4.4 Information on support for technology development and transfer provided under Article 10 of Paris Agreement

Technology transfer in the green economy and climate change is the process of sharing and implementing innovations to promote sustainable practices and reduce the impacts of climate change. This process involves the transfer of knowledge, skills, and technological solutions from one actor (e.g., country, company, or institution) to another, especially between developed and developing countries.

However, it is challenging to provide comprehensive data on technology transfer in the format stipulated by the BTR Preparation Guidelines. This report offers general information on the situation in the country in this direction. The electronic annex provides specific details on selected projects.
The main areas of technology transfer can be summarized as follows:

Green economy: This approach focuses on developing economic activities that support environmental sustainability while promoting economic growth and social justice. It emphasizes reducing GHG emissions, conserving natural resources, and improving the environment.

Climate change mitigation includes technologies to reduce GHG emissions, improve energy efficiency and promote the use of renewable energy. These solutions include solar and wind energy technologies, electric vehicles and advanced energy storage systems.

Capacity building: Effective technology transfer is about more than just physically transferring technologies. It also involves education and training to build local capacity to use and support these technologies.

Innovation: Promoting innovation and research on sustainable technologies is crucial for a green economy. Collaborative efforts between different stakeholders may lead to the development of new solutions tailored to specific needs.

Policy support: States play an important role in technology transfer by creating supportive policies, offering financial incentives, and promoting international cooperation to address climate challenges.

Equity and access: It is imperative that developing countries have access to advanced environmental technologies to achieve global climate goals and support equitable sustainable development.

The International Monetary Fund (IMF) data on the volume of trade in low-carbon technology products was analyzed to assess the dynamics of technology transfer to Uzbekistan (Table 4.7). Between 2020 and 2021, Uzbekistan's imports of low-carbon technology products amounted to US$1,382.2-1550.6 million in value terms. This was equivalent to 1.99-2.57% of the country's GDP during this period, or 5.30-7.77% of total imports.

Table 4.7 Imports of low-carbon technology products into Uzbekistan

Indicator	Unit	2020	2021	2022
Imports of low-carbon technology products in value terms	Million USD	1 550.6	1 382.2	1 492.6
Imports of low-carbon technology products (share in GDP)	%	2.57	1.99	1.84
Imports of low-carbon technology products (share in total imports)	%	7.77	5.82	5.30

Source: IMF

According to IMF data, China, Russia, Turkey, Lithuania, and South Korea were the key suppliers of low-carbon technology products to Uzbekistan in 2020-2022 (Table 4.8).

Table 4.8 Imports of low-carbon technology products to Uzbekistan by trading countries

Country	2020	2021	2022
China	406.6	454.7	648.3
Russia	25.1	216.5	185.5
Turkey	76.1	195.2	149.5
Lithuania	132.2	121.2	78.9
South Korea	62.3	97.3	70.4
Germany	62.1	45.6	52.4
Japan	16.4	13.0	43.0
U.S.	8.9	27.5	27.4
Italy	41.4	13.0	24.9
Czech Republic	363.8	14.8	21.6
Kazakhstan	12.5	18.7	17.0
UAE	3.0	4.5	16.9
Poland	10.5	7.3	13.8
India	10.4	10.0	12.5
Iran	17.8	14.0	11.4
Belarus	7.1	14.4	10.3
France	3.6	8.2	7.9
Netherlands	7.7	7.9	7.0
Estonia	1.0	7.2	6.5
Austria	2.7	2.1	5.4
Hong Kong	3.7	2.8	5.3
Switzerland	1.4	3.8	5.1
Pakistan	0.0	0.1	4.9
Mexico	0.4	0.3	4.8
UK	2.0	3.5	4.4
Latvia	3.2	3.2	4.2
Denmark	0.2	0.7	3.5
Belgium	2.6	4.5	1.8
Other countries	265.9	70.3	48.2
Total	1 550.6	1 382.2	1 492.6

Source: ITC Trademap

Between 2020 and 2021, Uzbekistan's exports of low-carbon technology products ranged in value from US$28.4-62.6 million annually. This was equivalent to 0.04-0.08% of the country's GDP over the period or corresponding to 0.20-0.41% of total exports (Table 4.9).

Table 4.9 Exports of low carbon technology products from Uzbekistan

Indicator	Unit	2020	2021	2022
Exports of low-carbon technology products in value terms	Million USD	32.7	28.4	62.6
Exports of low-carbon technology products (share in GDP)	%	0.05	0.04	0.08
Exports of low-carbon technology products (share in total exports)	%	0.25	0.20	0.41

Source: IMF

The trade balance of low-carbon technology products in Uzbekistan for 2020-2022 is shown in Table 4.10.

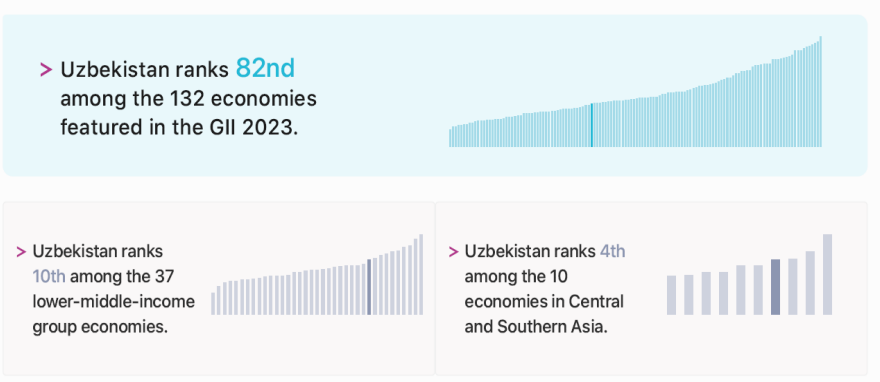
Table 4.10 Trade balance of low carbon technology products in Uzbekistan

Indicator	Unit	2020	2021	2022
Trade balance of low-carbon technology products in value terms	Million USD	-1 517.9	-1 353.8	-1 430.0
Trade balance of low-carbon technology products (share in total imports)	%	-2.52	-1.95	-1.76

Source: IMF

Tables 4.11-4.12 provide a comprehensive analysis of the imports of low-carbon technology products to Uzbekistan from 2019 to 2023, broken down by value and volume. This analysis is based on the 6-digit HS commodity nomenclature codes.

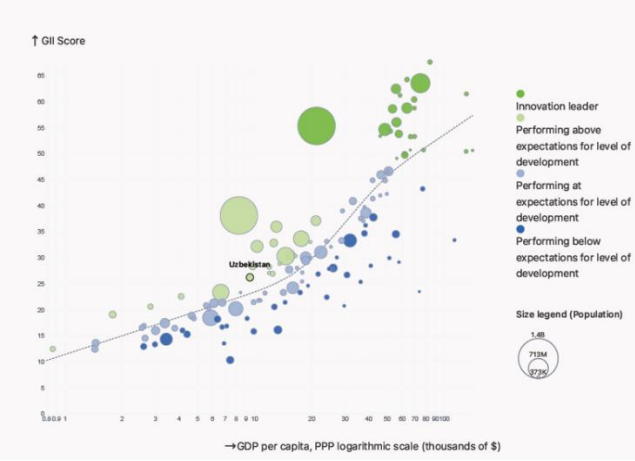
The analysis of Uzbekistan's innovative development shows that Uzbekistan ranks 82nd among 132 economies worldwide and 37th among lower-middle-income countries according to the World Bank classification. In the period from 2020 to 2023, Uzbekistan was able to improve its position in the global ranking, moving from 93rd to 82nd place. (Figure 4.12)



Source: WIPO

Figure 4.12 Uzbekistan's international positions in the Global Innovation Index 2023

Uzbekistan is characterized by a higher level of innovative development compared to other countries with a similar level of per capita GDP in PPP terms (Figure 4.13).



Source: WIPO

Figure 4.13 Uzbekistan's international positions in the Global Innovation Index 2023 based on PPP per capita GDP

Table 4.11 Nomenclature of imports of low-carbon technological products in Uzbekistan in value terms in 2019-2023, thousand USD

HS code	Product Name	2019	2020	2021	2022	2023
252390	Cement, colored or uncolored (except Portland cement and alumina cement)	36	10	48	33	
392010	Plate, sheet, film, foil and strip, of non-porous ethylene polymers, unreinforced	11 380	12 150	10 352	14 911	17 768
441872	Floor panels, multilayer, prefabricated, wood (except mosaic floors)	0	0	0	0	
560314	Nonwovens, impregnated or unimpregnated, coated, laminated or unlaminated, not elsewhere named or included, of chemical yarn	8 655	6 950	5 231	7 839	2 235
680610	Slag wool, mineral wool and similar mineral wool, including their admixtures, in bulk, in sheets	10 445	10 508	11 877	9 475	4 380
680690	Mixtures and products of heat-insulating, sound-insulating or sound-absorbing mineral materials	1 622	1 674	1 290	1 470	2 212
700800	Insulating glass blocks	3 435	1 521	14 629	23 419	4 960
701931	Unevenly laminated fiberglass mats	553	5 407	889	1 499	
701939	Fiberglass canvases, mattresses, panels and similar non-woven products	5 551	4 736	4 892	5 731	
730820	Towers and lattice masts, of iron or steel	12 943	778	6 731	2 036	14 741
730900	Reservoirs, cisterns, tanks and similar containers, of iron or steel	56 775	5 765	5 181	2 413	8 048
732111	Household baking, roasting, grilling or cooking utensils and plate warmers	4 410	4 052	5 217	5 278	6 048
732190	Parts of household appliances, not electrically heated, of heading, not included in other categories	4 043	6 714	6 456	8 383	9 482
732490	Sanitary ware and parts thereof (except cans, boxes and similar containers)	1 370	1 106	1 658	2 214	5 166
761100	Tanks, reservoirs, vats and similar containers, of aluminium, for any material	16	22	24	289	36
761290	Barrels, drums, cans, jars, boxes and similar containers, including rigid tubular containers, of aluminium	11 780	19 988	26 260	46 468	26 492
840110	Nuclear reactors [Euratom]	0	0	0	1	
840140	Parts of nuclear reactors, not elsewhere specified or included [Euratom]	0	0	0	594	
840219	Steam or other vapour generating boilers, including hybrid boilers (other than central heating hot water boilers)	58 619	3 966	15 996	15 322	22 799
840290	Parts of steam or hot water boilers, not elsewhere named or included	5 047	1 479	5 170	72	22 218
840410	Auxiliary equipment for use with boilers of this heading, e.g., economizers, superheaters	7 220	4 059	4 754	5 231	2 921
840420	Condensers for steam or other steam power units	0	27	34	2	111
840490	Parts of auxiliary equipment and condensers for steam or other vapor power units	779	1 264	2 869	448	226
840510	Gas or water gas generators or water gas generators with or without purifiers; acetylene gas generators	10 934	6 057	9 385	5 611	3 328
840690	Parts of steam or other vapour turbines, not included in other categories	28 718	15 286	17 157	10 208	9 144
841011	Hydraulic turbines and water wheels <= 1000 kW	1 035	0	0	220	2 622
841012	Hydraulic turbines and water wheels with power> 1,000 kW but <= 10,000 kW	22 521	4 824	1 823	7 290	1 416
841013	Hydraulic turbines and water wheels with power> 1,000 kW but <= 10,000 kW	2 522	3 742	3 669	3 869	
841090	Hydraulic turbine and water wheel parts, including regulators	6 637	1 985	6 278	9 523	1 439
841181	Gas turbines <= 5,000 kW (without turbojets and turboprops)	0	0	0	21	683
841182	Gas turbines > 5000 kW (without turbojets and turboprops)	6 541	8 186	48 482	22 327	43 929
841199	Parts of gas turbines not included in other categories	35 670	12 973	41 649	33 115	26 479
841290	Parts of non-electric motors and engines, not elsewhere named or included	755	313	743	1 436	1 145
841581	Air conditioners that include a refrigeration unit and a valve for reversing	41 501	29 511	32 267	27 368	15 821
841780	Furnaces and kilns, industrial or laboratory, non-electric, including incinerators (except incinerators)	126 829	395 291	22 734	37 177	42 485

