IMV
IQTISODIYOT VA MOLIYA VAZIRLIGI

Supported by:

Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

based on a decision of
the German Bundestag

Greening the Economy in Uzbekistan: State of Play in 2023

Monitoring progress based on the OECD Green Growth Indicators

September 2023

Foreword

I am pleased to present the first monitoring report on progress towards the green economy transition in the Republic of Uzbekistan using the Green Growth Indicators (GGI) framework developed by the Organisation for Economic Co-operation and Development (OECD).

In December 2022, the President of Uzbekistan approved the Green Growth Strategic Framework Programme and Action Plan to transition to a green economy by 2030. The action plan has eight national targets against which the Ministry of Economy and Finance will monitor progress. In this context, this report helps answer four essential questions:

- Is Uzbekistan becoming more efficient in using natural resources and environmental services?
- Is the natural asset base of Uzbekistan's economy being maintained?
- Does greening economic growth generate quality of life for people in Uzbekistan?
- How does greening growth generate economic opportunities in Uzbekistan?

The findings in this report identify several positive trends towards green growth. Carbon, energy, material and water productivity are rising, resulting in fewer emissions and more efficient energy and resource use alongside economic growth. The share of forest and protected natural areas is increasing, while agricultural land is decreasing as a proportion of total land area.

Despite progress, several challenges remain, among them:

- Uzbekistan's total greenhouse gas emissions are the second largest in Central Asia after Kazakhstan, and the carbon and energy intensity of its economy is one of the highest in the world.
- Air pollution is one of the worst in the world.
- Water stress levels are high and rising.
- Only a quarter of solid waste produced is recycled.

The government of Uzbekistan affirms its commitment to a greener economy. I gratefully acknowledge financial support from Germany's Federal Ministry for the Environment, Nature Conservation and Nuclear Safety for this project. I wish to thank the OECD and the Westminster International University in Tashkent for their technical assistance.

Mr. Ilkhom Norkulov,
First Deputy Minister
Ministry of Economy and Finance, Tashkent, Uzbekistan

Background and acknowledgments

This report is a first attempt to assess Uzbekistan's progress in greening its economy using the internationally recognised green growth indicators (GGIs) developed by the Organisation for Economic Co-operation and Development (OECD). By presenting trends for GGIs during 1990-2022 (or the latest data available), the report provides valuable statistical trends and analytical insights that track progress in the ongoing greening efforts of Uzbekistan. It also compares trends in Uzbekistan against those in other countries or regional averages. In addition, the report covers the trends for the national targets established in the Plan of Action for Transitioning to a Green Economy and Ensuring Green Growth until 2030.

The monitoring report is the outcome of joint efforts from the Ministry of Economy and Finance (MoEF) and the Statistics Agency, working together to establish a reliable monitoring system towards a green economy. The report was developed in the framework of the OECD project *Improving the Incentive Frameworks and Capacity for Green Climate-Related Investment in Eastern Partnership Countries and Central Asia* with financial support from Germany's Federal Ministry for the Environment, Nature Conservation and Nuclear Safety through its International Climate Initiative (IKI). Isabella Neuweg (OECD) managed the project.

The monitoring report was prepared by a team of experts from the WIUT under the leadership of Bakhrom Mirkasimov (Rector) and Etenesh B. Asfaw (Senior Research Fellow at the Centre for Policy Research and Outreach). The research team included Etenesh Asfaw, Nargiza Alimukhamedova, Omonjon Ganiev, Zohid Askarov, Akhtem Useinov, Angelo Battaglia, Kamilla Sultanova and Abdulaziz Dusbabaev. The work was supervised by Isabella Neuweg, Irina Belkahia and Krzysztof Michalak (all OECD Environment Directorate). The WIUT team is grateful for the insights, national statistical data and contributions from the MoEF and the Statistics Agency under the President of the Republic of Uzbekistan. The authors are thankful for the inputs from various national stakeholders, including the former Institute for Forecasting and Macroeconomic Reforms, renamed the Institute for Macroeconomic and Regional Studies and the former Ministry of Natural Resources, renamed as Ministry of Ecology, Environmental Protection and Climate Change (MoEEPCC). The report benefited from discussions during the project kick-off event on 16 February 2023 and the experts' working meeting on 12 July 2023. The work is translated into Uzbek and available on the WIUT, MoEF and OECD websites. The authors acknowledge the valuable contributions of translators, editors and proof-readers.

Structure of the report

The report is divided into two parts.

The first part monitors Uzbekistan's green growth based on the OECD's GGIs framework, while the second (special) part monitors implementation of the national Plan of Action for Transitioning to a Green Economy and Ensuring Green Growth until 2030, using eight national indicators. It is structured into six chapters**:**

- Chapter 1 describes the methodology, the OECD GGIs framework and how it complements national processes to measure environmental indicators.
- Chapter 2 provides the socio-economic context and characteristics of the growth of Uzbekistan.
- Chapter 3 discusses the efficiency with which economic activities in Uzbekistan use energy, other natural resources, materials and environmental services.
- Chapter 4 reflects on whether the natural asset base of Uzbekistan is being kept intact.
- Chapter 5 presents the environmental dimension of quality of life and shows how environmental conditions and risks interact with the well-being of Uzbekistan people.
- Chapter 6 captures the economic opportunities in Uzbekistan’s green growth and policy responses.

The definitions and technical comments on measurability and interpretation of the indicators covered in the report are provided at the end of each chapter.

The second part, Chapter 7, monitors Uzbekistan’s strategic framework for transitioning to a green economy by 2030. It focuses on the eight indicators approved by the government to monitor implementation of the Green Growth Strategy, Programme and Action Plan in achieving its objectives and targets. The chapter also uses national indicators to capture the progress in implementing the Green Growth Strategy in 2022.

Challenges and ways forward

The study builds on national statistics, complemented with international data for Uzbekistan and others. The analytical work encountered limitations related to access to national data, data fragmentation across different institutions and inconsistency in some indicators' definitions and measurements. More specific challenges are indicated in the chapters.

For future monitoring of GGIs, the government will need to:

- Build capacity of the Statistics Agency, MoEF and other relevant stakeholders on definitions/interpretation of GGI terms and international comparable standards on measurability and data requirements to monitor the indicators.
- Establish a mechanism where the different sources regularly supply data to track indicators to a co-ordinating body in the Statistics Agency or the MoEF.
- Establish a dataspace dedicated to the GGIs in the Statistics Agency database with historical data since 1991 in three languages (English, Russian and Uzbek). Data can be provided as open access to the public or on a cost recovery basis.
- Appoint a monitoring and evaluation expert in the MoEF to work closely with the Statistics Agency and other data-collecting institutions to manage, validate, monitor and analyse the GGIs regularly and report. This will help the ministry make great strides in collecting, analysing, organising and getting value from data.
- Expand the MoEF's official web portal on-premises to serve as a digital platform hub for GGI-related data from multiple sources (e.g., Ministry of Ecology; Ministry of Water Resource, Cadastre; Ministry of Energy; and Forestry Agency). The portal will help the MoEF leverage data strategically.

Disclaimers

The views expressed in this report are those of the authors only. They cannot in any way be taken to reflect the official opinion of the OECD, its members, the governments, donors or the implementing partners.

This report and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any region, city or area.

The report was produced with financial support from Germany's Federal Ministry for the Environment, Nature Conservation and Nuclear Safety through its International Climate Initiative.

Please cite this work as "Ministry of Economy and Finance of the Republic of Uzbekistan *(2023). Greening the Economy in Uzbekistan: State of Play in 2023. Monitoring progress based on the OECD Green Growth Indicators*."

Acronyms and abbreviations

AFD	French Development Agency
AQG	Air Quality Guideline
CO_2	Carbon dioxide
^oC	Degree Celsius
CPI	Consumer Price Index
CA	Central Asia
CPRO	Centre for Policy Research and Outreach
DP	Development Partner
DMC	Domestic material consumption
EBRD	European Bank for Reconstruction and Development
EECCA	Eastern Europe, Caucasus and Central Asia
FAO	Food and Agriculture Organization
GDP	Gross domestic product
GG	Green growth
GGI	Green growth indicators
GGGI	Global Green Growth Institution
GGSF	Green Growth Strategic Framework
GHGs	Greenhouse gases
ha	Hectares
IEA	International Energy Agency
IFI	International financial institution
IMRS	Institute for Macroeconomic and Regional Studies
IRENA	International Renewable Energy Agency
ILO	International Labour Organization
IMF	International Monetary Fund
kg	Kilogrammes
km^2	Square kilometre
kWh	Kilowatt-hour
MoEF	Ministry of Economy and Finance
MoNR	Ministry of Natural Resources
MoEEPCC	Ministry of Ecology, Environmental Protection and Climate Change
MSW	Municipal solid waste
m^3	Cubic metre
µg	Microgramme
MW	Megawatt
OECD	Organisation for Economic Co-operation andDevelopment
OWD	Our World in Data
PM	Particulate matter
RES	Renewable energy sources
SA	Statistics Agency
SDGs	Sustainable Development Goals
SWM	Solid waste management
TPES	Total Primary Energy Supply
toe	Tonnes of oil equivalent
t	Tonnes
UN	United Nations
UNDP	United Nations Development Programme
USD	US dollars
UZS	Uzbekistan soum
WHO	World Health Organisation

Table of contents

FIGURES

TABLES

Main findings

Uzbekistan is becoming more efficient in using natural resources and environmental services, but the pressure on natural capital remains

- Uzbekistan's economy is becoming more efficient in using natural resources. Carbon, energy, material and water productivity have increased in the last 30 years. However, they remain well below average in Central Asia (CA) and the Eastern Europe, Caucasus and Central Asia (EECCA) region. Although progress is encouraging, environmental resource use is high, which implies pressures on natural capital.
- Uzbekistan's total greenhouse gas (GHG) emissions are the second largest in CA after Kazakhstan, and its emissions per unit of gross domestic product (GDP) are the fifth largest in the world. At the same time, it managed to decrease its carbon emissions per unit of GDP by around 75% in the last 20 years. Thus, the trend is encouraging.
- The energy intensity of GDP has been declining in recent years but remains one of the world's highest. Uzbekistan was the eighth most energy-intense country in the world in 2022. Buildings (residential and commercial) consume about 45% of its energy, while industry consumes 21% and transport 18%.
- Renewable energy sources such as wind and solar energy play a minor role (below 2%) in Uzbekistan's energy mix and their share is significantly lower than the CA average (15%). Renewable energy sources (RES) made up 9% of electricity generation in 2022. Over 90% of RES is hydropower. The development of renewables is slow, despite the high potential for solar energy.
- Water productivity in the economy increased fourfold to USD 2 per cubic metre (m^3) of water used in the past 30 years. Despite this progress, productivity remains one of the lowest compared to the European and Central Asia region average of USD 43/m^3 and the world average of USD 21/m^3.
- Material productivity in the economy (output generated from using a given amount of metal, non-metal and biomass material) more than doubled over the last 30 years. The value is the third highest in CA.
- In 2021, Uzbekistan produced ten times more solid waste than five years ago. It generated around 6 million tonnes of household solid waste or 165 kg per capita in 2021. Although waste generation is increasing, current levels are only half of the world's average. However, regular waste collection services covered only half of the population in 2018. Only one-fourth of solid waste was recycled in 2021, although recycling is increasing.
- Mineral fertiliser used per hectare (ha) of cropland increased in Uzbekistan, leading to a rise in excess fertiliser per ha of cropland. It has increased by more than 50% in the past 30 years and was 75% higher than the world average in 2020.