Continuation of Table 4.11

HS code	Product Name	2019	2020	2021	2022	2023
841790	Parts of industrial or laboratory furnaces, non-electric, including incinerators, not elsewhere named or included	15 093	1 746	1 720	10 603	33 293
841861	Heat pumps (except air-conditioning units)	571	449	191	582	919
841869	Refrigeration or freezing equipment (excluding refrigeration and freezer furniture)	84 273	49 046	46 540	41 207	37 642
841919	Flow-through or storage water heaters, non-electric (except flow-through gas water heaters)	1 926	1 467	3 244	2 879	2 908
841939	Dryers (except lyophilizers, freeze dryers, spray dryers, agricultural dryers)	21 344	18 488	8 788	9 015	7 251
841940	Distillation or rectification plant	10 489	23 097	4 646	4 054	2 884
841950	Heat exchange units (except for those used with boilers)	103 702	19 840	15 550	27 283	37 522
841960	Machines for liquefying air or other gases	267	18 867	2 964	1 728	569
841989	Machines, plants or laboratory equipment with electric or non-electric heating for processing	112 866	33 624	26 746	46 490	26 314
841990	Parts of machinery, plant and laboratory equipment, electrically or non-electrically heated, for	26 448	3 370	1 451	2 608	42 731
842121	Machines and apparatus for filtering or purifying water	58 017	39 718	35 596	45 752	41 277
842129	Machines and apparatus for filtering or purifying liquids (except machines and apparatus	16 077	11 675	5 605	7 972	26 399
842139	Machines and apparatus for filtering or purifying gases (except isotope separators and intake devices	118 751	63 266	59 142	66 588	28 821
842199	Parts of machines and apparatus for filtering or purifying liquids or gases, not elsewhere named or included	15 593	8 460	16 019	13 691	65 277
847420	Crushing or pulverizing machines for solid mineral substances	237 907	210 717	184 230	131 108	54 685
847982	Mixing, kneading, crushing, grinding, sieving, screening, sieving, homogenizing, emulsifying, or stirring	16 586	32 114	16 669	29 171	19 342
847989	Machinery and mechanical appliances not included in other categories	88 216	102 701	132 359	147 639	68 687
847990	Parts of machines and mechanical devices, not included in other groupings	5 172	1 952	3 965	5 114	56 180
848340	Gears and gears for machinery (except gears, chain sprockets and other transmission	13 958	10 189	17 882	17 222	29 140
848360	Couplings and shaft connections, including cardan joints, for machines	3 773	2 837	3 239	5 474	3 794
850161	AC generators (“alternators”) <= 75 kVA (excluding photovoltaic generators)	470	261	476	324	690
850162	AC generators (“alternators”) with capacity> 75 kVA but <= 375 kVA (excluding photovoltaic generators)	518	337	61	4	844
850163	AC generators (“alternators”) with capacity> 375 kVA but <= 750 kVA (excluding photovoltaic generators)	585	960	1	1 085	1 230
850164	AC generators (“alternators”) with capacity> 750 kVA (excluding photovoltaic generators)	13 490	6 964	11 341	7 673	2 619
850231	Generating sets powered by wind energy	1	24	7	24	29 108
850239	Generating sets (except for wind and spark-ignition reciprocating internal combustion engines)	20 163	163	14 837	11 400	2 356
850300	Parts fitted for use exclusively or primarily with electric motors and generators, electric motors	12 112	7 507	7 886	8 173	233 757
850490	Parts of electrical transformers and inductors not included in other categories	14 920	4 308	3 647	3 253	21 958
850680	Primary electric cells and primary electric batteries (except for spent, as well as silver-oxide, mercury)	832	496	368	399	7
850710	Lead-acid batteries used for starting reciprocating engines	13 234	12 685	17 545	14 742	21 136
850720	Lead-acid batteries (except spent and starter batteries)	8 160	6 774	5 009	11 459	16 650
850730	Nickel-cadmium batteries (excluding spent batteries)	414	245	413	180	1 023
850740	Nickel-iron batteries (excluding spent batteries)	480	759	61	4	
850780	Electric batteries (except spent, lead-acid, nickel-cadmium, nickel-metal hydride)	424	1 904	317	601	627
850790	Plates, separators and other parts of electric batteries, not elsewhere named or included	2 586	1 379	1 653	1 782	1 075
851410	Industrial or laboratory resistance ovens and dryers (excluding drying cabinets)	11 231	7 673	12 535	7 706	3
851420	Ovens and stoves operating by induction or dielectric losses	2 463	5 117	4 096	6 234	2 551

Continuation of Table 4.11

HS code	Product Name	2019	2020	2021	2022	2023
851430	Electric industrial or laboratory ovens and stoves (except resistance heating)	2 694	1 057	8 114	20 122	
851490	Parts of electric industrial or laboratory ovens and stoves	368	663	171	1 384	13 165
853120	Indicator panels with liquid crystal devices “LCD” or light emitting diodes “LED”	3 271	2 415	3 051	5 001	5 648
853224	Electrical capacitors of constant capacitance, ceramic dielectric, multilayer (except for power capacitors)	114	120	39	243	6 283
853710	Shields, cabinets and similar combinations of apparatus for electrical control or distribution	145 826	62 859	83 303	80 536	181 422
853931	Discharge lamps, fluorescent lamps, hot cathode lamps	162	88	81	58	96
854140	Photosensitive semiconductor devices, including photovoltaic cells	4 376	4 521	43 070	75 124	39
854390	Parts of electrical machines and apparatus having individual functions not included in other categories	681	190	396	543	5 198
860120	Railroad locomotives running on electric batteries	105	0	0	0	
870390	Automobiles and other vehicles	0	0	242	0	3 037
900190	Lenses, prisms, mirrors and other optical elements of any material	688	1 155	1 489	1 539	3 474
900290	Lenses, prisms, mirrors and other optical elements mounted of any material	226	73	60	210	224
901380	Optical instruments and tools	37 676	46 140	46 484	54 141	288
901390	Parts and accessories for lasers and other devices and instruments	383	155	133	69	154
901580	Instruments and instruments used in geodesy, topography, hydrography, oceanography, hydrology	11 276	4 588	5 006	2 153	7 381
902610	Instruments and apparatus for measuring or controlling the received support or level of liquids	16 915	9 454	11 494	11 008	15 256
902620	Instruments and apparatus for measuring or controlling the pressure of liquids or gases (except regulators)	21 957	9 919	8 954	8 392	10 906
902680	Instruments or apparatus for measuring or controlling the variable properties of liquids or gases	6 857	6 905	8 556	10 969	9 525
902690	Parts and accessories for instruments and apparatus for measuring or controlling received support	2 581	779	783	1 659	3 095
902710	Gas or smoke analysis apparatus	14 461	3 146	3 911	5 607	12 810
902720	Chromatographs and electrophoresis instruments	1 650	8 786	12 536	2 293	3 039
902730	Spectrometers, spectrophotometers, and spectrographs that utilize optical radiation such as UV	5 313	7 331	8 666	6 690	5 065
902750	Instruments and apparatus for physical or chemical analysis using UV, visible or IR optical range	7 982	15 780	14 688	10 766	10 244
902780	Instruments and apparatus for physical or chemical analysis or for measuring or testing viscosity	10 675	8 090	11 977	9 682	16
902790	Microtomes; parts and accessories of instruments and apparatus for physical or chemical analysis	5 310	2 184	2 495	2 589	5 403
903149	Optical instruments, apparatus and machines for measuring or controlling	2 431	1 136	1 556	1 958	5 329
903180	Instruments, apparatus and machines for measuring or controlling	26 847	19 025	24 903	28 427	27 195
903190	Parts and accessories for instruments, devices and machines for measurement and control	2 037	1 400	901	883	3 331
903210	Thermostats	5 124	5 640	5 473	7 236	6 982
903220	Manostats	211	189	214	186	395
903289	Regulating or controlling instruments and apparatus (except hydraulic or pneumatic, manostats)	42 053	18 535	21 275	28 169	23 612
903290	Parts and accessories for regulating or controlling appliances and apparatus	649	172	651	463	3 047
903300	Parts and accessories for machines, appliances, instruments	306	807	1 025	1 646	3 944

Source: IMF, Technology Transfer and Innovation for Low-Carbon Development. International Development in Focus. Washington, DC: World Bank, ITC Trademap

Table 4.12 Nomenclature of imports of low-carbon technological products to Uzbekistan in physical terms in 2019-2023

HS code	Product Name	Unit	2019	2020	2021	2022	2023
252390	Cement, whether or not colored (excl. portland cement and aluminous cement)	T	302	4	328	91	
392010	Plates, sheets, film, foil and strip, of non-cellular polymers of ethylene, not reinforced	T	5 211	6 558	4 053	6 170	7 190
441872	Flooring panels, multilayer, assembled, of wood (excluding for mosaic floors)	T					
560314	Nonwovens, whether or not impregnated, coated, covered or laminated	T	6 103	5 131	5 066	6 434	587
680610	Slag-wool, rock-wool and similar mineral wools, incl. intermixtures thereof, in bulk, sheets	T	12 669	16 420	15 162	8 481	3 421
680690	Mixtures and articles of heat-insulating, sound-insulating or sound absorbing mineral materials	T	1 097	674	539	631	1 255
700800	Multiple-walled insulating units of glass	Thousand m^2	35	23	90	8 724	1 890
701931	Mats of irregularly laminated glass fibers	T	422	662	595	778	
701939	Webs, mattresses, boards and similar nonwoven products, of glass fibers (excluding mats)	T	3 991	3 782	3 077	3 181	
730820	Towers and lattice masts, of iron or steel	T	8 252	584	3 319	630	9 373
730900	Reservoirs, tanks, vats and similar containers, of iron or steel, for any material	T	5 980	1 940	1 245	599	
732111	Appliances for baking, frying, grilling and cooking and plate warmers, for domestic use	Univ.	34 254	34 023	45 610	687	
732190	Parts of domestic appliances non-electrically heated of heading	T	2 227	3 243	2 938	3 610	3 158
732490	Sanitary ware, incl. parts thereof (excl. cans, boxes and similar containers of heading	T	458	379	613	736	804
761100	Reservoirs, tanks, vats and similar containers, of aluminum, for any material	T	4	6	5	18	6
761290	Casks, drums, cans, boxes and similar containers, incl. rigid tubular containers, of aluminum	T	0	0	3 134	4 722	2 847
840110	Nuclear reactors [Euratom]	T				0	
840140	Parts of nuclear reactors [Euratom].	T				10	
840219	Vapor generating boilers, incl. hybrid boilers (excl. central heating hot water boilers)	T	4 248	627	2 976	1 892	1 992
840290	Parts of vapor generating boilers and superheated water boilers	T	346	16	737	13	4 875
840410	Auxiliary plant for use with boilers of heading	T	620	31	439	285	480
840420	Condensers for steam or other vapor power units	T		19	35	0	9
840490	Parts of auxiliary plant of heading 8402 or 8403 and condensers for steam or other vapour power	T	541	55	797	118	24
840510	Producer gas or water gas generators, with or without their purifiers; acetylene gas generators	T	252	224	294	340	99
840681	Steam and other vapor turbines, of an output > 40 MW (excl. those for marine propulsion)	Univ.	5		4	283	
840690	Parts of steam and other vapor turbines	T	0	0	0		627
841011	Hydraulic turbines and water wheels, of a power <= 1.000 kW (excl. hydraulic power engines)	Univ.	17			1	300
841012	Hydraulic turbines and water wheels, of a power > 1,000 kW but <= 10,000 kW	Univ.	206	31	53	202	95
841013	Hydraulic turbines and water wheels, of a power > 10.000 kW (excl. hydraulic power engines)	Univ.	54	42	2	16	
841090	Parts of hydraulic turbines and water wheels incl. regulators	T	105	139	156	186	117
841181	Gas turbines of a power <= 5,000 kW (excl. turbojets and turbopropellers)	Univ.				6	0
841182	Gas turbines of a power > 5,000 kW (excl. turbojets and turbopropellers)	Univ.	3	5	24	14	
841199	Parts of gas turbines	Univ.	480	363	11 754		196
841290	Parts of non-electrical engines and motors	T	56	22	55	120	
841581	Air conditioning machines incorporating a refrigerating unit and a valve for reversal	Univ.	6 902	68 113	9 484	1 781	1 602