The natural asset base of Uzbekistan's economy needs more maintenance

- Land degradation due to inappropriate irrigation, poor pastureland and manure management is a major challenge in Uzbekistan. Land area is predominantly agricultural. Agricultural land, defined as area that is either arable, under permanent crops or under permanent pastures, makes up almost 60% of total surface area. Land degradation is estimated to cost close to 5% of annual GDP. The cost includes the loss of agriculture productivity, increased soil erosion, reduced water availability and loss of carbon sequestration and ecosystem services.
- Organic farming has increased since 2010, but only makes up 0.004% of agricultural land.
- Uzbekistan is one of the most water-stressed countries in the world. The water stress level, or the ratio of water used relative to available water, has significantly increased in the last 20 years from around 50% to almost 70%. The agriculture sector uses over 90% of the freshwater withdrawn. Despite the severe stress, 40% of agricultural water is lost due to outdated irrigation infrastructure. Uzbekistan is investing in more efficient irrigation systems, improved water management practices and water conservation to mitigate water stress.
- Forested area and tree stocks have been increasing. Forests make up around 8% of total land area, an increase of more than 30% from 2014.
- Uzbekistan has more than 40 protected natural areas. They make up 8% of total land area, an increase of more than 300% in the last ten years. Over the same period, despite the expansion of protected areas, nearly 20 threatened animal and plant species were added to the national Red Book. The heightened risk is due to climate change (and resulting temperature increase), unchecked overgrazing, indiscriminate hunting and poaching.
- In terms of natural resources, Uzbekistan ranks 11th in natural gas production and 14th in reserves globally. The gap between production and consumption of gas has decreased due to increased production, reaching 54 billion m^3 in 2021. Natural gas reserves are forecasted to last for 20-30 years. Natural gas losses pose a significant challenge due to outdated infrastructure.

Some GGIs in the population's quality of life are improving, while challenges remain

- Uzbekistan is the 20th most air polluted country in the world. Major sources of pollutants are dust particles, vehicle emissions and industrial emissions. Particulate matter ($PM_{2.5}$) concentration in the air has consistently been above the 35 µg/m^3 level considered unhealthy by the World Health Organization (WHO) over the past ten years.
- The share of the population exposed to unhealthy concentration levels of $PM_{2.5}$ declined from around 80% to 56% over the past ten years. Nonetheless, population exposure level is more than five times higher than the world average of 10%.
- Mortality and welfare costs due to air pollution are increasing. Annually, over 750 people per million inhabitants are estimated to die prematurely due to exposure to outdoor air pollution, positioning the country above the world average of 645 people in 2019. Deaths related to outdoor air pollution are the third highest globally. Their welfare costs are estimated at almost 9% of GDP equivalent compared to around 6.5% in the EECCA region.
- The share of households with access to safe public drinking water supply declined by 10% to around 70% over the past ten years due to outdated water supply infrastructure, increased population and construction of houses, adding burden to the supply. Moreso, there is high inequality in access to drinking water between cities and rural areas. Although over 97% of Tashkent houses have access to safe drinking water, access is still a challenge in rural areas.
- Uzbekistan made some progress in expanding public sewerage systems. Nevertheless, less than half (48%) of households were connected to a sewerage system in 2022, and there is inequality between regions. For instance, while all residences in Tashkent City are connected to a sewerage system, only 16% of households are connected in the Karakalpakstan region.

More economic opportunities need to be tapped in the transition to a green economy

- No data are available for the last five years on investments in environmental technologies. However, the previous trends in patent applications shows that Uzbekistan has invested in environmental technologies since the early 1990s. Over 15% of the innovations in Uzbekistan in 2018 were environment-related, higher than the world's average of 10%.
- Environmental expenditures are generally showing an upward trend but remain small. On average, they accounted for only 0.06% of total government expenditures or 0.02% of GDP over more than the past ten years. The value can be underestimated as Uzbekistan lacks systematic budget tagging for "green" expenditures, which makes it hard to assess all green investments.
- The share of environmental tax revenues in the state budget remained constant at a 0.01% average for 2015-18. Solid waste collection fees make up 57% of environmental tax revenues. Despite the lack of systematic accounting of all environment-related taxes, environmental revenues from pollution fees, including solid waste and wastewater collection fees, in general have increased. They were almost four times higher in 2018 (the latest year for which data are available) than in 2010, amounting to around USD 1.7 million (USD 1 = UZS 8 069 in 2018).[1]
- Energy subsidies are gradually declining but remain high. In 2020, fossil fuel subsidies were 60% lower than in 2010 but amounted to almost USD 4 billion (USD 1 = UZS 10 065 in 2020), making up the equivalent of 6.6% of GDP.
- Tariffs for energy resource use do not represent the production cost. However, policies that protect the low-income populations object extreme energy price reforms. Accordingly, electric tariffs increased, but various tariff schemes are set as of 2019 for different categories of consumers. Thus, the tariff for commercial consumers was 30-50% more than for residential users. Similarly, though water tariff levels have increased, water is still subsidised, and tariffs do not cover the operational cost. The price of water is higher in regions than in Tashkent City. Rates vary by region, consumer residence type and availability of water meters.

The main socio-economic characteristics in Uzbekistan are promising

- The economy has grown by around 6% annually in the past ten years. Despite double-digit inflation at an average rate of 11% in the last three years, Uzbekistan's real GDP per capita stood at around USD 2,042 in 2022 (USD 1= UZS 10 605 in 2021)[2], a more than sevenfold increase in ten years.
- Trade openness increased in Uzbekistan, and it became a net importer of goods and services as of 2016. The total import value increased by USD 25.5 billion in 2021, while the export value was USD 16.7 billion (USD 1 = UZS 10 623 in 2021).
- The population is growing annually at 1.6%, despite negative net external migration. The population was over 35 million in 2022, with 54% below the age of 30. The share of employed in the total labour force increased to about 70% in 2021. The primary employers are the service sector (51%), followed by industry (25%) and agriculture (24%).
- Enrolment in tertiary education institutions was only one-fifth of eligible students in 2021 compared to 100% gross enrolment rates in primary and secondary education.

[1] The report uses yearly average exchange rates based on information from the Commercial Bank of Uzbekistan: https://cbu.uz/en/arkhiv-kursov-valyut/

[2] Data for the real GDP in local currency – UZS is taken from the Statistics Agency. The data is reported at constant prices (previous year prices) calculated by the production method. To covert the real GDP in local currency to USD, we used exchange rate from the previous year (here 2021).

Uzbekistan did well in achieving some of the strategic targets set for 2022 in its green economy transition programme and action plan

- Uzbekistan exceeded its 2022 target of reducing energy intensity by 5%: energy intensity declined by more than 10% compared to 2021.
- It also overachieved the 2022 target of an 8% share of RES in total electricity generation by 0.8 percentage points. It exceeded the construction of a new solar panel capacity target of 10 megawatts by five times.
- It met the target of increasing the proportion of households with access to safe drinking water to around 70%. As stated above, in light of a growing population and infrastructure that struggles to keep up with increasing demand, the share of households with access to safe drinking water is lower than ten years ago. Uzbekistan could make this target more ambitious to reflect the growth in demand.

Part I: Monitoring the Green Economy in Uzbekistan based on the OECD Green Growth Indicators

1 OECD Green Growth Indicators Framework and country context

This chapter introduces the OECD Green Growth Indicators (GGIs) framework, developed to monitor progress towards a green economy in OECD member states, and its pilot application in Uzbekistan. It describes which OECD GGIs are included in the report based on data availability. The chapter also overviews the country's green growth context and national processes relevant to monitoring the transition to a green economy. It shows how the OECD GGIs complement the national monitoring processes.

Introduction to the OECD green growth indicators framework

The OECD defines green growth as "fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies". It is the point where twin challenges meet – the need to expand economic opportunities, while addressing environmental pressures. It is also about exploiting the opportunities to realise the two together (OECD, 2017).

In 2011, the OECD developed a green growth monitoring framework to support implementation of a Green Growth Strategy in its member countries. Since then, it has been widely applied among OECD members and beyond, including in Central Asia (CA) (Kyrgyzstan and Kazakhstan). The approach is kept flexible to allow adaptation to the national context.

Benefits of monitoring progress towards a green economy

Green economy policies need to be supported with appropriate indicators to monitor progress. The OECD Green Growth Indicators (GGIs) framework helps countries to:

- track and communicate progress in greening economic growth;
- make informed decisions;
- demonstrate accountability to national and international stakeholders;
- raise public awareness about the links between economic growth and the environment;
- compare progress with other countries.

The GGIs framework comprises 26 main indicators grouped around four dimensions of green growth:

1. environmental and resource productivity of the economy
2. natural asset base
3. environmental dimension of quality of life
4. economic opportunities and policy responses.

The GGIs framework also captures information on the socio-economic context of a country to complement the four green growth dimensions.

Table 1.1 shows the list of OECD GGIs, including those in this report. The indicators included are mostly based on national sources using available data up to June 2023. National data were provided by the Ministry of Economy and Finance (MoEF), the Statistics Agency (SA) and the Ministry of Ecology, Environment Protection and Climate Change (MoEEPCC). The national data are complemented by international sources, including the International Energy Agency (IEA), OECD and World Bank databases. The proposed GGIs for Uzbekistan in this report are not exhaustive and final. They can be extended further as data become available and the green growth concept evolves.

Table 1.1. OECD green growth indicators and those applied to Uzbekistan

Green growth group	Sub-group	OECD indicators	Included in the report	Data source	Years covered in the report
Environmental and resource productivity	Carbon and energy productivity	Production-based CO_2productivity	Yes	OECD Uzhydromet	1990-20
		Demand-based CO_2 productivity	No	Not available	Not available
		Energy productivity	Yes	Statistics Agency	2018-21
		Energy intensity of GDP	Yes	Statistics Agency	2000-22
		Share of renewable energy sources in total energy supply and in electricity generation	Yes	OECD	1990-2020
	Resource productivity	Production-based material productivity	Yes	OECD	1992-2019
		Demand-based material productivity	No	Not available	Not available
		Solid waste generation intensity and recycling ratio	Yes	Statistics Agency	2015-21
		Nutrient flows and balances in agriculture (nitrogen, phosphorus)	Yes	World Bank	1992-2020
		Water productivity	Yes	OECD	1994-2019
	Multifactor productivity	Environmentally adjusted multifactor productivity	No	Not available	Not available
Natural asset base	Natural resources stocks	Natural resources Index	No	Not available	Not available
	Renewable stocks	Fresh water resources	Yes	World Bank	1994-2019
		Forest resources	Yes	Statistics Agency	2014-20
		Fish resources	No	Not available	Not available
	Non-renewable stocks	Mineral resources	Yes	Statistics Agency	2000-21
		Land resources	Yes	Statistics Agency FAO	1991-2021
		Soil resources	No	Not available	Not available
	Biodiversity and ecosystems	Wildlife resources	Yes	Red Book Uzbekistan	2019
		Protected area	Yes	Statistics Agency	2011-21
Environmental dimension of quality of life	Environmental health and risks	Population exposed to air pollution health risks	Yes	OECD	2010-19
		Environmentally induced health problems and related costs	Yes	OECD Statistics Agency	2010-19
		Exposure to environmental risks and related health and economic losses	Yes	OECD	2010-19
		Share of population connected to sewerage systems	Yes	Statistics Agency	2010-22
		Share of population with sustainable access to safe drinking water	Yes	Statistics Agency	2010-22
Economic opportunities and policy responses	Technology and innovation	Research and development expenditure in green growth	Yes	MoEEPCC MoEF	2012-19 2019-22