Continuation of Table 4.12

HS code	Product Name	Unit.	2019	2020	2021	2022	2023
841780	Industrial or laboratory furnaces and ovens, non-electric, incl. incinerators	Univ.	127 506	1 405	163	2 499	11 040
841790	Parts of industrial or laboratory furnaces, non-electric, incl. incinerators	Univ.	17 190	2 923	1 593	546	6 060
841861	Heat pumps (excl. air conditioning machines of heading)	Univ.	291	1 397	1 583	32	63
841869	Refrigerating or freezing equipment (excl. refrigerating and freezing furniture)	T	8 366	4 735	3 864	3 670	
841919	Instantaneous or storage water heaters, non-electric (excl. instantaneous gas water heaters)	Univ.	5 628	5 126	10 032	443	834
841939	Dryers (excl. lyophilization apparatus, freeze drying units, spray dryers, dryers for agricultural)	Univ.	17 042	1 426	1 486	352	836
841940	Distilling or rectifying plant	Univ.	1 042	867	1 504	86	288
841950	Heat-exchange units (excl. those used with boilers)	Univ.	76 175	47 706	40 931	1 342	
841960	Machinery for liquefying air or other gases	Univ.	7	4 660	41	51	121
841989	Machinery, plant or laboratory equipment, whether or not electrically heated	Univ.	3 447	3 942	5 570	1 194	
841990	Parts of machinery, plant and laboratory equipment, whether or not electrically heated	T	3 830	111	235	202	6 776
842121	Machinery and apparatus for filtering or purifying water	Univ.	625 658	600 658	797 506	2 029	
842129	Machinery and apparatus for filtering or purifying liquids (excl. such machinery and apparatus)	Univ.	137 096	195 596	95 342	0	
842139	Machinery and apparatus for filtering or purifying gases (excl. isotope separators)	Univ.	2 061 400	2 624 576	2 353 757	2 068	3 602
842199	Parts of machinery and apparatus for filtering or purifying liquids or gases	T	1 058	471	995	1 195	10 619
847420	Crushing or grinding machines for solid mineral substances	Univ.	5 494	15 827	1 364	15 848	8 692
847982	Mixing, kneading, crushing, grinding, screening, sifting, homogenizing	Univ.	7 452	1 577	4 538	2 611	
847989	Machines and mechanical appliances	Univ.	89 420	120 499	129 043	0	
847990	Parts of machines and mechanical appliances	T	417	112	242	375	
848340	Gears and gearing for machinery (excl. toothed wheels, chain sprockets and other transmission)	Univ.	138 907	105 935	95 877	761	
848360	Clutches and shaft couplings, incl. universal joints, for machinery	Univ.	567 293	574 315	552 077	198	
850161	AC generators “alternators”, of an output <= 75 kVA (excl. photovoltaic generators)	Univ.	304	129	100	255	129
850162	AC generators “alternators”, of an output > 75 kVA but <= 375 kVA (excl. photovoltaic generators)	Univ.	19	20	30	3	85
850163	AC generators “alternators”, of an output > 375 kVA but <= 750 kVA (excl. photovoltaic generators)	Univ.	8	7	0	2	110
850164	AC generators “alternators”, of an output > 750 kVA (excl. photovoltaic generators)	Univ.	113	86	51	1 011	
850231	Generating sets, wind-powered	Univ.	2	5	2	3	6 079
850239	Generating sets (excl. wind-powered and powered by spark-ignition internal combustion piston	Univ.	117	12	571	5 602	710
850300	Parts suitable for use solely or principally with electric motors and generators	T	1 296	648	1 107	1 461	78 345
850490	Parts of electrical transformers and inductors	T	1 491	1 162	1 491	2 886	2 836
850680	Primary cells and primary batteries, electric (excluding spent)	Univ.	84 309 497	75 610 027	83 550 490	79 118 158	0
850710	Lead-acid accumulators of a kind used for starting piston engine “starter batteries”	Univ.	599 172	580 269	950 399	4 485	9 917
850720	Lead acid accumulators (excluding spent and starter batteries)	Univ.	95 543	103 099	148 683	2 756	4 715
850730	Nickel-cadmium accumulators (excluding spent)	Univ.	2 749	5 109	2 622	1 910	
850740	Nickel-iron accumulators (excluding spent)	Univ.	6 582	6 077	259		
850780	Electric accumulators (excluding spent, and lead-acid, nickel-cadmium, nickel-metal hydride)	Univ.	288 700	66 368	174 242	16	
850790	Plates, separators and other parts of electric accumulators	T	478	300	326	390	213

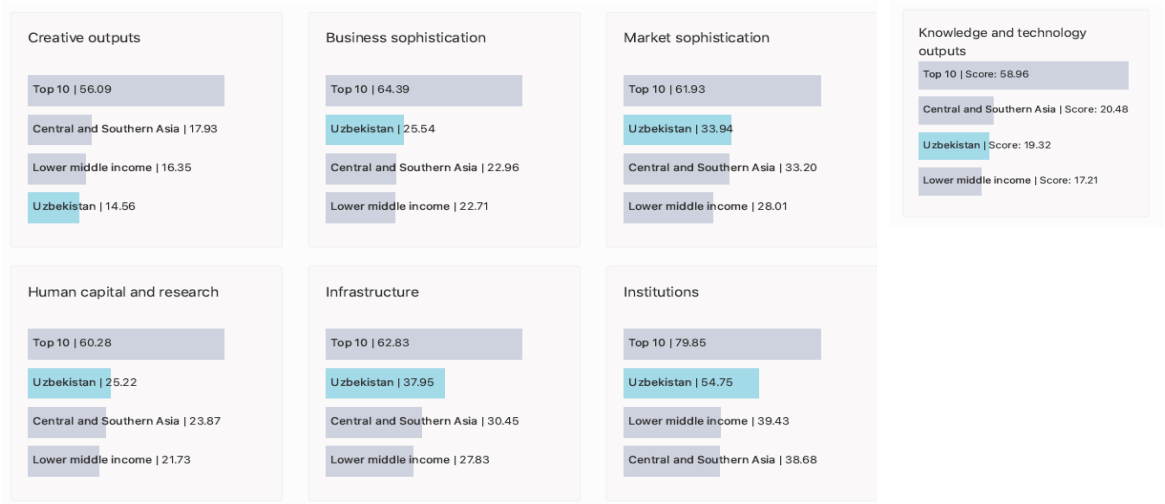
Continuation of Table 4.12

HS code	Product Name	Unit.	2019	2020	2021	2022	2023
851410	Resistance heated industrial or laboratory furnaces and ovens (excluding drying ovens)	Univ.	7 556	4 625	5 189	373	3
851420	Furnaces and ovens functioning by induction or dielectric loss	Univ.	116	280	136	294	226
851430	Electric industrial or laboratory furnaces and ovens	Univ.	299	180	461	1 118	
851490	Parts of electric industrial or laboratory furnaces and ovens	T	63	70	22	204	512
853120	Indicator panels with liquid crystal devices “LCD” or light emitting diodes “LED”	Univ.	1 071 434	691 301	387 474	29	
853224	Fixed electrical capacitors, ceramic dielectric, multilayer	T	4	4	5	8	
853710	Boards, cabinets and similar combinations of apparatus for electric control	T	2 866	1 567	2 347	2 135	
853931	Discharge lamps, fluorescent, hot cathode	Univ.	266 557	92 746	74 223	5	2
854140	Photosensitive semiconductor devices, incl. photovoltaic cells whether or not assembled	Univ.	79 232 216	82 812 631	102 529 873	44 346 195	
854390	Parts of electrical machines and apparatus, having individual functions	T	30	5	3	29	
870390	Motor cars and other vehicles	Univ.			1		
900190	Lenses, prisms, mirrors and other optical elements, of any material, unmounted	T	401	351	273	468	6
900290	Lenses, prisms, mirrors and other optical elements, mounted, of any material	T	1	1	3	0	0
901380	Optical appliances and instruments	Univ.	742 499	617 334	639 585	937 746	
901390	Parts and accessories for lasers and other appliances and instruments	T	1	0	0	2	0
901580	Instruments and appliances used in geodesy, topography, hydrography, oceanography, hydrology	Univ.	41 203	15 841	1 561	5	
902610	Instruments and apparatus for measuring or checking the flow or level of liquids	Univ.	304 409	438 978	516 395	82	
902620	Instruments and apparatus for measuring or checking pressure of liquids or gases	Univ.	952 407	888 717	845 733	43	
902680	Instruments or apparatus for measuring or checking variables of liquids or gases	Univ.	353 949	388 666	294 032	61	
902690	Parts and accessories for instruments and apparatus for measuring or checking the flow, level	T	67	19	16	21	25
902710	Gas or smoke analysis apparatus	Univ.	5 988	39 775	12 497	20	
902720	Chromatographs and electrophoresis instruments	Univ.	107	153	314	6	
902730	Spectrometers, spectrophotometers and spectrographs using optical radiations, such as UV, visible	Univ.	184	3 989	468	12	
902750	Instruments and apparatus for physical or chemical analysis, using UV, visible or IR optical	Univ.	26 320	21 748	12 084	26	
902780	Instruments and apparatus for physical or chemical analysis, or for measuring or checking viscosity	Univ.	34 489	48 118	67 817	37	3
902790	Microtomes; parts and accessories of instruments and apparatus for physical or chemical analysis	T	61	0	0	11	21
903149	Optical instruments, appliances and machines for measuring or checking	Univ.	1 406	2 775	2 899	5 721	
903180	Instruments, appliances and machines for measuring or checking	Univ.	1 959 311	2 652 966	1 738 289	0	
903190	Parts and accessories for instruments, appliances and machines for measuring and checking	T	14	8	4	5	32
903210	Thermostats	Univ.	3 234 382	3 456 425	3 430 011	106	
903220	Manostats	Univ.	12 896	20 277	27 839	2	
903289	Regulating or controlling instruments and apparatus	Univ.	627 006	666 057	894 896	183	
903290	Parts and accessories for regulating or controlling instruments and apparatus	T	19	8	16	13	335
903300	Parts and accessories for machines, appliances, instruments or other apparatus	T	6	10	10	20	40

Source: IMF, Technology Transfer and Innovation for Low-Carbon Development. International Development in Focus. Washington, DC: World Bank, ITC Trademap

Uzbekistan's ranking based on the main criteria used to assess the Global Innovation Index was as follows:

- 55th place in terms of institutional environment development.
- 55th place in terms of satisfaction with the development of the market environment.
- 73rd in terms of infrastructure development.
- 89th in human capital and research.
- 93rd in terms of creativity results.



Source: WIPO

Figure 4.14 Constituents used to assess Uzbekistan's position in the Global Innovation Index 2023

Figure 4.15 shows the percentage of projects with technology transfer activities by type of activity, based on the list of projects in Annex 4.1.

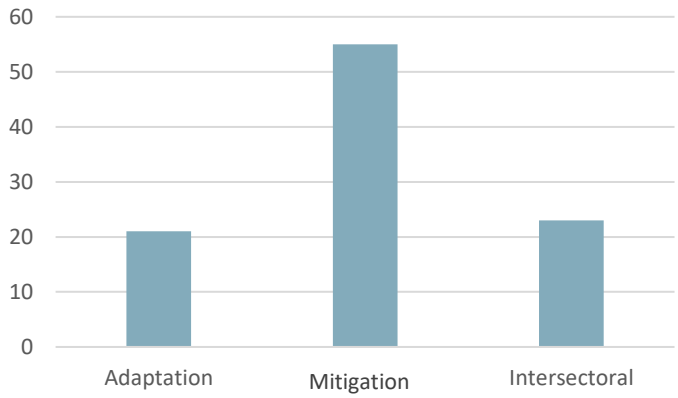


Figure 4.15 The percentage of projects with technology transfer activities is shown by type of activity. This information is derived from the list of projects in Annex 4.1

Table 4.13 shows a list of priority technology needs for adaptation in Uzbekistan.