		Patents of importance to green growth	No	Not available	Not available
		Environment-related innovations	Yes	OECD	1993-2018
	Environmental goods and services	Production of environmental goods and services (EGS)	No	Not available	Not available
	International financial flows	International financial flows to green growth	Yes	UNDP	2023
	Prices and transfers	Environment-related taxation and subsidies	Yes	MoEEPCC IEA	2015-18 2010-22
		Energy pricing	Yes	OECD	2012-21
		Water pricing and cost recovery	Yes	Golden Pages Uzbekistan	2019-22
	Education, training and skills development	No indicator set by OECD yet	No	Not available	Not available
The socio-economic context and characteristics of growth	Economic growth, productivity and competitiveness	Economic growth and structure	Yes	Statistics Agency	2011-22
		Productivity and trade	Yes	Statistics Agency	2000-21
		Inflation and commodity prices	Yes	Statistics Agency	2000-22
	Labour market and socio-demographic patterns	Labour force participation and unemployment	Yes	Statistics Agency	2010-21
		Population growth and structure	Yes	Statistics Agency	1991-21
		Life expectancy	Yes	Statistics Agency	2000-21
		Inequality Gini index, N	Yes	Statistics Agency	2017-20
		Educational attainment: Level of and access to education	Yes	Statistics Agency	2005-21

Note: International Energy Agency (IEA), Ministry of Ecology, Environmental Protection and Climate Change (MoEEPCC), Ministry of Economy and Finance, Organisation for Economic Cooperation and Development (OECD)

Source: Author's compilation[3]

Country context and national processes with relevance to a green economy

Uzbekistan is the world's 42nd largest greenhouse gas (GHG) emitter with a 0.37% share in 2019. It is the second largest emitter in CA, after Kazakhstan and its emissions per unit of gross domestic product (GDP) are the fifth largest in the world.[4] In 2019, the government adopted a strategy for transitioning to a green economy by 2030 to reverse this trend, framing the country's strategic vision to decouple economic growth from environmental degradation.[5] The green strategy sets six core priorities followed by three cross-cutting priorities:

1. ensuring efficient use of natural resources
2. strengthening the resilience of the economy to natural disasters and climate change

[3] See OECD GGI indicators at OECD Statistics and www.oecd.org/greengrowth/green- growth-indicators/.

[4] See Uzbekistan's emission data at www.climatewatchdata.org/countries/UZB?end_year=2019&start_year=1990.

[5] See https://lex.uz/ru/docs/4539506 for the Decree of the President of the Republic of Uzbekistan on approval of the strategy for the transition of the Republic of Uzbekistan to a green economy for the period 2019-2030.

3. ensuring low-carbon emissions of the economy, in particular, the industry sector
4. introducing innovations and attracting green investments
5. developing sustainable urbanisation, with expanding urban green spaces
6. supporting the population most affected during the transition to a green economy
7. building human capacity on the green economy and enhancing green thinking
8. developing an enabling policy environment (institutions, data collection and monitoring)
9. increasing flows of green financing.

In 2020, the priorities of the COVID-19 pandemic jeopardised implementation of the Green Economy Transition Strategy, shifting attention and resources from green measures to the urgent socio-economic response. Thus, the government's COVID-19 response measures did not have explicit green elements and were not vigilant against environmental impacts (Amirova et al., 2021). The trade-off between speeding up the green transition (e.g., with a cut of energy subsidies and consequently raising electricity tariffs) and protecting lower-income households from cost increases (e.g., by keeping low energy tariffs) also poses a barrier to Uzbekistan's green transition reforms. Another challenge are high-upfront capital costs for investments in low-carbon technologies and infrastructure (Mirkasimov et al., 2023).

The national green priorities couple with Uzbekistan's ambitious international commitments. In 2018, the government adopted the 2030 Agenda, including commitments to environmental targets to ensure access to clean water, sustainable consumption, adoption and mitigation to climate change, and conservation of land and forest (SDG 6,12,13,15). In 2021, as part of its commitment to the Paris Agreement, the government pledged at the 26th session of the UN Convention on Climate Change (COP26) to reduce GHG emissions per unit of GDP by 35% in 2030 compared to the 2010 level. In 2022, the country joined the Global Methane Pledge to achieve the collective goal of reducing methane emissions by 30% by 2030 compared to the 2020 level (190.6 megatonnes of carbon dioxide equivalent).[6]

Implementing national targets for building a green economy in Uzbekistan and reaching international commitments require proper monitoring of indicators. Several national processes could be mentioned in this regard. The most important process is the monitoring of the 16 national Sustainable Development Goals (SDGs) and 125 indicators, adopted in 2018 and recalibrated in 2022.[7]

The national SDGs include environmental indicators and targets to protect the planet; ensure access to clean water; sustainable consumption; adaptation and mitigation of climate change; and conservation of land and forest (SDG 6,12,13,15). The SDG monitoring is vested to the SA, which publishes annual progress reports on its implementation dating back to 2016 as a base year.[8] In addition, since 2011, the SA has regularly collected data from other official sources. It has also published open data on selected environment, ecology and energy indicators. These include protected areas, volume of pollutants emitted, forest area, population access to drinking water and sewage treatment, energy supply and share of renewables in electricity generation.[9]

Another national process at the core of the green transition by 2030 is the green growth monitoring framework, consisting of eight indicators (Table 1.2). This framework was introduced on 3 December

[6] See https://lex.uz/docs/6303233 for the GGSF programme and action plan in the Decree of the President of the Republic of Uzbekistan, dated 2 December 2022, No. PP-436 03.12.2022.

[7] See the national SDGs in the resolution of the CM No. 841: https://lex.uz/docs/4013358.

[8] See the monitoring reports on the SDG targets at https://nsdg.stat.uz/en.

[9] See national statistical data on ecology environment, and energy at: https://stat.uz/en/official-statistics/ecology& https://stat.uz/en/official-statistics/environment; https://stat.uz/en/official-statistics/industry.

2022 as part of the "Decree of the President on measures to improve the effectiveness of reforms aimed at the transition of Uzbekistan to a 'green' economy until 2030" (hereafter "the national Green Growth Strategic Framework, or GGSF). The GGSF Programme and Action Plan envisions establishing a modern monitoring, reporting, and validation (MRV) system for inventory of GHG emissions. The MoEF will implement the MRV system in collaboration with the MoEEPCC – Uzhydromet Centre from 1 January 2024. The national GGSF monitoring indicators and processes are further discussed in Chapter 7 of the report.

The SDGs, the eight indicators in the GGSF Programme and Action Plan and the OECD GGIs partially overlap. It is thus vital to ensure these three monitoring streams complement, rather than duplicate, to maximise the value added of each monitoring exercise. Table 1.2 helps to compare the three sets of indicators.

Table 1.2. Comparing different green-growth related indicators and targets

OECD Green Growth Indicators	National SDGs	National indicators for monitoring the transition to a green economy by 2030
Environmental and resources productivity of the economy		
• Production-based CO_2 productivity • Energy productivity • Energy intensity by sector • Share of renewable energy sources(and electricity) • Production-based materialproductivity • Solid waste generation intensity andrecycling ratio • Nutrient flows and balances in agriculture (N, P) • Water productivity	SDG 7: Clean energy SDG 11: Sustainable cities and communities SDG 13: Climate action	• energy intensity per unit of GDP • share of energy from solar power plants • share of renewable energy sources in total electricity generation • energy consumption in the industry • solid waste recycled
Natural asset base		
• Freshwater resources • Forest resources • Land resources • Wildlife resources and protected area	SDG 6: Clean water SDG 15: Life on land	• urban green (forest) areas • stocks of trees and shrubs on forest lands
Environmental dimension of quality of life		
• Environment induced healthproblems and related costs • Exposure to natural or industrial risks and related economic losses • Population connected to sewage treatment • Population with sustainable accessto safe drinking water	SDG 3: Health SDG 6: Clean water and sanitation	population access to improved drinking water
Economic opportunities and policy responses		
• Research and development expenditure in green growth • Environment-related innovation • International financial flows in green growth	SDG 9: Innovations and infrastructure SDG 13: Climateaction	No indicator
• Environment-related taxationand subsidies • Energy pricing • Water pricing	SDG 16: Partnership	
Socio-economic context		
• Economic growth and structure • Trade • Inflation and commodity prices • Labour force participation and unemployment • Population growth and structure	SDG 1: No poverty SDG 4: Quality education SDG 8: Decent work and economic growth SDG 10: Reduced inequalities	No indicator

OECD Green Growth Indicators	National SDGs	National indicators for monitoring the transition to a green economy by 2030
• Life expectancy • Inequality Gini index, N • Educational attainment: Access to education		

Source: Authors' compilation [1],[4],[5]

Uzbekistan's mandated public authorities – the MoEF and the SA – should establish a mechanism for regular data collection and reporting on GGIs. Developing a national OECD-based set of GGIs for Uzbekistan will complement the existing national monitoring processes. Although the national SDGs and the 2030 GGSF have a set of target values used in the monitoring processes, the OECD-based GGIs do not require established targets. Rather, they show a trend over time for supporting policy makers to make informed decisions. The OECD GGIs also enable comparison of Uzbekistan with other countries.

This report is the first attempt to assess Uzbekistan's progress towards a green economy using a set of OECD GGIs adapted to the national context. The report unveils historical green growth trends between 1991 and 2022 or the latest data available.

References

Amirova, I., E. Asfaw and K. Sultanova (2021), "Assessment of potential environment, social and economic impacts of Uzbekistan's COVID-19 response", report commissioned by the OECD under the Project for aGreen and Inclusive COVID-19 Recovery in Uzbekistan, Westminster International University in Tashkent, Tashkent.

Mirkasimov, B., Asfaw, E. B., Askarov, Z., and Mukhammedova, A. (2023), "Determinants of carbon emission and the potential economic impact of 'green' economy strategies in Central Asia: Kazakhstan and Uzbekistan" in Chapter 5, CAREC Institute. Available at: Chapter-5.pdf (carecinstitute.org)

OECD (2017), *Green Growth Indicators 2017*, OECD Green Growth Studies, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264268586-en.

OECD (2011), *Towards Green Growth,* OECD Green Growth Studies, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264111318-en.

2 Socio-economic context

This chapter looks at indicators describing Uzbekistan's socio-economic context and growth characteristics. It provides background information and helps track the effects of green growth policies on development. The indicators complement and assist in the understanding of the four main green growth indicator groups introduced in Chapter 1. The socio-economic indicators are grouped into three themes: economic growth and competitiveness; labour market, income and education; socio-demographic patterns. The definitions of the indicators, how they are measured in this report, and the data sources used are provided at the end of the chapter. Most of the socio-economic indicators are measured using Statistics Agency data, complemented by data from the World Bank.

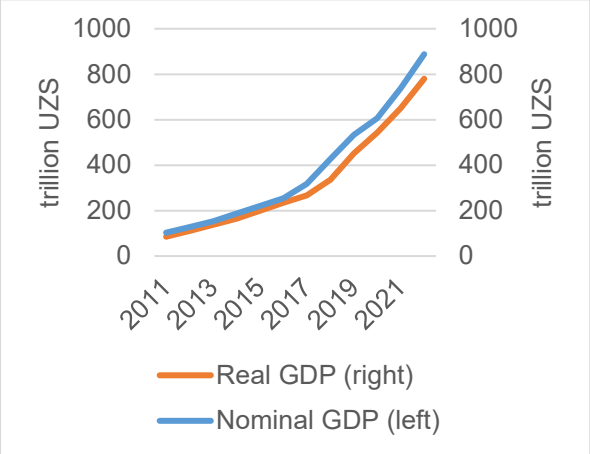
Economic growth and competitiveness

The section provides an important macroeconomic context of Uzbekistan for understanding the green growth indicators (GGIs).