Table 4.13 Need for Priority Technologies for Adaptation in Uzbekistan

Direction of adaptation	Adaptation technologies
Climate-resilient plants	Agroforestry and integrated farming systems for improved sustainability
	Crop diversification and crop intercropping
	Bioinsecticides for crop pest control
	Increasing drought resistance by priming with seaweed
	Pest control by releasing self-limiting insects
	Photo selectivity grid for crops
	Crop gene editing using CRISPR technology
	Robotic identification of crop characteristics
Healthy soils	Seeder-fertilizer
	Combined application of seeds and nutrients
	Biofertilizers based on mushrooms
	Liquid bio stimulant for soil improvement
	Use of microorganisms to improve soil fertility
	Nitrogen-fixing biofertilizer
	Nitrogen-fixing microbes
	Soil analysis using genomics and machine learning
	Soil conservation technologies in desert conditions
	Application of graphene for improved fertilizers
	Soil additives for increased water absorption
Farming technologies	Precise planting of crops
	Precision farming with Internet of Things technologies and sensors
	Robotic farming technologies for precision farming
	Containerized hydroponic farms
	Soilless farming using alternative methods
	Vertical aquaponic farms
	Agrovoltaics for crop sustainability
	Self-propelled tractors
	Agricultural drone for automated application of fertilizers and pesticides
	Automated harvesting
Irrigation	Low pressure irrigation systems
	Lining of irrigation canals
	Wetting and drying alternation
	Controlling the irrigation system with alternative energy from a smartphone
	Irrigation control system
	Combined rainwater collection and irrigation
	Adaptive irrigation
	Irrigation with treated municipal wastewater
	Precision intelligent irrigation system using remote sensing
	Moisture absorbing gel
	Robotic irrigation systems
Cattle breeding	Conservation of climate-resilient native species
	Infrared thermography for the detection of animal heat stress
	Feed additive feeding and monitoring applications for animal heat stress management
	Fogging systems for livestock
	Vertical greenhouse for forage animal husbandry
	Innovative livestock watering practices
	Smart tags for livestock monitoring
	Livestock control with virtual fencing
	Precision grazing
	Services for genomic evaluation of livestock populations
	Genetically modified animals with increased resistance to heat stress
	Biochips for detection of livestock diseases

Continuation of Table 4.13

Direction of adaptation	Adaptation technologies
Forest and ecosystem management	Planting trees and plants as natural fire barriers
	Reforestation and afforestation using climate change resistant species
	Pest control using satellite monitoring
	Wildlife crossings and underpasses
	Application of air fire extinguishing
	Open-source fire forecasting systems
	Monitoring forest fires using artificial intelligence
	Reforestation of forests with the help of drones
	Genetic engineering of forest species
Early warning, modeling and monitoring systems	Crop monitoring and irrigation management using satellite information
	Crop monitoring using artificial intelligence, machine learning and machine vision
	Wireless sensor networks for agricultural resource management
	Yield forecasting using satellite and geospatial data
	Monitoring and crop planning with sensors, drones and satellite imagery
	Automated insect monitoring
	Blockchain-based crop insurance against climate risks
	Wireless emergency notification technologies
	Weather and climate information technologies for remote communities
	High impact weather assessment toolkit
	Unmanned aerial vehicles for hurricane forecasting
	Flood forecasting based on artificial intelligence
	Virtual sensors for weather data collection
	Crowdsourcing disaster data through social media
	Early warning system
Flood prevention and control	Lightweight barriers for flood protection
	Multipurpose mobile flood barriers
	Flood bags with superabsorbent powder
	Low-level bags with superabsorbent polymer
	Temporary mobile flood barriers
	Large-size pipes for flood protection
	Natural flood control
	Quickly erected pumping stations
	Self-closing flood barrier
	Hybrid flood protection systems
	Mechanical jacks for lifting houses during floods
Efficient use of water resources	Micro-watersheds for water harvesting
	Rainwater harvesting and underground storage
	Smart water networks
	Decision-making support system for water resources management
	Real-time water monitoring
	Satellite-based leak detection systems
	Technologies for water extraction from the air
	Circular shower systems
	Water saving technologies at power plants
	Water collection technologies in the desert
Urban planning	Underground water storage
	Large-scale rainwater collection system
	Cold sidewalk retrofit of sidewalks
	Flood tracking
	Cool sidewalks
	Satellite-based artificial intelligence solution for green spaces
	Green roofs for sloping and tiled roofs
	Green facades

Continuation of Table 4.13

Direction of adaptation	Adaptation technologies
Buildings	Wall-mounted rainwater collection system
	Rainwater harvesting on the roof
	Envelope waterproofing and foundation drainage
	Insulated gas double and triple glazed windows
	Ventilated facades
	Thermal concrete with cooling effect
	Radiation cooling
	Adsorption evaporative air conditioners
	Improved wind towers
	AI-based risk management of utility services
	Monitoring and management platform for utilities
Infrastructure and services	Remote urban water monitoring system
	Flood and fire risk assessment at the property level
	Distributed renewable energy sources
	Decentralized water treatment and storage systems
	Climate risk analytics systems
	Trenchless pipe replacement technologies
	"Smart grids"
	Reduction of thermal conductivity and temperature of asphalt concrete pavements
	Mesh messaging: emergency communication during an internet outage
	Technologies of local automated weather monitoring
	Electronic sirens and urban early warning systems

Source: WIPO. Green Technology Book 2022. Solutions for Climate Change Adaptation

Uzbekistan is facing obstacles and difficulties in technology transfer and deployment, as is the case in many other countries transitioning to a greener economy and addressing climate change.

Limited financial resources: Uzbekistan is facing challenges in investing in new environmentally friendly technologies and infrastructure. The government of the republic is actively engaged in attracting investments in different sectors of the economy. However, the high upfront costs of renewable energy, energy efficiency, and research and development projects demonstrate the need to expand funding streams for both international and public investment.

Regulatory *and institutional aspects:* The existing legal and regulatory framework is designed to fully support technology transfer, while insufficient enforcement of environmental regulations may create obstacles for both domestic and foreign investors interested in green technologies.

Lack of infrastructure: The power sector is a major emitter of GHGs. It faces challenges such as obsolete equipment and grid losses. This makes it difficult to effectively implement renewable energy (RE) systems. RE systems require a reliable grid connection and consistency of net electricity generation. They also require widespread installation of storage equipment for active use during peak hours.

Limited awareness and expertise: Local stakeholders, including policymakers, businesses, and labor, often lack awareness and knowledge of advanced green technologies. This lack of knowledge hinders the adaptation and adoption of new technologies. At the same time, the turnover of relevant professionals in certain sectors creates a need for repeated workshops and training courses to upgrade skills.

Dependence on fossil fuels: Uzbekistan has always relied on fossil fuels, especially natural gas, to meet its energy needs. This dependence is a key factor in creating resistance to the transition to renewable energy and complicating efforts to transition to a green economy.

Technical skills shortage: There is a clear shortage of trained staff and technicians who can utilize and maintain advanced clean technologies. Efforts to build capacity are underway, but effective implementation remains a challenge.

Market access and competition: Domestic enterprises may face challenges entering international markets and competing with imported technologies. This restricts the capacity of local industry to adopt new technologies or innovate effectively.

Data and research gaps: Insufficient data on energy resources, environmental impacts, and technology performance hinders effective decision-making and strategic implementation of technology transfer initiatives.

International commitments and compliance: Uzbekistan has committed to the Paris Agreement and participates in other global initiatives, but there is room for improvement in aligning national policies with international standards.

Gender and social inclusion are critical to technology transfer in the context of Uzbekistan's green economy and climate change efforts. It is essential to consider these factors to ensure equitable distribution of benefits from sustainable technologies and practices, and to ensure the active involvement of vulnerable groups in the transition process.

Addressing these barriers requires a coordinated approach involving the government, private sector, and civil society to create an enabling environment for technology transfer and promote sustainable development in Uzbekistan. Integrating gender and social inclusion aspects into technology transfer efforts is essential for Uzbekistan to facilitate a more equitable transition to a green economy. This approach ensures that all people benefit and contribute to sustainable development in the face of climate change.

The BTR transparency report for Uzbekistan in terms of technology transfer faces the following difficulties:

Lack of systems for recording and tracking technology transfer. Uzbekistan lacks a reliable system for recording, monitoring, and reporting on the transfer of environmentally sound and climate-friendly technologies. This hinders the collection of accurate and complete information for reporting.

Lack of technology needs assessment. Conducting a technology needs assessment is essential for prioritizing economic development and innovation. This assessment will pinpoint the key areas where new technologies adapted to local conditions are needed and determine which resources and skills need to be developed. It will also improve the efficiency of planning and assess the financial needs and attract investment in areas where technology will have the greatest socio-economic impact.

Scattered data sources: Information on technology transfer is often distributed among different government agencies, private companies, and international partners. This makes it difficult to aggregate and process for a single report.

Lack of uniform assessment methodologies: International standards require specific methodologies for assessing and categorizing transferred technologies. These standards are difficult to meet without pre-developed national standards and protocols.

These challenges require an integrated approach and support from international organizations to provide an accurate picture of progress in technology transfer for climate resilience in Uzbekistan.

4.5 Information on capacity-building support provided under Article 11 of the Paris Agreement

Improving climate change capacity in Uzbekistan is essential for strengthening the country's adaptive capacity and promoting sustainable development. This includes improving institutional and technical resources for data collection, analyzing climate risks, and developing adaptation strategies. Training qualified specialists, introduce advanced climate technologies, and develop cooperation with international organizations. This will help Uzbekistan better respond to climate challenges, reduce economic vulnerability, and maintain environmental sustainability.

It is currently difficult to provide information on capacity building in a format consistent with the BTR Guidelines. Therefore, the report provides general information on the current situation in the country in this area. It will include several projects in the electronic annex.

A significant number of projects in the country have a capacity building component. Figure 4.16 shows the percentage of projects with capacity building activities by type of activity, derived from the list of projects in Annex 4.2.

These actions will help Uzbekistan fulfill its commitments under the Paris Agreement, effectively manage climate change, and create a sustainable, low-emission economy.

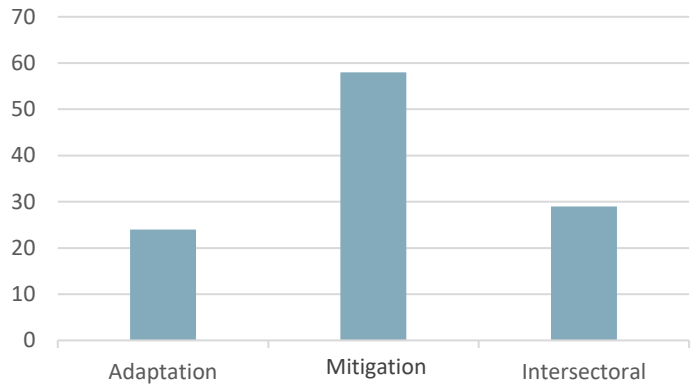


Figure 4.16 The percentage of projects with capacity building activities by type of activity, derived from the annex project list

Annex 4.3 presents an analysis of the support provided to strengthen Uzbekistan's national capacity in the area of climate policy.

Uzbekistan must take measures to enhance institutional, human, and technological capacities, as outlined in Article 11 of the Paris Agreement, which emphasizes the importance of capacity building for effective mitigation and adaptation to climate change.

Uzbekistan is developing capacity to fulfill its Paris Agreement commitments in the following key areas:

- Enhancing institutional capacity
  - Develop and support the sustainability of national climate change coordination structures responsible for climate policy development and implementation.
  - Develop national climate change strategies and action plans that will include specific targets for reducing emissions and adapting to the impacts of climate change.
  - Collaborate with international organizations to obtain technical assistance and share climate best practices

- Human capacity-building
  - **Develop and implement** sector-specific education and training programs on climate change for staff of public and private institutions.
  - **Enhance training** in climate science, ecology, water management and sustainable agriculture through international scholarships and exchange programs.
  - **Raise public awareness** of the importance of climate resilience and adaptation.
- Development of technological potential
  - **Adoption of advanced technologies** in sectors such as renewable energy, agriculture, water management and infrastructure.
  - **Training professionals** with the knowledge and skills to promote advanced technologies.
  - **Use climate data and monitoring systems** to predict climate change and assess its impacts.
  - **Localization and adaptation of climate technologies**, including systems for energy efficiency, climate monitoring, and climate risk prediction.
- Establish of mechanisms for financing climate initiatives
  - **Attract grants and loans** from international organizations to finance climate change projects and programs.
  - **Encourage the private sector** to invest in green technologies and climate change adaptation projects through tax credits and other incentives.
  - **Develop programs to support adaptation measures for vulnerable populations** that may be affected by the impacts of climate change.
- Stimulating international cooperation
  - **Collaborating with international partners** and participating in projects that help share experience and best practices in climate change adaptation and mitigation.
  - **Participation in international programs** and initiatives aimed at building capacity in developing countries, such as the Climate Technology Center & Network (CTCN).

The following capacity-building challenges were identified during the preparation of this report:

Limited data on capacity development activities: Collecting and systematizing information on trainings, workshops, and professional development programs can be difficult due to the lack of centralized databases or a system for recording such activities.

Lack of clear indicators to measure effectiveness: The lack of specific indicators, such as gains in knowledge, skills and participation, makes it difficult to quantify program outcomes.

Fragmented information: Data on capacity-building projects is not consolidated.

A needs assessment for the future will contribute to a more efficient use of resources and a sustainable system that helps meet climate commitments.

Table 4.14 provides a list of projects aimed at preparing key reporting documents, such as biennial reports, national communications, and transparency and adaptation reports. Funding is provided by the GEF and plays an important role in supporting the implementation of Uzbekistan's climate change commitments under the Paris Agreement and UNFCCC.