Indicators:

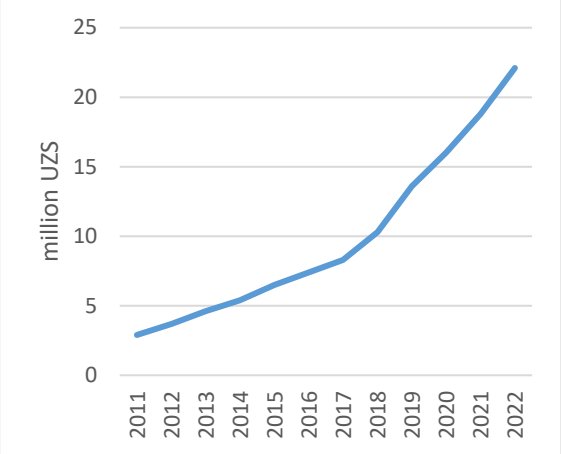
- nominal and real gross domestic product (GDP)
- GDP per capita
- GDP growth
- share of main sectors by value added
- Consumer Price Index (CPI) (inflation)
- foreign trade.

Figure 2.1. Gross domestic product (GDP)



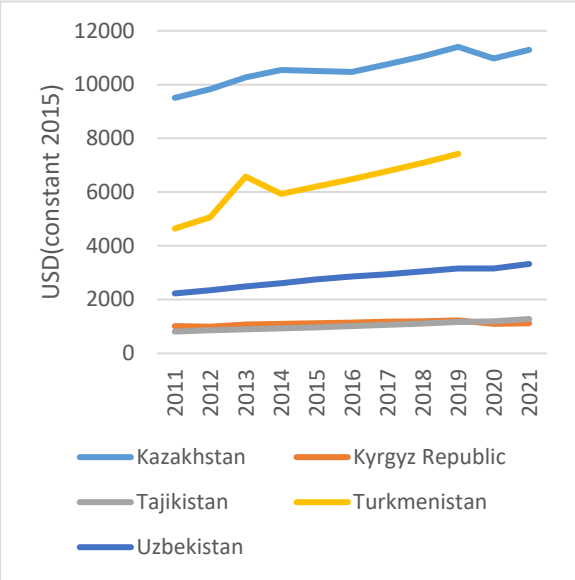
Source: Statistics Agency (2023).

Figure 2.2. Real GDP per capita



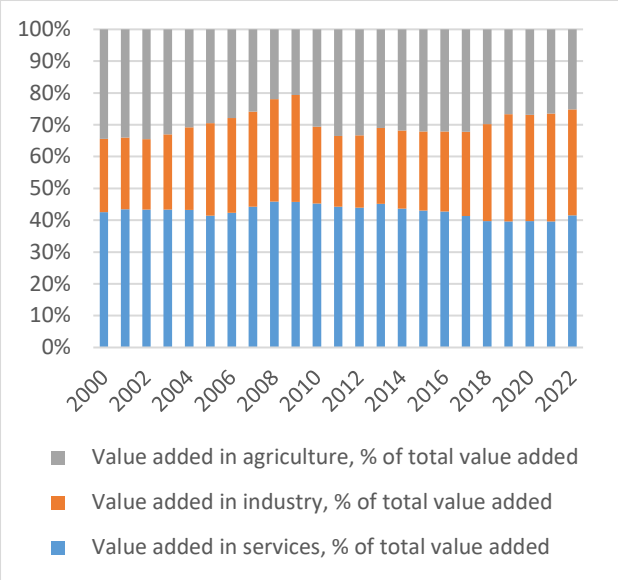
Source: Authors' calculation using Statistics Agency data, 2023.

Figure 2.3. GDP per capita, regional



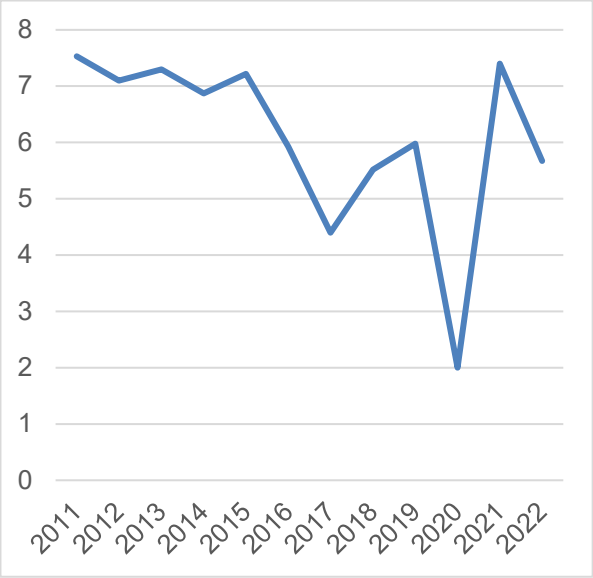
Source: World Bank (2023).

Figure 2.4. Share of main sectors by value-added



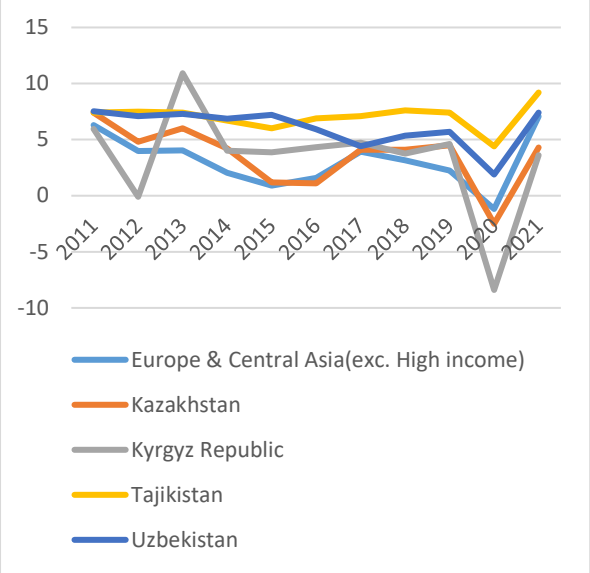
Source: Statistics Agency (2023).

Figure 2.5. Real GDP growth rate in percentage



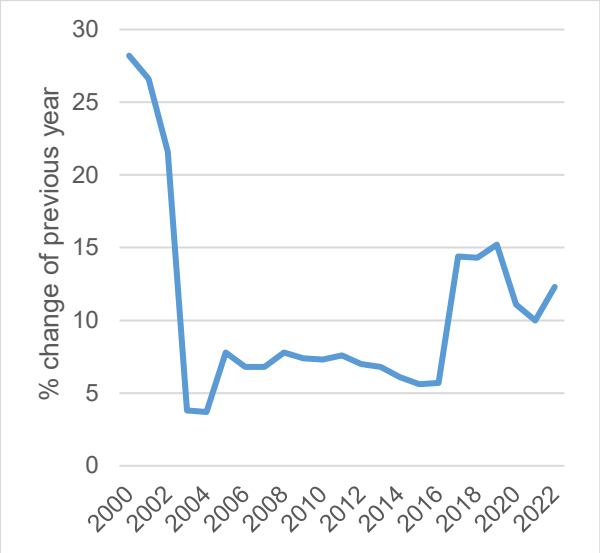
Source: Statistics Agency (2023).

Figure 2.6. GDP growth, regional percentage



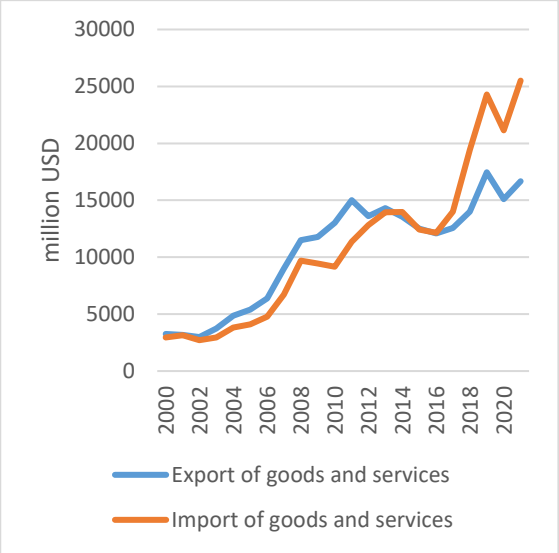
Source: World Bank (2023).

Figure 2.7. Consumer price index (CPI)



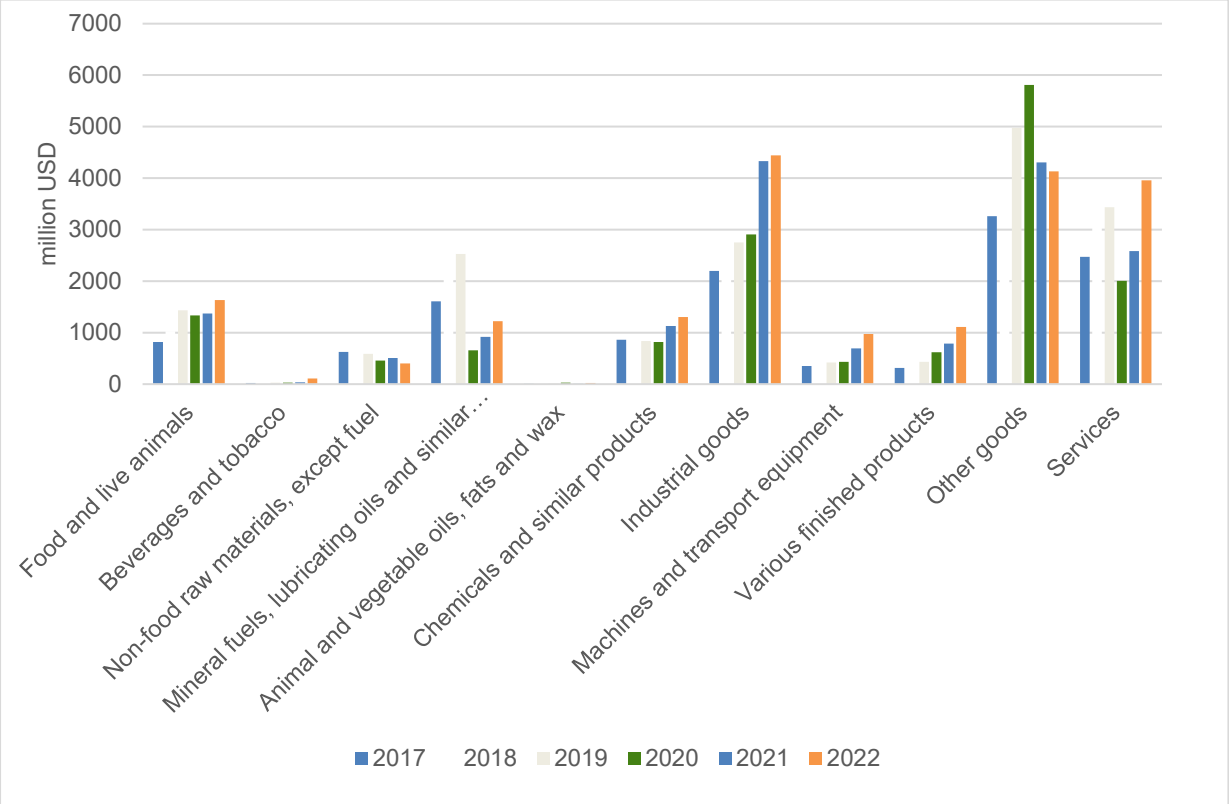
Source: Statistics Agency (2023).

Figure 2.8. Foreign trade



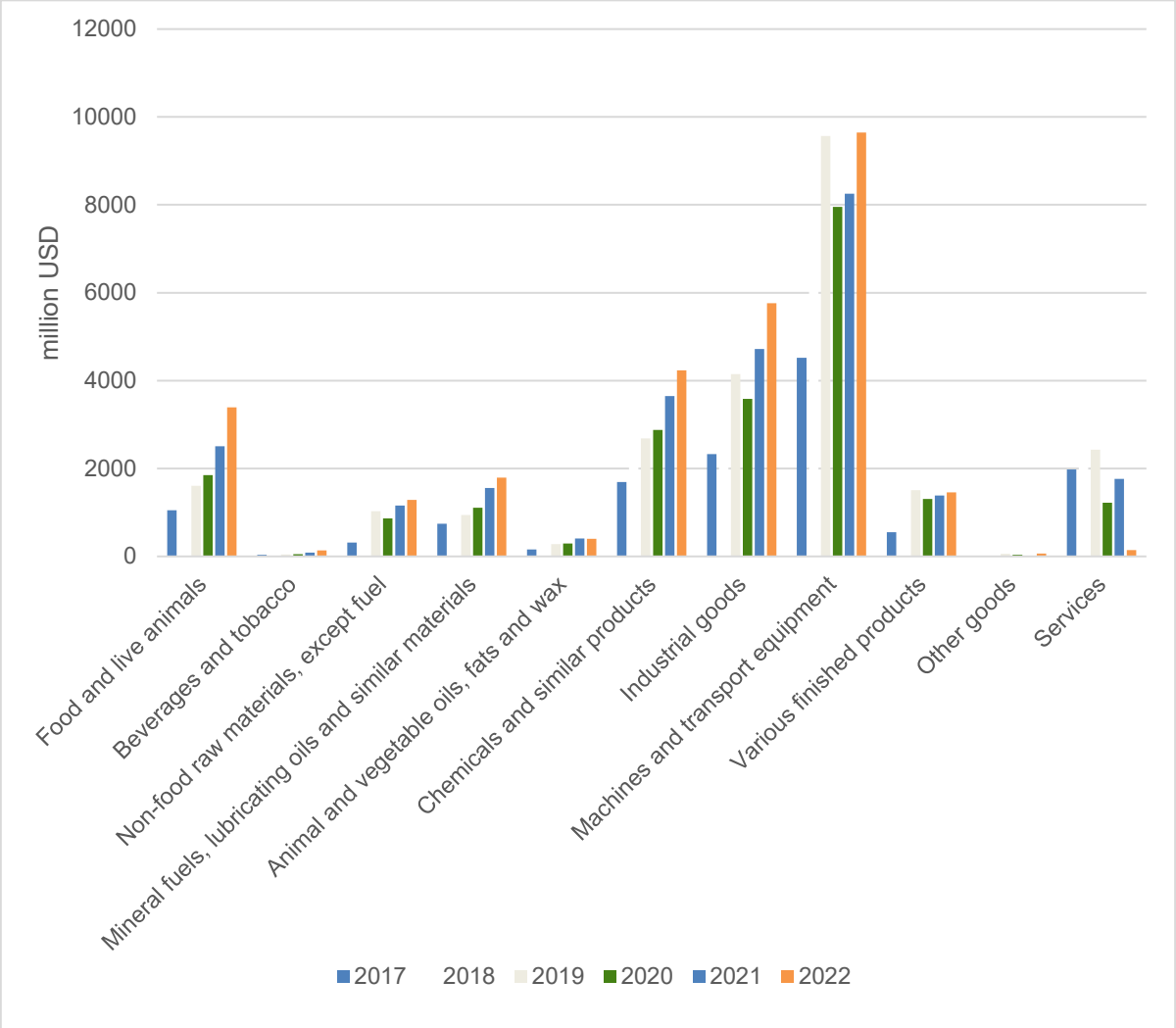
Source: Statistics Agency (2023).

Figure 2.9. Export composition



Source: Statistics Agency (2023).

Figure 2.10. Import composition



Source: Statistics Agency (2023).

Main trends

The economy and per capita income in Uzbekistan have been steadily increasing over the last three decades

In 2011-22, Uzbekistan's GDP in real value increased by 43% from USD 49.5 billion to USD 70.9 billion (or UZS 84.9 trillion to UZS 780.3 trillion) (Figure 2.1).[10] Similarly, the real GDP per capita increased sevenfold since 2011, reaching over USD 2042 (or UZS 22.1 million) in 2022 (Figure 2.2). The trend shows that economic growth is accompanied by the increasing prosperity of citizens. Furthermore, per capita income affected by the COVID-19 pandemic bounced back in 2021 to above pre-COVID values.

Compared to other Central Asian (CA) countries, Uzbekistan has the third highest real GDP per capita, after Kazakhstan and Turkmenistan (Figure 2.3).[11] By 2022, the service sector dominated Uzbekistan's production, contributing 41.5% of the total value added. It was followed by the industry and construction sector at 33.4%, while the share of agriculture decreased and equalled 25.1% of GDP (Figure 2.4).

Uzbekistan's economy grew on average by 6% annually between 2011 and 2022. The growth rate has slowed since 2015, with 4.4% in 2017 and around 5.5% and 6.0% in 2018 and 2019, respectively (Figure 2.5). The slowed-down GDP growth rate in 2017 reflects more accurate accounting than a sharp contraction (EBRD, 2017). GDP growth declined sharply to around 2% in 2020 due to the COVID-19 pandemic. However, the economy got back on track, with 7.4% and 5.7% growth in 2021 and 2022, respectively.

Economic growth in Uzbekistan is supported by a centrally planned and investment-led economic strategy. Most of the growth since 2010 has been generated through increases in capital stock and the value of natural resource exports, such as gold and natural gas (World Bank, 2022). In general, the GDP growth rate of Uzbekistan has followed the regional trend (Figure 2.6). In 2020, during the COVID-19 pandemic, Uzbekistan's GDP growth rate equalled 1.89%, mentioned above. Meanwhile, the average GDP growth rate of Europe and Central Asia (ECA) region (excluding high-income countries) was negative (-1.18%).

The inflation rate in Uzbekistan has been rising since 2016

The inflation rate, expressed in CPI, has been double digits since 2016 (Figure 2.7). It peaked at 15.2% in 2019, with an average of 11% over the past three years. The high inflation rates are due to the steady depreciation of the exchange rate, price deregulation, price increases and, more recently, global trends, including supply chain challenges and commodity price increases (IMF, 2022).

Foreign trade is an increasingly important factor in the Uzbekistan economy

Both import and export volumes increased significantly over the last decade. Import volumes grew eightfold from USD 3 billion in 2000 to USD 25.5 billion in 2021. Meanwhile, export volumes grew fivefold from USD 3.2 billion to USD 16.7 billion during the same period (Figure 2.8).

Uzbekistan is a net importer as of 2016. Based on the Standard International Trade Classification (SITC-2008), chemicals, industrial commodities, services, and other goods dominated the composition of Uzbekistan exports during the last five years. Exports of industrial commodities totalled more than USD 4 billion in 2021. More detailed commodities data based on the Harmonised System codes show that Uzbekistan exports precious metals, natural resources and unskilled labour (Figure 2.9). On the

[10] The real GDP in local currency is calculated by the SA using the production method and constant prices from previous year. We converted the real GDP value in local currency into USD values using official exchange rate (from previous year) provided by the Commercial Bank of Uzbekistan: https://cbu.uz/en/arkhiv-kursov-valyut/.

[11] Data for Turkmenistan GDP per capita (constant USD) are missing for 2020 and 2021.

other hand, machines and transport equipment dominate its imports (Figure 2.10). By 2021, the leading trade partners were the Russian Federation (17.9%), the People's Republic of China (17.7%), Kazakhstan (9.3%), Türkiye (8.1%) and South Korea (4.5%) out of total trade (Gazeta.uz, 2022).

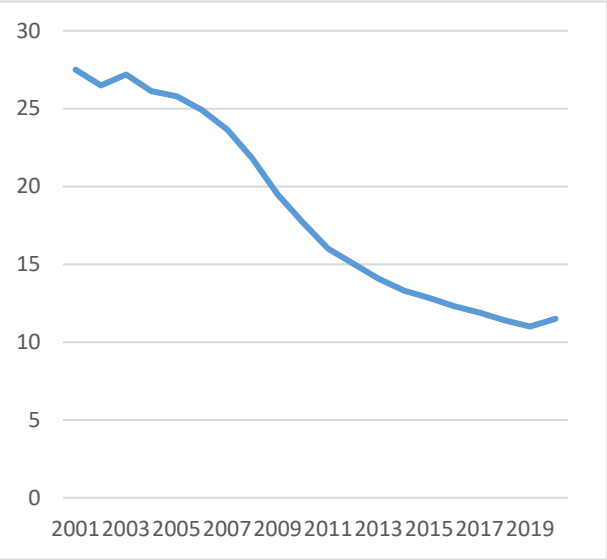
Labour market and socio-demographic patterns

Employment in the labour market and income levels of the population are at the centre of green growth strategies. Indicators in this section help to understand the effects of green growth policies on the labour market and income.

Indicators:

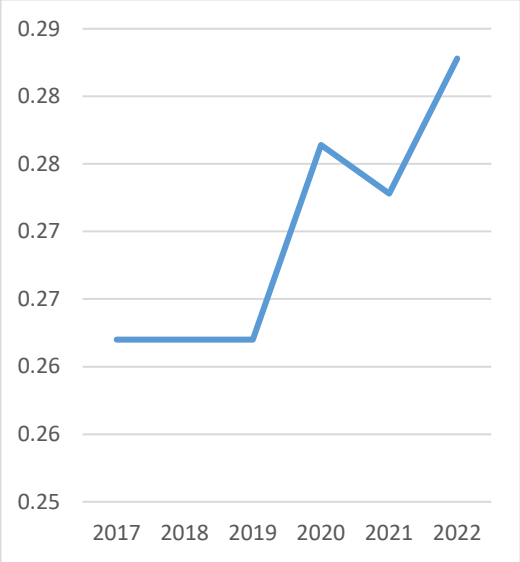
- share of the low-income population
- inequality (Gini coefficient)
- economically active population
- employment rate
- employment by sector
- school enrolment
- total population and structure
- life expectancy
- net migration.

Figure 2.11. Share of the low-income population



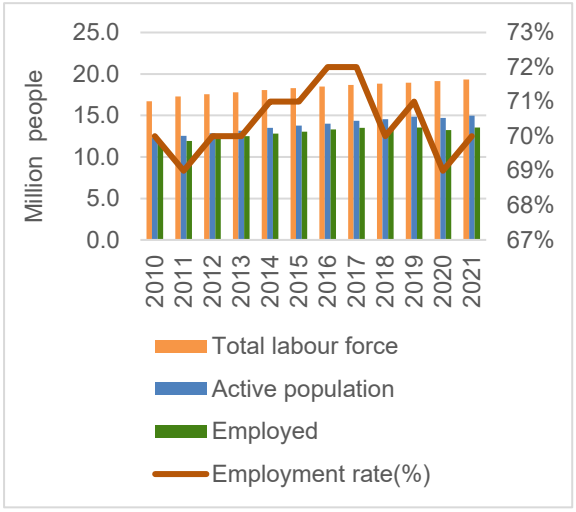
Source: Statistics Agency (2023).

Figure 2.12. Inequality (Gini coefficient)



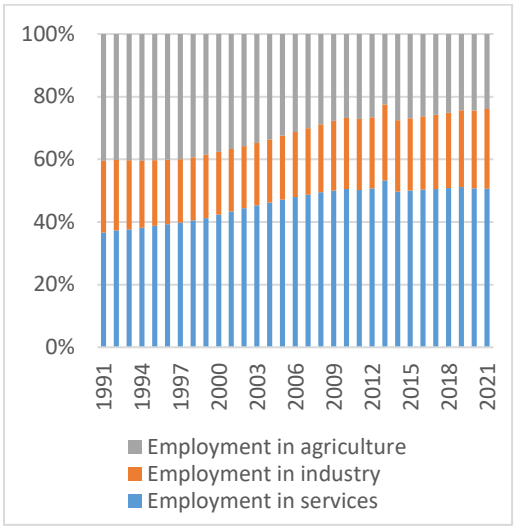
Source: Statistics Agency (2023).