4.6 Information on support needed and received by a developing country Party for the implementation of Article 13 of the Paris Agreement and transparency-related activities

Table 4.14 includes a list of projects aimed at preparing key reporting documents such as biennial reports, national communications, and transparency and adaptation reports. Funding is provided by the

Global Environment Facility (GEF) and plays an important role in supporting the fulfillment of Uzbekistan's climate commitments under the Paris Agreement and the UN Framework Convention on Climate Change.

Table 4.14 Support received for the preparation of Paris Agreement-related documents

No.	Executive Agency Project	Objectives	Donor	Amount (USD)
1	Preparation of the First Biennial Update Report (1BUR) under the United Nations Framework Convention on Climate Change (UNFCCC).	The objective of the project is to prepare the First Biennial Report on Climate Change in accordance with the obligations of the Republic of Uzbekistan under the United Nations Framework Convention on Climate Change (UNFCCC) (Articles 4 and 12 of the UNFCCC, Decisions 16 and 17 of the Conference of the Parties 1/CP.16, paragraph 60 and 2/CP.17, paragraph 41 and Annex III). The BUR will be based on previous studies and assessments, guidelines and methodological notes of the UNFCCC.	GEF	352 000
2	Preparation of the Fourth National Communication (4NC) on Climate Change under UNFCCC.	The purpose of the project is to prepare the 4NC on fulfillment of the obligations of the Republic of Uzbekistan under the UNFCCC (Articles 4 and 12 of the UNFCCC, Decisions 16 and 17 of the Conferences of the Parties 1/CP.16, paragraph 60 and 2/CP.17, paragraph 41 and Annex III thereto). The 4NC is based on previous studies and assessments, guidelines and methodological guides of the UNFCCC.	GEF	500 000
3	Provision of activities for the First Biennial Transparency Report (1BTR), Fifth National Communication (5NC) and the Second Biennial Transparency Report (2BTR) for UNFCCC.	Project objective: To support Uzbekistan in the preparation and submission of the 1BTR and 5NC that meet the reporting requirements of the UNFCCC and the Paris Agreement, while addressing national development objectives. This project will also support the preparation and submission of the Communication on Adaptation to the Paris Agreement as a component of the 1BTR and 5NC/2BTR, as required under Article 7 of the Paris Agreement and Decision 9/CMA.1.	GEF	1 233 000
4	Capacity building for the establishment of an integrated and enhanced transparency system in Uzbekistan to track national climate change actions and technical assistance provided GCP/UZB/013/GFF.	Project Objective: To strengthen the institutional and technical capacity of the Republic of Uzbekistan to track, report and verify the climate change actions proposed by the country in its Nationally Determined Contributions (NDCs) in accordance with the requirements of the Enhanced Transparency Framework of the Paris Agreement.	GEF	1 819 863
5	Regional Center for Climate Action Transparency in Central Asia (ReCATH).	ReCATH aims to facilitate the transition of Central Asian countries to the new reporting requirements of the Extended Transparency Framework (ETF) by assisting them in establishing and managing a transparent Measurement, Reporting and Verification (MRV) system.	GEF	

5 FLEXIBILITY INFORMATION

5.1 Utilization of flexibility mechanisms in the current inventory

The following flexibility mechanisms are used in this inventory in accordance with Decision 18/CMA.1 and the available options:

Reporting format

Paragraph 12. The 1990-2022 National Inventory Report is presented as a component of the Biennial Transparency Report.

Methods

Paragraph 21. Tier 1 methodologies of the 2006 IPCC guidelines have been applied to estimate GHG emissions in most key categories. This is due to the lack of detailed activity data required to use Tier 2 methodologies and the lack of reliable national emission factors. Work is ongoing to collect detailed activity data for key inventory categories. The transition to the use of Tier 2 methods for key inventory categories is included in the Inventory Improvement Plan.

The transition to Tier 2 methodologies will require additional research to collect and disaggregate activity data and develop national emission factors.

The next inventory report is scheduled to transition to Tier 2 methodologies in the Energy sector categories, which together account for 65% of total GHG emissions, including:

- In category 1.A “Activities related to fuel combustion”.
- In category 1.B.2.b “Natural gas”.

And also, in the Agriculture sector category 3. A Enteric Fermentation, which accounts for 11.1% of total GHG emissions.

The prioritization of further improvements to transition to Tier 2 methodologies in key inventory categories is presented in the Inventory Improvement Plan document.

Completeness assessment

Paragraphs 32 and 45. Table 1.5 lists the inventory categories marked with the NE key. This table also explains why certain categories are not estimated. In most cases, the reason is the lack of statistical data and the need for significant efforts to collect them. It is expected that the establishment of the MRV system for GHG emissions in the country in 2025-2026 will help to fill the data gaps and provide an opportunity to estimate GHG emissions from sources not yet accounted for.

The next inventory will prioritize improving the completeness of emission estimates in the LULUCF sector, including estimating emissions/removals for the first time in the categories of wetlands, settlements, other land, and harvested timber, as well as in the subcategories of land converted to forest, land converted to cropland, and land converted to grassland.

Sectors and gases

Paragraph 48. Uzbekistan exercised flexibility in the reporting of four of the seven GHGs. The inventory includes emission estimates for CO_2, CH_4, N_2O and HFCs. These GHGs are also included in the country's NDC. Other gases-SF_6, PFCs, NF_3 - are not included in the inventory due to lack of activity statistics. In order to include them in the inventory, research and experience from other countries on data collection and methodological assumptions as well as expert capacity building are required. It is most likely that new gases will be added to the inventory in the medium term (by 2030).

5.2 Utilization of flexibility mechanisms in tracking NDC

In this section, Uzbekistan applies the flexibility provisions in accordance with paragraphs 85 and 95 of the MPGs (18/CMA.1).

Paragraph 85. GHG emission reductions for climate change mitigation policies and measures

Uzbekistan uses this mechanism due to the lack of necessary data to present and estimate GHG emission reductions in the required tabular format for several policies and measures for which the country currently provides qualitative descriptions, as information and technical resources to access the necessary data are limited. The MRV system and the National Transparency System are in the process of being established, resulting in the lack of a comprehensive system for monitoring decarbonization measures at both the sectoral and national levels.

Uzbekistan plans to establish a GHG MRV system in 2025-2026. This will include developing technical expertise and improving the data collection system to increase the capacity to provide detailed emission reduction estimates for the BTR3.

Paragraph 95. Shorter timeframe for projections. Uzbekistan provides projections for a shorter time period, covering the endpoint of NDC (2030). This time limitation is due to the adoption of key strategic documents with a planning horizon up to 2030.

The country is in the process of developing a long-term low-carbon development strategy, which will extend the forecast timeframe to meet the requirements of the forecast reporting.

5.3 Use of flexibility mechanisms in the evaluation of financial support

In this section, Uzbekistan applies the flexibility provisions of the MPGs (18/CMA.1) due to the lack of necessary detail on the following items:

Paragraph 133. Information on required financial support in tabular form. To date, there has been no regular assessment of climate finance needs in the country. Estimates of mitigation and adaptation financing needs are provided in World Bank studies supported by the Government of Uzbekistan and published in Uzbekistan: Country Report on Climate and Development (2023)[323]. These investments cover all technologies in all parts of the energy value chain, including power and hydrogen, as well as end-use sectors: buildings, industry and transport (e.g. machinery, household appliances, conventional cars, cars, cars, cars). The information provided in this publication does not allow for completion of the CTF tables, so this section provides available general information in text form.

Paragraph 136. Information on required support for technology development and transfer is not presented in **general tabular form**, due to the lack of required information, it is given in text format for the implementation of actions aimed at adaptation, obtained on the basis of analysis of international databases provided in this section.

Paragraphs 139, 140. Information on the required capacity building support is not provided due to lack of detailed information.

In paragraphs 143 (Information on support required and received for the implementation of Article 13 of the Paris Agreement and activities related to transparency), 144 (Information on support required and received for the implementation of Article 13 of the Paris Agreement and activities related to transparency, in a common tabular format) and 145 (Information on support required and received for the implementation of Article 13 of the Paris Agreement and activities related to transparency),

[323] https://www.vsemirnyjbank.org/ru/country/uzbekistan/publication/ccdr

flexibility is applied with respect to information on support required for the implementation of Article 13 and activities related to transparency due to the lack of evaluation data at this time.

6 APPENDICES

ANNEX 1. Key stakeholders involved in the preparation and harmonization of the BNR1 and the GHG inventory

Key stakeholders	Mandate/activities	Key stakeholders
The Interagency Council for Coordination of Measures on Transition of the Republic of Uzbekistan to a Green Economy is a national body for cross-sectoral optimization and coordination of issues related to climate change. The Interagency Council coordinates the implementation of the Strategy for Transition to a Green Economy, which was adopted to implement the Paris Agreement.	National body for cross-sectoral optimization and coordination of climate change issues, including climate reporting. As a result of institutional restructuring and the establishment of the Ministry of Ecology, Environment and Climate Change, and the subsequent creation of a high-level coordinating body on climate change, many issues have been transferred to the Ministry of Ecology.	Coordinate and approve climate reports and the National GHG Inventory Report. Ensure interaction with stakeholders in the process of data and information collection.
Ministry of Ecology, Environment and Climate Change National Climate Change Center are the working body of the Climate Council under the President of the Republic of Uzbekistan.	UNFCCC Focal Point Coordinate activities related to the implementation of the UNFCCC and the Paris Agreement in the country. Functions: -Preparation of biennial update reports and national communications to the UNFCCC. Preparation and updating of NDC. -Preparation of the National GHG Inventory Report and biennial transparency reports together with the Ministry of Economy and Finance. -Participates in the approval of the National GHG Inventory Report. The Minister of Ecology is the deputy chairman of the Interagency Council for Coordination of Measures for Transition to Green Economy, approves the GHG inventory.	Coordinate and approve climate reports and the national GHG inventory report. Ensure submission of reports to the UNFCCC Secretariat. Coordinate and implement the project. Collect and process data for the transport and use of substitutes for ozone depleting substance categories. Estimation of pollutant emissions from stationary and mobile sources.

Key stakeholders	Mandate/activities	Key stakeholders
Ministry of Economy and Finance	National body of the National Transparency System. Its functions include, but are not limited to - Checking the completeness, reliability and quality of the information submitted in accordance with the requirements of the MRV system. - Development, implementation and maintenance of the MRV system. - Preparation of the National Report on together with the Ministry of Ecology, Environment and Climate Change and the Hydrometeorological Service. -Leading the Interagency Council for Coordination of Measures for Transition to Green Economy.	Harmonize and approve the national report under Article 13 of the Paris Agreement Ensure stakeholder engagement in the data and information collection process.
Agency of Hydrometeorological Service under the Ministry of Ecology, Environmental Protection and Climate Change (Uzhydromet)	Preparation of biennial update reports and national communications to the UNFCCC under the coordination of the Ministry of Ecology, Environment and Climate Change. Preparation of GHG inventories, assessment of mitigation measures, preparation of GHG emission projections, participation in the development of MRV system, assessment of vulnerability and adaptation measures, climate change assessment.	Implementing organization for BTR preparation. GHG inventory preparation coordinator, including interaction with participating organizations, activity data collection and analysis, GHG emission calculations, quality control and evaluation procedures, documentation preparation, information archiving, inventory report preparation and tabular formats. Capacity building of national GHG inventory experts.
Ministries involved in the preparation of the GHG emissions inventory: Ministry of Energy, Department of Industry and Trade, Department of Agriculture, Ministry of Water Resources, Ministry of Housing and Utilities, Ministry of Transport, Statistical Agency, Forestry Agency, Hydrometeorological Research Institute, Forestry Research Institute.	Develop national policies in relevant sectors of the economy. Participate in the collection, processing, transparency and integration of information for national reporting under Article 13 of the Paris Agreement and the MRV system. Conduct sectoral GHG inventories. Participate in the approval of national GHG inventory reports. Decisions and regulations, national investments. Preparation of analytical and other materials.	Provide industry experts. Responsible for providing data on the relevant sector, defining targets, scenarios and measures to be considered in accordance with the provisions of the Paris Agreement. Participate in the selection and development of national emission factors for the preparation of the inventory. Independent experts participate in the evaluation and approval of the inventory.