Figure 2.13. Economically active population and employment



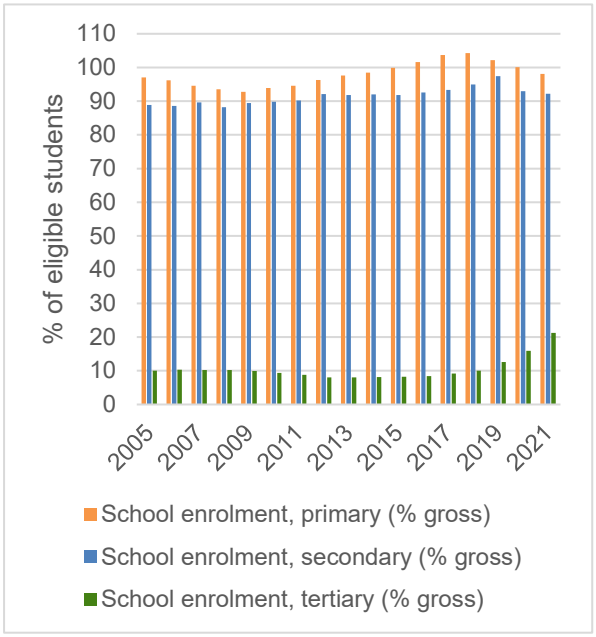
Source: Statistics Agency (2023).

Figure 2.14. Employment by sector



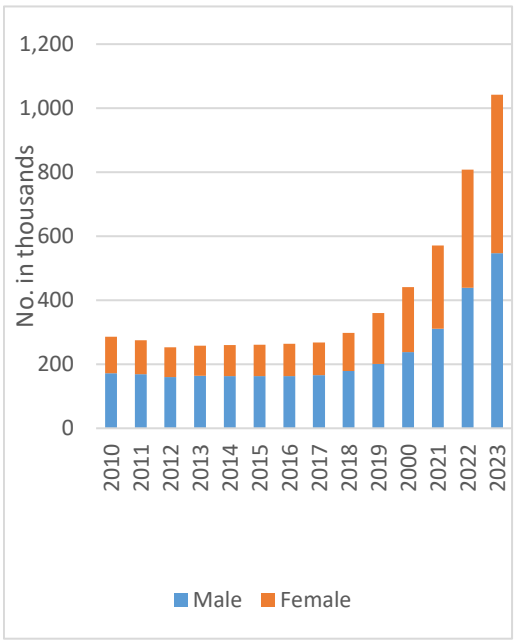
Source: World Bank. (2023).

Figure 2.15. Gross school enrolment



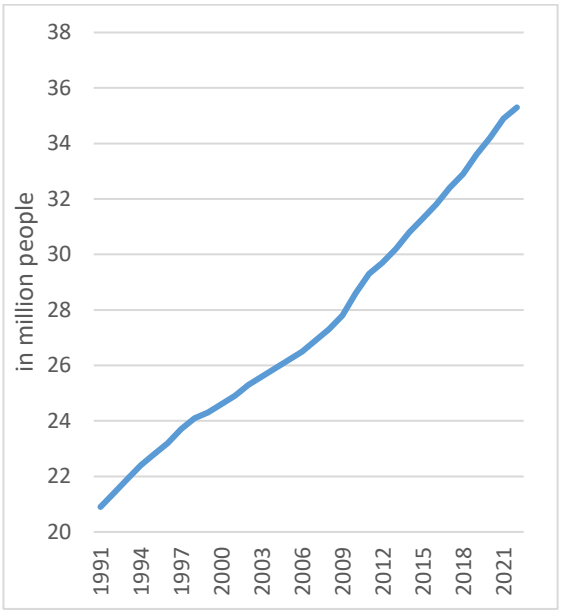
Source: World Bank (2023).

Figure 2.16. Number of students in higher education institutions by gender



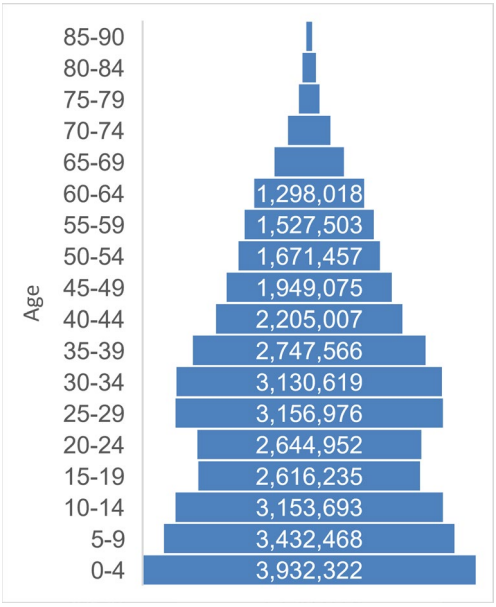
Source: Statistics Agency (2023).

Figure 2.17. Total population



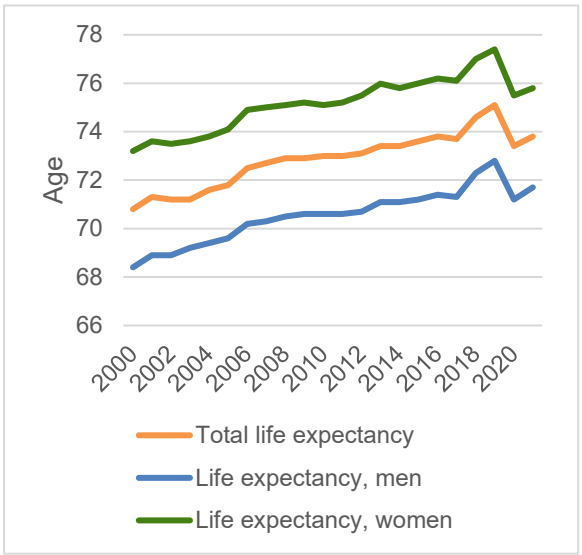
Source: Statistics Agency (2023).

Figure 2.18. Population structure by age, 2022



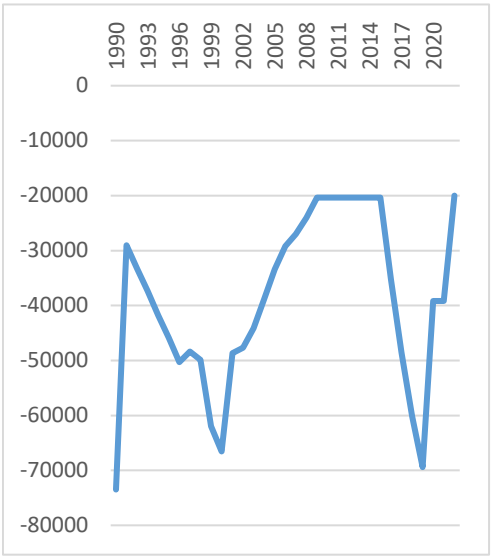
Source: Statistics Agency (2023).

Figure 2.19. Life expectancy



Source: Statistics Agency (2023).

Figure 2.20. Net external migration



Source: World Bank (2023)

Main trends

The proportion of low-income people was declining until the COVID-19 pandemic

The share of low-income population was halved between 2002-19. However, it rose by 0.5% in 2020 (Figure 2.11) due to the COVID-19 pandemic. The poverty rate in 2021 was 17% based on a new calculation method (SA, 2023).

Income inequality, increasing since 2019, was made worse by the COVID-19 pandemic. However, Uzbekistan has a low inequality or Gini index below 0.3 (Figure 2.12). The government holds income inequality in check through policy and public transfers (World Bank, 2022).

More than half the population is employed, but the employed labour force declined as of 2017

Uzbekistan's total labour force equalled 19.3 million people (more than half of the total population) in 2021, of which 15 million were economically active. The rate of the employed labour force increased until 2017 and declined to 70% in 2021 (Figure 2.13). On average, the employment rate per labour force was 71% in the last two decades.

Unemployment is exacerbated by the high youth-to-population ratio, creating a need for youth employment and active labour market policies (Honorati and Marguerie, 2021). Approximately 300 000 new jobs are required between 2020 and 2030 (ILO, 2021). Most new jobs are created in the informal sector (ILO, 2021), and many people are engaged in irregular employment (Dugarova, 2019). Young people – predominantly female, rural youth and youth from low-income households – face difficulties entering the labour market.

The employment structure in Uzbekistan, dominated by the agriculture sector in 1991, shifted to the service sector (Figure 2.14). In 2021, the primary employment sectors were services (51%), followed by industry (25%) and agriculture (24%).

The enrolment ratio of students in tertiary institutions remains low

Although Uzbekistan has achieved high gross enrolment ratios in primary and secondary education, enrolment in tertiary institutions remains low. With the creation of new local universities and branches of foreign institutions, tertiary enrolment increased from 8.5% to 21.2% over 2016-21.[12] However, this figure is still low (Figure 2.15) and only half of the global enrolment ratio of 40% in 2020 (World Bank, 2023).

The number of students attending higher education institutions increased by four-fold in the last decade (Figure 2.16). Also, the share of female students in the total students attending higher education increased from 40% in 2010 to 47% in 2023. Nevertheless, there is a need to improve the quality and relevance of education to the labour market needs (ILO, 2021).

The population of Uzbekistan has been steadily growing in the last three decades

On average, the population grew at 1.6% annually, reaching over 35 million in 2022 (Figure 2.17). The male and female population is proportional, and over half of the population lives in urban areas (SA, 2023). (Most of the Uzbekistan population is young, with 54% below the age of 30 in 2022 (Figure 2.18). Uzbekistan is the most populated country in CA. With economic growth, life expectancy in Uzbekistan increased for both men and women, reaching 75 years in 2019 (Figure 2.19). However, life expectancy dropped to 73 years in 2020 during the pandemic.

[12] World Bank data is used here. The SA of Uzbekistan data however indicates an increase from 7.2% to 28.2% in 2016 - 2021.

Uzbekistan has had negative net external migration during the last three decades

The net migration figure illustrates that more people were leaving the country than entering (Figure 2.20)[13]. Market-oriented reforms and economic uncertainties in the early 1990s caused internal and external migration. This was mainly due to a lack of decent employment opportunities. The external labour migration led to large remittance inflows, making Uzbekistan sixth among Asian recipient countries of international remittances by share of GDP in 2020 (IOM, 2022). In 2021, the share of received personal remittances to GDP equalled 13.3%.

Definitions of indicators

GDP: gross domestic product of a country calculated at current prices (nominal GDP) and at constant prices (real GDP).

GDP structure: percentage shares of value added in GDP by categories of main economic sectors in Uzbekistan: agriculture, industry and services.

GDP per capita: average annual income of the people in a country (annual real GDP is divided by the annual population number).

CPI: an indicator that shows changes in prices of goods and services over time consumed by the population. It shows the changes in the value of inflation in the economy for a fixed set of consumer goods and services.

Export: transaction of goods and services from Uzbekistan to a foreign state in monetary value.

Import: transaction of goods and services from a foreign state to Uzbekistan in monetary value.

Share of low-income population: the share of the population below income estimates of 2 100 kilocalories per day, as recommended by the World Bank.

Gini coefficient: an index between 0 and 1 based on the comparison of cumulative proportions of the population against cumulative proportions of income they receive.

Economically active population: the proportion of the population aged 15 and older that is economically active and seeking employment during a specified period.

Employment: persons of working age engaged in any activity to produce goods or provide services for pay or profit, whether at work during the reference period or not at work due to temporary absence from a job or working-time arrangement.

School gross enrolment ratio: the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.

Total population: number of people permanently living in the country at the beginning of the year, regardless of legal status or citizenship.