Key stakeholders	Mandate/activities	Key stakeholders
Private sector with partial state ownership: JSC TES (electric and thermal energy; within the Ministry of Energy of the Republic of Uzbekistan) Uzbekneftegaz JSC (geological exploration, production, transportation, storage, processing and sale of oil and gas; within the Ministry of Energy of the Republic of Uzbekistan). Uztransgaz JSC (transportation, storage and sale of gas, gas condensate and oil; within the Ministry of Energy of the Republic of Uzbekistan). JSC Hududgaztaminot (distribution of natural gas to consumers). JSC Uzkimyosanoat (Chemical Industry). Uzpromstroymaterialy Association (Construction). JSC Uzbekugol (coal industry). JSC Uzbekistan Airways (Airline). Uzbekistan Temir Yullari (Railway Administration).	Developing industry strategies and plans, leading relevant industry, decision-making and regulatory documents.	Participate in the preparation and discussion of NC, BTR, and GHG inventories, Responsible for providing data for climate reporting, conducting national inventories for the relevant sector, identifying targets, scenarios and actions to be considered in accordance with the provisions of the Paris Agreement. Participate in the selection and development of national emission factors for the preparation and inventory of relevant categories and sectors. Independent experts are involved in the assessment and harmonization of inventories.
Civil society organizations/private organizations/other major industries involved in activities related to GHG emissions and climate change mitigation: Local farm organizations	Active work to support both small and large businesses.	Participation in the preparation and discussion of NC, BTR, and GHG inventories Information gathering, participation in questionnaires. Capacity Building.
National Research Institutes and Universities. Forestry Research Institute (under the Forestry Agency). Hydrometeorological Research Institute.	Research on climate change issues. Conducting studies to establish parameters and national emission factors in relevant GHG inventory categories.	Participate in the preparation and discussion of NC, BTR, and GHG inventories. Collect and analyze activity data in profile-relevant inventory categories. Develop emission factors. Development of training programs and capacity building trainings.

Annex 2 List of international conventions with the participation of Uzbekistan relevant to climate change

No. n/a	International conventions and treaties	Ratification Date	Date of entry into force	Main objectives
1	Framework Convention on Climate Change	June 20, 1993 (adoption)	March 21, 1994	To stabilize the concentration of GHG at a level that will prevent dangerous anthropogenic interference with the climate system.
2	Kyoto Protocol	August 20, 1999	February 16, 2005	Establish internationally binding emission reduction targets.
3	UN Convention to Combat Desertification	August 31, 1995	January 29, 1996	Reversing and preventing desertification and land degradation in support of poverty reduction and environmental protection.
4	UN Convention on Biological Diversity	May 6, 1995 (joining)	October 17, 1995	Conservation of biological diversity, sustainable use of its components and equitable sharing of benefits.
5	Convention concerning the Conservation of the World's Cultural and Natural Habitats	December 22, 1995 r.	June 15, 1996	Protecting natural and cultural heritage.
6	Convention on International Trade in Endangered Species of Wild Fauna and Flora	April 25, 1997 (accession)	October 8, 1997	Ensure that international trade does not threaten wildlife.
7	Convention on the Conservation of Migratory Wild Animals (Bonn)	May 1, 1998 (joining)	September 1, 1998	A global platform for the conservation and sustainable use of migratory species and their habitats.
8	Ramsar Convention on Wetlands of International Importance Especially as Wildlife Habitat	August 30, 2001 (accession)	February 8, 2002	Conservation and wise use of all wetlands through local and national action and international cooperation to achieve sustainable development.
9	Basel Convention on the Control of Transboundary Movements and Disposal of Hazardous Wastes	December 22, 1995 (accession).	May 7, 1996	Regulation, reduction and restriction of transboundary movements of hazardous wastes.
10	Stockholm Convention on Persistent Organic Pollutants	May 22, 2001	May 8, 2019	Protect human health and the environment from chemicals that persist for long periods of time, accumulate in human and wildlife tissues, and cause adverse effects.
11	Cartagena Protocol on Biosafety to the Convention on Biological Diversity,	January 29, 2000	October 11, 2019	Conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including through appropriate access.

The following Agreements and Memoranda of Understanding are in force under the Bonn Convention on the Conservation of Migratory Wild Animals (1998):

→ Memorandum of Understanding on the Conservation and Recovery of the Bukhara Deer (Cervus elaphus bactrianus) (2002).

→ Memorandum of Understanding on the Conservation, Restoration and Sustainable Use of the Saiga Antelope (Uzbekistan, Russia, Kazakhstan, Mongolia, Turkmenistan, 2006).

→ Agreement between the Governments of Uzbekistan and Kazakhstan on the Conservation, Rehabilitation and Sustainable Use of the Saiga Antelope (2010).

→ Memorandum of Understanding on Conservation Measures for the Slender-billed Curlew (1994).

→ Central Asian Mammal Initiative (CAIM, 2014).

→ Memorandum of Understanding on the Conservation of the Siberian Crane (1998).

→ African-Eurasian Migratory Waterbird Agreement (AEWA) (2003).

Annex 3. Summary of priorities and objectives of key adaptation and mitigation strategies and action plans

Name	Year	Targets	Priorities
Fundamental strategies			
Strategy for the transition of the Republic of Uzbekistan to a green economy for the period 2019-2030. (No. PP-4477 dated 04.10.2019).	2019-2030	- Improving energy efficiency and the use of natural resources. - Supporting the implementation of pilot projects on transition to green economy, training and retraining of personnel. - Taking measures to mitigate the effects of the environmental crisis in the Aral Sea region and strengthening international cooperation in the field of green economy with the participation of IFIs.	- Improving the energy efficiency of the basic sectors of the economy. - Diversification of energy resources consumption and development of renewable energy sources. - Adapting to and mitigating climate change, improving the efficiency of natural resource use and preserving natural ecosystems; developing financial and non-financial mechanisms to support the green economy.
Development strategy of the New Uzbekistan for 2022-2026. (No. UP-60 dated 28.01.2022.	2022-2026	- Accelerate the development of the national economy and ensure energy saving and active introduction of green economy technologies in all spheres.	Target 30: Increase farmers' income by at least a factor of two, with annual growth in agriculture. Target 31: Implement the water resources management reform and water conservation program, including saving at least 7 billion m^3 of water through efficient water use. Target 32: Expand the feed base of livestock with a 1.5-2-fold increase in production and feed.
Strategy “Digital Uzbekistan – 2030” (No. UP-6079 dated 05.10.2020)	2021-2030	- Development of the digital economy, increasing the competitiveness of the national economy. - A set of measures for the development of the digital economy and the introduction of ICT in sectors and spheres of public administration, education, health care and agriculture.	- Improve the e-government system. - Development of software products and IT market. Organization of IT parks in all regions. - Provide qualified personnel.
Strategy of innovative development of the Republic of Uzbekistan for 2022-2026. (No. UP-165 dated 06.07.2022)	2022-2026	Growth targets: - Subjects of innovation infrastructure (techno parks, technology transfer centers, clusters, innovation centers, business incubators) by 3 times. - New jobs through entrepreneurship, by 4 times. - New innovative developments created in the domestic and foreign markets.	- Creation of innovative technologies for production, storage and use of an alternative and environmentally friendly energy source (green hydrogen in the field of RE development). - Implementation of innovative technologies for production of new composite materials. - Expansion of R&D on creation and introduction of biotechnological products and innovative technologies for food security (drought-resistant and high-yielding animal species and breeds).

Name	Year	Targets	Priorities
Agriculture and water management			
"Strategy for Development of Agriculture of the Republic of Uzbekistan for 2020-2030" and the roadmap for coordination of its implementation (No. UP-5853 dated 23.10.2023).	2020-2030	- Radical improvement of public policies aimed at deepening reforms and measures to adapt to climate change, as well as measures to improve the competitiveness of the agri-food sector. - Develop public administration systems. - Gradually diversify public spending to support the sector.	- Ensure food security for the population and a favorable climate for agribusiness and value chains. - Reduce the role of the state in sphere management and increase investment attractiveness; ensure rational use of natural resources and environmental protection. - Development of scientific, educational and consulting systems. - Rural development and development of a transparent system of sectoral statistics.
Concept of water sector development in Uzbekistan for 2020-2030 and roadmap for coordinating its implementation (No. UP-6024 dated 10.07.2020)	2020- 2030	- Improving the system of forecasting, record keeping and creation of water resources databases and ensuring its transparency. - Modernization, provision of safety and reliable operation of villages and reservoirs, etc. Expansion of water-saving technologies, introduction of market economy principles, introduction of PPP and outsourcing in the water sector, transfer to farms, clusters, etc. - Implementation of IWRM principles, guaranteed water supply for the population and economic sectors. - Development of interstate relations and joint use of transboundary waters.	- Increase irrigation system efficiency and water availability. - Conserve resources and increase the area under water-saving technologies to 2 million hectares. - Improve land reclamation and reduce salinization of arable land by attracting foreign investment and grants. - Introduction of innovations and new control systems "Smart Water". - Launching the last 40 projects based on PPP and CSA practices and training and professional development in the water sector. - Develop cooperation to ensure security in the context of global climate change in the CAR.
Biodiversity, environmental and human habitat protection			
Strategy to achieve the goals of the Sendai Framework for Disaster Risk Reduction 2015-2030 and the National Action Plan (No. PKM-299 dated 2.04.2019)	2016- 2030	To increase the effectiveness of ongoing reforms in the field of comprehensive protection of people and territories from disasters, and to significantly reduce the number of victims and direct economic damage caused by disasters by 2030.	- Improve knowledge of disaster risks. - Improve the organizational and legal framework for disaster risk management and invest in disaster risk reduction measures. - Strengthen disaster preparedness for effective response and "better than usual" recovery.
Strategy for the Conservation of Biological Diversity in the Republic of Uzbekistan for the period 2019-2028 (No. PKM-484 dated 11.06.2019)	2019-2028	- Ensuring the conservation and sustainable use of biological diversity, expanding protected areas. - Implementation of measures to reduce the rate of degradation of ecosystems, restoration of rare and endangered animal and plant species, and development of international relations in related areas of the CBD. - Creation of a unified system of monitoring biodiversity components with reference ecosystems of protected areas.	- Increase the area of protected natural areas to 12% of the country's territory. - Afforestation of the dry Aral Sea bed, increasing the forest area to 1.2 million hectares. - Breeding of gazelles in the Bukhara nursery "Jeyran" with increase of their number up to 1,000 animals. Before 2022: - Expansion of the area of protected areas in the Republic of Karakalpakstan.

Name	Year	Targets	Priorities
		- Unified GIS biodiversity monitoring and inventory. - Annual geobotanical survey of 2 million hectares, etc.	- South Ustyurt (1.4 million ha) and Central Kyzylkum (1.1 million ha) national parks; and (1.1 million ha). - State reserves "Beltau" (188,3 thousand), "Akpetki" (587,7 thousand) and "Interfluve Akdarya-Kazakhdarya" (22 thousand). - Creation of the state reserve "Sudochinskaya lake system" on the basis of the reserve "Sudochie", from 50 to 88 thousand hectares.
Roadmap adopted at the IFAS Summit. Development program of Muynak district of the Republic of Karakalpakstan for 2019-2021.	2019-2021	- 75 projects with a total cost of 26.974 trillion UZS are being implemented. - More than 40 ministries and agencies, local bodies and civil society were involved.	- In April 2020, such plantings were conducted on 1,167,000 hectares during 2019-2020 and in 2020-2021. - Government decisions have also been taken on the development of the fishing industry.
National Concept of Environmental Protection of the Republic of Uzbekistan for the period up to 2030 (No. UP-5863 dated 03.11.2019)	2020-2030	- Ensuring favorable environmental conditions. - Sustainable economic development through innovation to reduce environmental and human health impacts. - Ensuring rational use of environmental assets and reproduction of biological resources.	- Increase the area of forest plantations on the Uzbek part of the dried Aral Sea bed to 60% of its territory. - Reduce water losses in agriculture by 10%. - Reduce water consumption in agriculture (per hectare) by 15%. - To increase the forest area to 4.5 million hectares. - To increase the area of protected areas of categories I- V up to 12%.
Climate change and disaster risks			
NAP on climate change and disaster risk for the period up to 2030 (No. PKM-362 dated 11.08.2023)	2023-2030	Develop integrated measures to build resilience to natural disasters and climate change, in line with the 2030 Action Plan for a Green Economy. Develop legal and institutional frameworks, national, sub-national and local strategies. Ensure full implementation of NAP and Roadmap measures and monitor and oversee their timely implementation; coordinate ministries and institutions, improve legal and regulatory frameworks and develop measures and actions for their effective implementation to reduce SSR and build resilience to IR.	- Strengthening the participation and responsibility of local authorities in this area. - Identification and assessment of natural disaster risks, raising public awareness of these phenomena. - Attracting public and private investment, localizing the production of rescue and other specialized equipment based on PPP principles. - Improve the institutional and legal framework for disaster risk reduction (DRR) and climate resilience. - Building public knowledge and expertise on reducing SSR and building resilience to climate change. - Organize financing for DRR and climate resilience and improve disaster preparedness.
National program on adaptation of agriculture in Uzbekistan for the period up to 2030 (No. PP-233 dated 24.06.2024)	2024	Main tasks of the Interagency Council: Development and implementation of proposals for adaptation of the agricultural sector, preparation of PSAs of agricultural producers on the threats of drought and weather events and pest risks. - Implementation of agricultural adaptation projects through IFI loans and grants, budget and cooperation; improving the environmental culture of knowledge and experience of farmers and agro-clusters, on adaptation.	- Increased awareness and popularization of results and assets. - Efficient organization of activities carried out in the regions of climate change. - Implementation of activities in the field of agriculture within the framework of grant projects. - Efficient use of natural resources and improvement of agrotechnologies for growing crops. - Development of measures for adaptation of agriculture to climate change. - Efficient use of pastures and organization of their protection.