Life expectancy: average number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.

Net external migration: the net total of migrants during the period (i.e. the number of immigrants minus the number of emigrants, including citizens and noncitizens).

[13] The population is growing due to declining mortality and increasing fertility rates, despite the number of people leaving Uzbekistan is more than people entering.

Technical comments on measurability and interpretation

Table 2.1 describes the unit of measurement, measurability, interpretation, source and years of data for the indicators included in this chapter.

Table 2.1. Measurability, interpretation and data source on socio-economic context

Indicators	Unit of measurement, measurability and interpretation	Source of data and years covered
GDP	Nominal and real GDP in trillion Uzbekistan Soums (UZS).The SA calculates GDP at constant prices by the production method with reference to the previous year's prices, while the World Bank reports constant prices in 2015 US dollars.	SA 2011-22 https://stat.uz/en/official-statistics/national-accounts.
GDP growth rate	Annual percentage change of real GDP values. The SA reports GDP growth rate as the percentage changes to the previous year at constant prices (UZS) calculated by the production method.	SA 2011-22 https://stat.uz/en/official-statistics/national-accounts.
Real GDP per capita	Real GDP per population in UZS is the ratio of real GDP to the annual permanent population, UZS/person.	Authors' calculation using SA data 2011-22.
Share of sectors value addition in GDP	Percentage of total value added in GDP by the main sectors (in agriculture, industry and services).	SA 2000-21 https://stat.uz/en/official-statistics/national-accounts.
Consumer Price Index (CPI)	Annual percentage change in the price of a basket of commodities based on SA calculation of price data in the consumer market. This report uses the percentage changeas of December of the previous year.	SA 2000-22 https://stat.uz/en/official-statistics/prices-and-indexes.
Foreign trade	Export and import values of goods and services in million USD.	SA 2000-22 https://stat.uz/en/official-statistics/merchandise-trade.
Share of low-income population	Percentage of the population with income less than a given amount. The SA collects data on the indicator through household surveys. However, it calculates the poverty rate as of 2021 using different measurement methods.	SA 2001-20 https://stat.uz/en/official-statistics/living-standards.
Gini coefficient	Index number. The coefficient ranges between 0 in the case of perfect income equality and 1 in the case of perfect income inequality.	SA 2017-20 https://stat.uz/en/official-statistics/living-standards
Economically active population and employment	Percentage of the total labour force actively searching for jobs. The employment rate here in the report is a proportion (percentage) of the labour force employed.	SA 2010-21 https://stat.uz/en/official-statistics/labor-market.

Employment by sector	Percentage of total employment by main sectors of the economy.	World Bank 1991-2021 https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=UZ.
School enrolment	Percentage of total candidates enrolled in schools at primary secondary and tertiary levels. Number of students attending higher learning institutions	World Bank 2005-21 https://data.worldbank.org/indicator/SE.SEC.ENRR?locations=UZ. SA https://stat.uz/en/official-statistics/social-protection.
Total population and structure	Number of people permanently living in Uzbekistan at the beginning of the year.	SA 1991-2022 https://stat.uz/en/official-statistics/demography.
Life expectancy	Average number of years, showing premature death.	SA 2000-21 https://stat.uz/en/official-statistics/demography.
Net external migration	Net external migration in numbers – number ofimmigrants minus the number of emigrants.	World Bank 2000-21

References

Dugarova, E. (2019), "Poverty Reduction through Social Protection and Labor Policies in the Former Soviet Union', in *Social Policy, Poverty and Inequality in Central and Eastern Europe andthe Former Soviet Union*, p. 45, www.crop.org/social-policy-poverty-and- inequality-in-central-and-eastern-europe-and-the-former-soviet-union.aspx.

EBRD (2017), *Transition Report 2017-18, Country Assessments: Uzbekistan,* www.ebrd.com/documents/oce/pdf-transition-report-201718-uzbekistan.pdf.

Gazeta.uz. (2022), Внешнеторговый оборот Узбекистана в 2021 году увеличился на 16%. [Foreign trade turnover of Uzbekistan in 2021 increased by 16%], www.gazeta.uz/ru/2022/01/21/trade/.

Honorati, M. and A. Marguerie (2021), *Youth Employment in Uzbekistan: Opportunities and Challenges*, World Bank, Washington, DC, https://documents.worldbank.org/pt/publication/documents-reports/documentdetail/666311634704762319/youth-employment-in-uzbekistan-opportunities-and-challenges.

IOM (2022), *World Migration Report 2022*, International Organization for Migration, Geneva, https://worldmigrationreport.iom.int/wmr-2022-interactive/.

ILO (2021), *Towards Full and Productive Employment in Uzbekistan: Achievements and Challenges,* International Labour Organization, Geneva, www.ilo.org/moscow/information-resources/publications/WCMS_782059/lang-- en/index.htm.

IMF (2022), *Uzbekistan's Transition to Inflation Targeting*, Working Paper, International Monetary Fund, Washington, DC, www.imf.org/en/Publications/WP/Issues/2022/11/18/Uzbekistan-s-Transition-to-Inflation-Targeting-525745.

Statistics Agency of Uzbekistan (2023), data on demographic indicators available at: https://stat.uz/en/official-statistics/demography.

World Bank (2022), *Toward a Prosperous and Inclusive Future: The Second Systematic Country Diagnostic for Uzbekistan*, World Bank, Washington, DC, https://documents1.worldbank.org/curated/en/933471650320792872/pdf/Toward-a-Prosperous-and-Inclusive-Future-The-Second-Systematic-Country-Diagnostic-for-Uzbekistan.pdf.

World Bank (2023), Gross enrolment ratios, Available at: https://data.worldbank.org/indicator/SE.TER.ENRR.

3 Environmental and resource productivity of the economy

This chapter explores whether Uzbekistan is becoming more efficient in using natural resources and environmental services. The green growth indicators (GGIs) capture the efficiency with which economic activities use energy, natural resources and materials. These groups of indicators are essential for decoupling economic growth from environmental pressures. Understanding Uzbekistan's carbon and energy productivity trends is key for tracking its green growth transition. Indicators are grouped into the themes of carbon and energy productivity and resource productivity. The definitions of the GGIs, how they are measured and interpreted, and sources of data used are provided at the end of the chapter.

Carbon and energy productivity of the economy

Carbon and energy productivity characterise the interaction with climate change, consumption and the results of policies that promote low-carbon technologies and green energy (OECD, 2014). These indicators are key to identifying the decoupling between economic growth and environmental pressures. They are also key to understand Uzbekistan's efforts to decarbonise the economy. Carbon and energy productivity are important indicators of green growth. Thus, understanding the trends and reasons for their dynamics is a necessary component of green growth policy development. Productivity, as an indicator, emphasises the amount of economic benefits generated per unit of energy used. Carbon and energy productivity indicators are the inverse of carbon and energy intensity indicators used in Uzbekistan's green economy strategic action plans.

Indicators in this sub-group are related to production-related carbon emissions. The report does not assess demand-based CO_2 productivity (adjusted for trade) or environmentally adjusted multifactor productivity indicators due to lack of data to measure the indicators. Indicators only consider CO_2 emissions rather than all GHG emissions. CO_2 emissions accounted 50-55% of the greenhouse gas (GHG) emissions in Uzbekistan between 1991-2019 (Center of Hydrometeorological Service, 2021).

This monitoring report could not access national statistical data for the carbon emission indicators at the time of writing. Thus, the data are complemented by the *OECD. Stat* database. The Statistics Agency (SA) neither collects nor compiles data on carbon emissions. However, access to data on carbon emission and other GHG emissions is a crucial variable in calculating the carbon intensity of gross domestic product (GDP), productivity and emissions per capita.

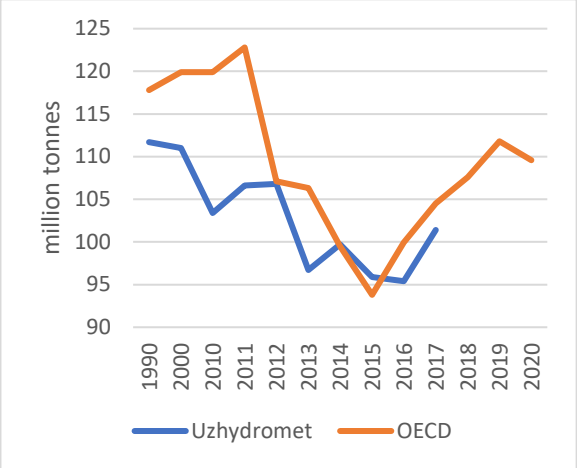
From the discussion at the expert meeting in July 2023, the Center of Hydrometeorological Service of the Republic of Uzbekistan (Uzhydromet) is appointed national co-ordinator for the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC). In this role, it collects data on selected GHG emissions, including CO_2 as part of the GHG inventory (UNFCCC, 2021). However, recent carbon emission data were unavailable for this report.

The SA's open data portal has some energy-related statistics, including energy supply, energy intensity, energy per capita and share of renewable energy supply under the "Industry" heading. By adopting international methodologies, the SA and the Ministry of Economy and Finance (MoEF) need to collaborate with the Uzhydromet to provide up-to-date emission data openly. Open access to statistics on emissions and their sources, and energy consumption through the SA is valuable. It permits monitoring the trend in decarbonising the economy and measuring energy efficiency in the economy. Quality information on carbon emissions and energy is also valuable for evaluating the impact of policies that promote carbon-neutral and energy-efficient interventions.

Indicators:

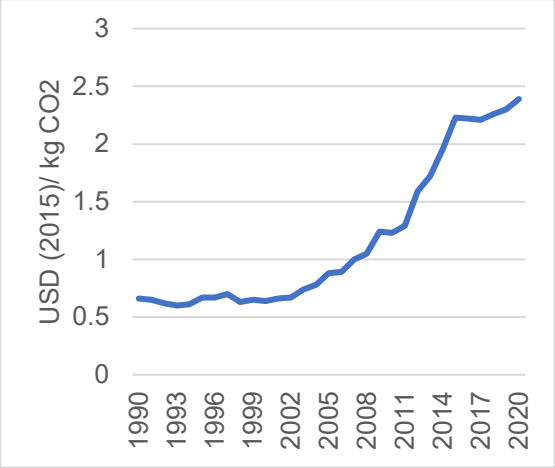
- CO_2 emissions
- production-based CO_2 productivity
- total primary energy supply (TPES)
- share of renewable energy sources (RES) in the TPES
- share of renewable energy sources (RES) in electricity generation
- energy productivity
- energy consumption by sectors
- energy intensity of GDP.

Figure 3.1. Production-based CO_2 emissions



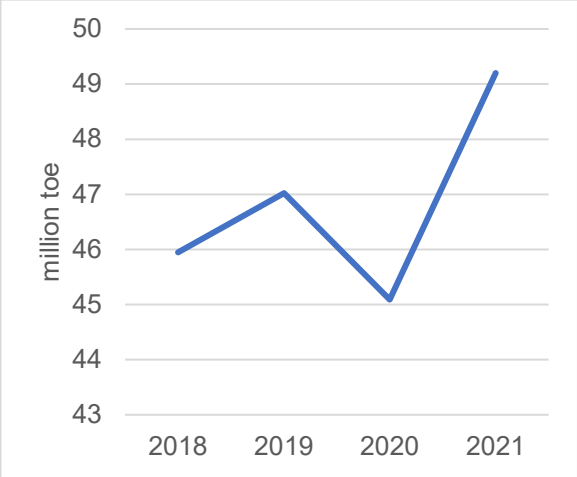
Source: OECD (2023) and Uzhydromet (2021)

Figure 3.2. CO_2 productivity



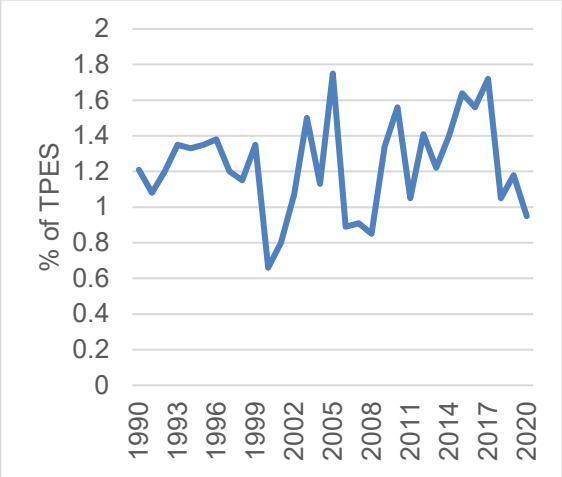
Source: OECD (2023).