Annex 4. PPP projects (as of January 1, 2024)

No.	Date	Project name	sector	Public partner	Private partner	Project cost, million UZS	Project cost, USD	Project duration (year)
1	15.09.2021	Collection, transportation, sorting and recycling of MSW in Uchkuduk, Tomdy and Kyzyltepa districts of Navoiy region	Ecology and environmental protection	Ministry of Ecology, Environment and Climate Change	PE Berejlivost	63 406	5 138 762	10
2	13.12.2023	Pumping stations belonging to the Amu-Surkhan Basin Irrigation Department and the Jayhun pumping station located in Muzrabot district	Water resources management	Ministry of Water Resources	SCT cluster sholi Ltd.	69 546	5 636 380	10
3	17.11.2020	Collection, transportation, sorting and recycling of MSW in Namangan city and Torakorgan district of Namangan region	Ecology and environmental protection	Ministry of Ecology, Environment and Climate Change	NAMANGAN LTD. MUSAFFO IQLIM	70 078	5 679 496	10
4	16.02.2022	Collection, transportation, sorting and recycling of MSW in Andijan city, Asaka, Oltinkol and Andijan districts of Andijan region	Ecology and environmental protection	Ministry of Ecology, Environment and Climate Change	OOO BIO-TEX ECO	71 371	5 784 288	10
5	26.05.2021	Collection, transportation, sorting and recycling of MSW in Tashkent district of Tashkent region.	Ecology and environmental protection	Ministry of Ecology, Environment and Climate Change	ZANGIOTA OBODON LTD.	82 107	6 654 391	10
6	05.09.2022	Modernization and Management of Samarkand International Airport, Samarkand Region	Transportation	JSC Airports of Uzbekistan	AIR MARAKAND A LTD.	1 006 821	81 598 166	20
7	05.04.2023	Construction and management of a 100 MW solar photovoltaic power plant in Khorezm region 100 MW solar photovoltaic power plant in Khorezm region	Energy	JSC National Electric Networks of Uzbekistan	VOLTALIA	1 020 804	82 731 423	25
8	04.03.2021	Investment project for the construction of a 174 MW gas piston power plant in Khorezm region	Energy	JSC National Electric Networks of Uzbekistan	ODAS ENERJI	1 295 280	104 976 428	25
9	17.12.2021	Project for construction and management of a 100 MW wind power plant in Karaozak district of the Republic of Karakalpakstan	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	1 329 821	107 775 816	25
10	27.12.2023	Investment project for the construction of a power storage system with the capacity of 100 MW (200 MWh) in Asaka district of Andijan region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	1 356 960	109 975 305	10
11	27.12.2023	Investment project for the construction of a 100 MW (200 MWh) electricity storage system in Pop district of Namangan region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	1 356 960	109 975 305	10

No.	Date	Project name	sector	Public partner	Private partner	Project cost, million UZS	Project cost, USD	Project duration (year)
12	27.12.2023	Investment project for the construction of a 100 MW (200 MWh) electric energy storage system in Uichi district, Namangan region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	1 356 960	109 975 305	10
13	27.12.2023	Investment project for the construction of a 100 MW (200 MWh) electric energy storage system in Parkent district of Tashkent region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	1 356 960	109 975 305	10
14	27.12.2023	Investment project for the construction of a 100 MW (200 MWh) electric energy storage system in Piskent district of Tashkent region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	1 356 960	109 975 305	10
15	27.12.2023	Investment project on construction of electric energy storage system 100 MW (200 MWh) capacity in Ohangaron district of Tashkent region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	1 356 960	109 975 305	10
16	08.11.2019	Investment project for the construction of a 100 MW photovoltaic power plant in Navoiy region	Energy	JSC National Electric Networks of Uzbekistan	MASDAR	1 369 296	110 975 081	25
17	13.09.2019	Investment project for the construction of a 100 MW photovoltaic power plant in Samarkand region	Energy	JSC National Electric Networks of Uzbekistan	TOTAL EREN	1 603 680	129 970 816	25
18	28.06.2021	Investment project for the construction of a 220 MW gas piston power plant in Syrdarya region	Energy	JSC National Electric Networks of Uzbekistan	CENGIZ ENERJI	1727040	139 968 571	25
19	27.12.2023	Investment project on the construction of a 150 MW (300 MWh) electricity storage system in Asaka district of Andijan region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	1 776 384	143 967 673	10
20	27.12.2023	Investment project for the construction of an 150 MW (300 MWh) electric energy storage system of Fergana region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	1776384	143 967 673	10
21	11.05.2020	Investment project for the construction of a 230 MW gas piston power plant in Tashkent region	Energy	JSC National Electric Networks of Uzbekistan	AKSA ENERJI	1 850 400	149 966 326	25
22	10.09.2020	Investment project for construction of a 240 MW combined cycle power plant in Tashkent region	Energy	JSC National Electric Networks of Uzbekistan	CENGIZ ENERJI	1 850 400	149 966 326	25
23	20.01.2021	Investment project for construction of a 240 MW combined cycle power plant in Tashkent region	Energy	JSC National Electric Networks of Uzbekistan	AKSA ENERJI	1 850 400	149 966 326	25
24	20.01.2021	Investment project for construction of a 270 MW gas piston power plant in Bukhara region	Energy	JSC National Electric Networks of Uzbekistan	AKSA ENERJI	2 121 792	171 961 387	25
25	12.07.2021	Investment project for construction of a 220 MW PV power plant in Kattakorgan district of Samarkand region	Energy	JSC National Electric Networks of Uzbekistan	MASDAR	2 226 648	180 459 479	30
26	12.07.2021	Investment project for construction of a 220 MW PV power plant in Gallaorol district of Jizzakh region	Energy	JSC National Electric Networks of Uzbekistan	MASDAR	2 264 890	183 558 815	30

No.	Date	Project name	sector	Public partner	Private partner	Project cost, million UZS	Project cost, USD	Project duration (year)
27	09.11.2023	Investment project for the construction of a 400 MW gas piston power plant in Nishon district of Kashkadarya region	Energy	JSC National Electric Networks of Uzbekistan	AKSA ENERJI	3 084 000	249 943 876	25
28	30.11.2023	Project for the construction and management of a 300 MW solar photovoltaic power plant and 75 MW electricity storage system in Kashkadarya region	Energy	JSC National Electric Networks of Uzbekistan	MASDAR	3 090 168	250 443 764	25
29	08.02.2021	Investment project for the construction of a 456.6 MW photovoltaic power plant in Sherabad district of Surkhandarya province	Energy	JSC National Electric Networks of Uzbekistan	MASDAR	4 070 880	329 925 916	25
30	03.04.2023	Investment project for the construction and management of a 250 MW solar photovoltaic power plant and a 63 MW electrical energy storage system of in Bukhara region	Energy	JSC National Electric Networks of Uzbekistan	MASDAR	4 854 216	393 411 661	25
31	29.04.2023	Investment project for the construction of a 500 MW solar photovoltaic power plant in Karovulbazar district of Bukhara region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	4 934 400	399 910 202	25
32	29.04.2023	Investment project for the construction of a 500 MW solar photovoltaic power plant in Nishon district of Kashkadarya region	Energy	JSC National Electric Networks of Uzbekistan	GEZHOUBA	4 934 400	399 910 202	25
33	27.11.2023	Investment project for the construction of 300 MW wind power plant and overhead transmission network in Gijduvan district of Bukhara region	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	4 971 408	402 909 528	25
34	14.09.2023	Investment project for the construction of a 550 MW combined cycle power plant in Jizzakh region	Energy	JSC National Electric Networks of Uzbekistan	CENGIZ ENERJI	6 168 000	499 887 752	25
35	10.06.2020	Investment project for the construction of a 5,000 MW wind power plant in Navoiy region	Energy	JSC National Electric Networks of Uzbekistan	MASDAR	7 093 200	574 870 915	25
36	24.01.2021	Investment project for the construction of a 300-500 MW wind power plant in Peshkusky district of Bukhara region	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	8 117 088	657 852 282	25
37	23.12.2022	Investment project for the construction of a 500 MW wind farm, a 100 MW storage system, a 500 kV substation and an overhead network power transmission network (Kungrad Vetro2) in Kungirot district of the Republic of Karakalpakstan	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	8 228 112	666 850 261	25
38	23.12.2022	The investment project is the construction of a 500 MW wind power plant, a 100 MW power storage system and an overhead power transmission network (Kungrad Vetro-3) in the Kungirot district of the Republic of Karakalpakstan	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	8 228 112	666 850 261	25

No.	Date	Project name	sector	Public partner	Private partner	Project cost, million UZS	Project cost, USD	Project duration (year)
39	19.04.2023	Investment project for the construction of a 400 MW solar photovoltaic power plant and a 334 MW electricity storage system in the Urkochirchik district of the Tashkent region	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	8 351 472	676 848 016	25
40	27.11.2023	Investment project for the construction of a 500 MW wind power plant and overhead power transmission network in Kungirot district of the Republic of Karakalpakstan (Kungrad Wind 4)	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	8 413 152	681 846 894	25
41	24.01.2021	Investment project for the construction of 500 MW wind power plant in Gijduvan district of Bukhara region	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	8 511 840	689 845 098	25
42	10.08.2023	Investment project for the construction of a wind power plant with a capacity of 600 MW and overhead power transmission network in Gijduvan district of Bukhara region	Energy	JSC National Electric Networks of Uzbekistan	LIONING LIDE	8 635 200	699 842 853	25
43	19.04.2023	Investment project for the construction of a 500 MW solar photovoltaic power plant, a 334 MW electricity storage system and a substation to support its operation (Sasagan Solar 1) in Nurabad district of Samarkand region	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	9 350 688	757 829 832	25
44	16.02.2022	Investment project for the construction of combined cycle power plant with total capacity of a 1573 MW in Boyovut district of Syrdarya region	Energy	JSC National Electric Networks of Uzbekistan	EDF-NEBRAS-SOJITZ	11 196 154	907 396 280	25
45	05.03.2020	Investment project for the construction of steam-gas power plant with a capacity of 1500 MW in Syrdarya region	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	12 582 720	1 019 771 014	25
46	19.04.2023	Investment project for the construction of a 500 MW solar photovoltaic power plant, a 334 MW electricity storage system and a substation to ensure its operation in Nurabad district of Samarkand region (Sasagan Solar 2)	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	12 940 464	1 048 764 504	25
47	23.12.2022	Investment project for the construction of a 500 MW wind farm, a 100 MW electricity storage system and an overhead transmission network ("Kungrad Wind Farm 1") in Kungirot district of the Republic of Karakalpakstan	Energy	JSC National Electric Networks of Uzbekistan	ACWA POWER	13 162 512	1 066 760 463	25
48	22.04.2021	Investment project for the construction of a combined cycle power plant with capacity of 1500-1600 MW in Surkhandarya region	Energy	JSC National Electric Networks of Uzbekistan	STONE CITY ENERGY	16 221 840	1 314 704 788	25

Annex 5. Climate change adaptation progress achieved by key sectors

No. n/a	Direction of adaptation	Activities/technologies	Indicators
Water and agriculture			
1	Reduce water losses in the irrigation network	Concrete channels to reduce infiltration	By the end of 2023, 10 540 km of internal irrigation networks were concreted, 34 885 km of canals, ditches and flumes were cleaned. The water supply of 208 thousand hectares of land and the ameliorative condition of 106 thousand hectares have been improved. https://east-fruit.com/novosti/voda-ne-besplatna-agrariev-uzbekistana-prizyvayut-aktivnee-vnedryat-vodosberegayushchie-tekhnologii/ https://senat.uz/ru/post/post-1884
		Automation and modernization of water management	By the end of 2023, 11,446 facilities have Smart Water devices, 6,953 facilities have Diver devices, 1,709 NS have online control devices, and 67 large facilities are automated https://east-fruit.com/novosti/voda-ne-besplatna-agrariev-uzbekistana-prizyvayut-aktivnee-vnedryat-vodosberegayushchie-tekhnologii/.
2	Increase irrigation water use efficiency/savings	Implementation of water saving technologies	By the end of 2023, water saving was introduced on 30% of irrigated lands (1,266 thousand ha), including: 472 thousand ha - drip irrigation, 642 thousand ha- laser planning, 48 thousand ha- sprinkling, 97 thousand ha- other (discrete irrigation, flexible hoses, mulching of irrigation furrows with black film). https://cabar.asia/ru/v-uzbekistane-vnedryayut-novye-tehnologii-poliva-selhozugodij
3	Increase water use discipline	Water metering and payment for water used	Establishment of state services “Suv Yetkazib Berish Hizmati” (Water Delivery Services); from 2025, the price for the used volume ($1m^3$ = 100 UZS) will be introduced.
		Controlling water use	The creation of new gardens and greenhouses is allowed only when water-saving technologies are implemented. From 2026, land and water taxes from areas without laser planning will be increased.
4	Support land users to adopt water saving technologies	Incentives for water conservation	By the end of 2023 through the platform “suvkredit.uz”, provided loans in the amount of more than 2 trillion UZS. Lending through suvkredit.uz (5-year term, 14% per annum, 2-year grace period); in the next three years, the practice of subsidizing 15% of the cost of agricultural machinery and 30% of the cost of laser levelers will be continued.
5	Capacity building of land users	Training farmers and water managers	Consulting centers have been created under the relevant ministries and universities. Familiarization campaigns such as “Fairs”, “Farmers' Days”, “Presentation of the harvest on demonstration plots” are regularly held through government agencies (khokimiyats, the Ministry of Water Resources and the Ministry of Agriculture, with the participation of international projects).
		Dissemination of knowledge	Documentation of best practices in the global knowledge base WOCAT (22 technologies and 2 approaches from the Republic of Uzbekistan). https://qcat.wocat.net/en/wocat/list/?type=technologies ICARDA platform for knowledge sharing and promotion of SLM technologies (cacilm.org), Ministries, agencies, committees and the population work on social media platforms (websites, Telegram, Facebook), where they have created groups to discuss agricultural issues: - https://t.me/OrganikDehqonchilik- organic telegram channel; - http://www.cawater-info.net/index_e.htm- Knowledge portal on water and environmental issues; - http://www.icwc-aral.uz/index.htm- ICWC website for information exchange;

			- https://t.me/OrganikDehqonchilik- Organik Dehqonchilik
6	Scientific developments for modernization of agriculture and water management	Implementation of smart agriculture technologies	Establishment of the Center for Digitalization of Agro-Industry LLC under the Ministry of Agriculture; FAO developed the National Action Program for Digitalization of Agriculture in Uzbekistan. “1000 Digital Villages” is a flagship program of FAO.
7	New scientific developments for restoring fertility and increasing productivity of degraded saline soils	Bio-dispersal of lands with halophytes	Scientific research of the joint Japanese-Uzbek project in Karakalpakstan.
		The following preparations have been developed: Biosolvent (Institute of Bioorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan), Aminocide-Aton and Aminocide-Si (OOO Rasayana) and Bioazot (Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan)	Biosolvent promotes desalination, water conservation and maintenance of soil properties. Aminocide-Aton, Aminocid-Si and Bionitrogen increase the adaptive properties of cotton to salinity.
8	Improving the fertility of irrigated land	Diversification of crops with the introduction of legume repeated crops and green manure	About 20% of the area after harvesting winter wheat is sown with legumes, mainly mung bean.
9	Deforestation	Agroforestry of irrigated and dryland arable land	Creation of shelterbelts.
10	Adaptation to increased thermal regime and water deficit	Growing crops in closed ground	According to the results of 2021, about 3 thousand greenhouses (6.5 thousand hectares) were created, of which 1.1 thousand hectares (17%) are hydroponic and 4.9 thousand hectares (83%) are with the soil method. About 271 thousand tons of products were grown in greenhouses, of which 167 thousand tons were tomatoes.
Forestry			
11	Institutional measures	Institutional transformation	The Forestry Agency (2022) under the Ministry of Ecology, the Forestry Development Fund have been established, and the public-private partnership (PPP) mechanism is actively developing.
12	Expansion of green areas, reduction of CO_2 in the atmosphere	Planting 200 million seedlings annually within the framework of the “Yashil Makon” project	At the end of 2023, 91 million plants were planted within the framework of the national project “Yashil Makon”, which is equivalent to 107% of the plan.
13	Afforestation of the dried bottom of the Aral Sea	Sowing seeds by aerial seeding, as well as by ground mechanized and manual methods	At the end of 2023, the forest area exceeded 1.7 million hectares. Forestry enterprises of Karakalpakstan and local residents have prepared more than 540 tons of seeds (447 tons of saxaul, 7.2 tons of kandym, 84 tons of karaburak, 2.7 tons of other species) https://eco.gov.uz/ru/site/news?id=3999

7 ABBREVIATIONS AND NOTATIONS

4NC	Fourth national communication
ADB	Asian Development Bank
AF	Adaptation Fund
AFD	French Development Agency
AR	Assessment Report
ASCMNG	Automated System of Control and Metering of Natural Gas
BAT	Best Available Technologies
BREEAM	Building Research Establishment Environmental Assessment Method
BTR	Biennial Transparency Report
BUR	Biennial Update Report
CAREC	Central Asia Regional Economic Cooperation
CBIT	Capacity Building Initiative for Transparency
CCBII	Climate Change Budget Integration Index
CCGT	Combined Cycle Gas Turbine
CHPP	Combined Heat Power Plant
CMIP	Coupled Model Intercomparison Project
CSA	Climate Smart Agricultural
CSD	Commission on Sustainable Development
CTCN	Climate Technology Center & Network
E&E	Energy and Environment
EAKPF	E-Asia and Knowledge Partnership Fund of the Republic of Korea
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EDGE	Excellence in Design for Greater Efficiencies
EECA	Eastern Europe and Central Asia
ERM	Environmental Resources Management
ERP	Enterprise Resource Planning
ESG	Environmental, Social and Governance
ETF	Extended Transparency Framework
ETS	Emission Trade System
FAO	Food and Agriculture Organization of the United Nations
FDA	French Development Agency
FER	Fuel and Energy Resources
GACMO	The GHG Abatement Cost Model
GCC	Gas Chemical Complex
GCF	Green Climate Fund
GDP	Gross domestic product
GEF	Global Environment Facility
GGP	Greenhouse Gas Protocol
GHGs	Greenhouse Gases
GIZ	German Society for Technical Development
Goskomzemgeodezkadastr	State Committee for Land Resources, Geodesy, Cartography and State Cadaster

Gosvodkhoznadzor	State Inspectorate for Control and Supervision of Technical Condition and Safety of Operation of Large and Especially Important Water Management Facilities
GPP	Gas Processing Plant
GRI	Global Reporting Initiative
GRI	Global Reporting Initiative
GSP	Global Support Program
GST	Global Stocktake
GTL	Gas-to-Liquids
GTU	Gas Turbine Unit
GWP	Global Warming Potential
HFC	Hydrofluorocarbons
HPP	Hydroelectric Power Plant
HSS	Heat Supply System
IATI	International Aid Transparency Initiative
IBR	Islamic Development Bank
ICARDA	International Center for Agricultural Research in the Dry Regions
ICAT	Initiative for Climate Action Transparency
ICRAFT	Innovative Carbon Application for Energy Transition
ICT	Information and Communication Technologies
IDA	International Development Association
IDB	Islamic Development Bank
IEA	International Energy Agency
IFAS	International Fund for Saving the Aral Sea
IFI	International financial institution
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
IRENA	International Renewable Energy Agency
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
JAICA	Japan International Cooperation Agency
JCM	Joint Credit Mechanism
JFPR	Japan Fund for Prosperous and Resilient Asia and the Pacific
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
LDF	Loss and Damage Fund
LDN	Land Degradation Neutrality
LED	Light Emitting Diodes
LEED	Leadership in Energy and Environmental Design
LLC	Limited Liability Company
LULUCF	Land use, land-use change and forestry sector
M&E	Monitoring and Evaluation
MDB	Multilateral Development Bank
MES	Ministry of Emergency Situations of Uzbekistan
MMC	Mining and Metallurgical Complex
MPC	Maximum Permissible Concentration
MPGs	Modalities, Procedures, and Guidelines

MPTF	Multi-Partner Trust Fund
MRV	Measurement Reporting Verification
MSW	Municipal Solid Waste
MTF	Multipartner Trust Fund
MTS	Meteorological Telecommunication System
NAGAC	National Adaptation Plans and Climate Change Adaptation
NAMA	Nationally Appropriate Mitigation Actions
NAP	National Adaptation Plans
NC	National Communication
NDC	Nationally Determined Contributions
NDZ	Neutral land degradation
NGO	Non-governmental Organization
NHMS	National Hydrometeorological Service
NIGMI	Hydrometeorological Research Institute
NIIP	National Inventory Improvement Plan
NIR	National Inventory Report
NPP	Nuclear Power Plant
OECD	Organization for Economic Cooperation and Development
PKM	Resolution of the Cabinet of Ministers
PP	Presidential Decree
PPP	Public-Private partnership
PSC	Variable frequency drive
PV	Photovoltaic
PVC	Polyvinyl Chloride
PVPP	Photovoltaic power plants
QA/QC	Quality assessment/quality control
R&D	Research and development work
RCP	Representative Concentration Pathways
RES	Renewable Energy Sources
RP	Reception Point
SCADA	Supervisory Control and Data Acquisition
SDC	Swiss Development Agency
SDG	Sustainable Development Goal
SDII	Standardized Precipitation Evapotranspiration Index
SDS	Swiss Agency for Development and Cooperation
SE	State-owned Enterprise
SFM	Sustainable Forest Management
SFR	Saudi Fund for Development
SLM	Sustainable land management
SPEI	Standardized Precipitation Evapotranspiration Index
SWAT+	Soil and Water Assessment Tool Plus
SWM	Solid Waste Management
TAAS	Tracking Adaptation in Agricultural Sectors
TAGF-SPA	Spanish Cooperation Fund for Technical Assistance
TAILEV	Accelerating Investments in Low Emission Vehicles
TCAF	Transformational Carbon Fund
TPP	Thermal Power Plant

TS	Transfer Station
UCG	United Cement Group
UN	The United Nations
UNCCD	UN Convention to Combat Desertification
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Program
UNECE	UN Economic Commission for Europe
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Program
UNISDR	United Nations International Strategy for Disaster Reduction
UP	Presidential Decree
USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollar
Uzhydromet	Agency of Hydrometeorological Service under the Ministry of Ecology, Environmental Protection, and Climate Change of the Republic of Uzbekistan
UZS	Uzbekistan Som (the official currency of Uzbekistan)
VEB/RF	Vnesheconombank of the Russian Federation
WB	World Bank
WCP	World Climate Program
WCRP	World Climate Research Program
WHO	World Health Organization
WMO	World Meteorological Organization
WOCAT	World Overview of Conservation Approaches and Technologies
WPP	Wind Power Plant
ZRU	Law of the Republic of Uzbekistan

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Units

toe	tons of oil equivalent
GW	gigawatt
Mt	million tons
MW	megawatt
Kt	Kiloton (1,000 tons)
kW	kilowatt
kWh	kilowatt-hour
Gg	gigagrams (1,000 tons)
Gcal	gigacalorie
Gbit	gigabit
GJ	gigajoule (10^9 joules)
ppm	a unit of measurement of relative values equal to $1\text{-}10^{-6}$ of the base indicator (millionth part)

Chemical formulas

CO_2	carbon dioxide
CH_4	methane
N_2O	nitrous oxide
CH_2F_2, $C_{(2)}HF_5$, $C_{(2)}H_{(2)}F_4$, $C_2H_3F_3$	Hydrofluorocarbons (HFCs)
CO	carbon monoxide
NOx	nitrogen oxides
SO_2	sulfur dioxide
SF_6	sulfur hexafluoride