Figure 3.3. Total primary energy supply (TPES)



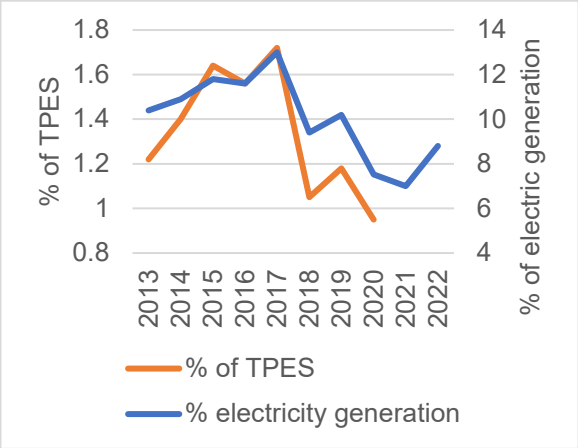
Source: Statistics Agency (2023).

Figure 3.4. Share of renewable energy supply (RES)



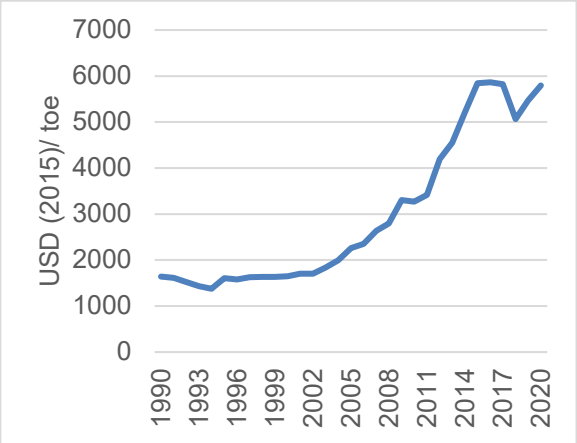
Source: OECD (2023).

Figure 3.5. Share of RES in electricity generation



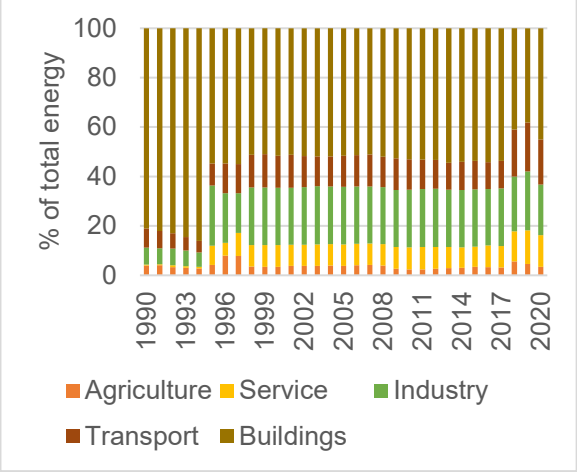
Source: Statistics Agency (2023).

Figure 3.6. Energy productivity



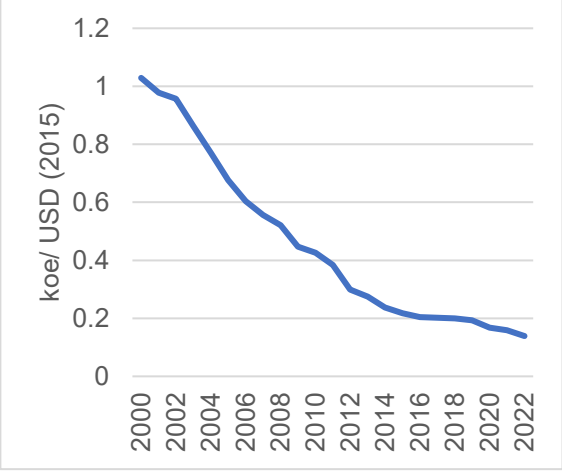
Source: OECD (2023).

Figure 3.7. Share of energy consumption by sector



Source: OECD (2023).

Figure 3.8. Energy intensity of GDP



Source: Statistics Agency (2023).

Main trends

Carbon emissions in Uzbekistan fluctuated with a general increasing trend

Despite the difference in the values recorded by the Uzhydromet and OECD, annual CO_2 emissions in Uzbekistan in both records showed an increasing trend. They fluctuate slightly above 95 million tonnes (t) but below 125 million t between 1990-2020 (Figure 3.1). Emissions surged in the early 2000s, with a subsequent drop between 2012-16. The emissions resumed an upward trajectory post-2016, with a noticeable drop in 2020. In 2021, the CO_2 emissions per capita in Uzbekistan which shows the

contribution of the average citizen to the total emission was 3.6 t. This was much less than the Central Asia (CA) average of 6.7 t per person (OWD, 2023).

Despite increased emissions, Uzbekistan is a minor contributor to global carbon emissions. In 2020, its emissions were 20 times less than the average of Eastern Europe, Caucasus and Central Asia (EECCA), contributing 5% of the region's emissions (OECD, 2023). Uzbekistan's global emissions share has been 0.33% over the last three decades (OWD, 2023). The energy (power) sector is the major CO_2 emitter, with 79% of emissions from the burning of natural gas fuel to generate electricity and heat.

Carbon emissions varied with the changes in economic activity. Emissions increased when the economy expanded after independence in the late 1990s, and decreased when fewer fossil fuels are used in the economy. Mirkasimov et al. (2023) studied drivers of emission drawing on 30 years of data (1990-2020). They show that emissions increased when the economy (real GDP) expanded, energy use and exports increased, and urbanisation and population grew. A 1% increase in population growth, energy use and urbanisation in Uzbekistan increased CO_2 emissions by 1.1 units, 0.0003 units and 0.071 units, respectively. By contrast, the use of renewable energy and an increase in forest cover by 1% will reduce CO_2 emissions by -0.063 and by -0.516 units, respectively. The study also shows that exports of goods increase CO_2 emissions, while imports have a negative association. In addition, it indicates that emissions decline with continued increases in GDP where further economic growth reduces CO_2 emissions through investments in sustainable environmental projects, including renewable energy sources.

The carbon productivity of the economy increased over 1991-2020

Despite increasing emissions, CO_2 productivity has gradually and steadily increased, indicating an increase in output produced per unit of CO_2 emitted (Figure 3.2). By 2020, USD 2.39 was produced per kg of CO_2 emitted versus USD 0.6 in 1990, showing a fourfold increase in the carbon productivity in the economy. However, this value is still less than the EECCA regional average of USD 2.46 (OECD, 2023). The increase in carbon productivity results from the consumption of natural gas fuel with lower carbon content. At the same time, CO_2 emissions are increasing against the background of relatively steady GDP growth during the period as shown in chapter 2. These factors helped decouple CO_2 emissions from GDP and were especially evident between 2012-15 when the GDP grew steadily against the background of declining CO_2 emissions.

Total primary energy supply showed a generally increasing trend in the last five years

Uzbekistan's TPES, consisting of non-renewables and RES, increased modestly to 49.2 million tonnes of oil equivalent (toe) in 2021, despite a drop in 2020 (Figure 3.3). On average, Uzbekistan supplied 46.8 million toe primary energy annually between 2018-21. The TPES did not change significantly, never surpassing 50 million toe, despite the growing population. Thus, energy per capita declined from 2.2 toe in 2000 to 1.4 toe in 2021 (Statisticsl Agency, 2023a).

Although the energy supply is higher than average for CA, it is 280 times less than the world average and 20 times less than the EECCA regional average in 2020 [2]. IRENA (2022) indicates that Uzbekistan was energy self-sufficient by 114% in 2019. In the same year, the country exported 20% of its produced energy, while importing 5% of the energy supply.

The share of renewable energy sources in the TPES and electric generation is low and has declined over the last five years

The share of RES in the primary energy mix is generally decreasing and is small, under 1% in 2020 (Figure 3.4). Over three decades (1990-2020), RES averaged about 1.2%. The value is less than the EECCA region average of 3.3% in 2020 and is significantly lower than the 15% average in CA (OECD, 2023). Almost all (99%) of the renewable energy supply comes from hydropower, followed by solar

energy, a relatively recent but growing energy source as of 2015 Statistics Agency (2023a). Despite the high potential, the contribution of RES to the energy mix remains low, and its production takes slow paths.

The share of RES in electricity generation was on a downward trend at only 8.8% in 2022 (Figure 3.5), showing that non-renewables continue to dominate national electric power generation. The share of RES in electricity generation was as high as 13% in 2017, but the value has declined in the last five years. Natural gas is the source of 74% of electricity production, followed by hydropower (21%). The share of RES in electric generation for Uzbekistan is three times less than the world average and five times less than the CA average of 40% (OECD, 2023).

Uzbekistan heavily relies on non-renewable sources like natural gas, oil, and coal for its primary energy supply. In 2021, of the total non-renewable fossil fuels, 85% was from natural gas, 9% from oil and 4% from coal (OWD, 2023). The use of natural gas increased from 63 million t in 1990 to 96.18 million t in 2021 (OWD, 2023), retaining its dominant position in the energy mix.

The outdated infrastructure, power plants and grid systems have been predominantly designed to accommodate the conventional energy sources. This creates a barrier to the fast integration of additional and RES (IEA, 2022). For instance, there were no industrial-scale solar power plants or wind farms in 2019.

Limited public awareness and understanding of the benefits and potential of renewable energy, including solar power, also hinder the integration of renewables into the energy supply. IEA (2022, 2020) indicate less urgency and incentive in diversifying the country's energy mix. This is due to abundant fossil fuel resources and reserves, high initial investment costs for renewable energy technologies, and limited expertise and experience. Nevertheless, in recent years, the energy sector has made efforts to increase the share of renewables in its energy mix and electric generation. Several policy documents, including the Green Economy Transition Strategy by 2030, indicate ambitions for more RES in electricity generation.

Energy productivity in Uzbekistan has increased over 2000-20 and thus the energy intensity of the economy declined in the last two decades

Uzbekistan is becoming more efficient in using energy, evidenced by a gradual increase in energy productivity, which tripled from 2005-20 (Figure 3.6). This means less energy is consumed per unit of GDP value produced. By 2020, Uzbekistan generated USD 5 798 per every toe energy used versus USD 1 643 in 1990, surpassing the EECCA region's average of USD 5 231(OECD, 2023). The increased productivity is driven by state policies that prioritise, promote and invest in improved, energy-efficient technologies in the main economic sectors, particularly industry (IEA 2022).

Residential and commercial buildings lead in energy consumption, making up 43% of the total, followed by industry (27%) and transport (18%) in 2020 (Figure 3.7). The service and agriculture sectors consume the least energy (12%). A notable spike in energy use was observed in the industry and service sectors post-1995.

From 2000-21, Uzbekistan's energy intensity of GDP declined, dropping from 1.03 kilogrammes of oil equivalent (koe)/USD to 0.14 koe/USD (Figure 3.8). Despite the decline in recent years, energy intensity is still high compared to the global average of 0.11 koe/USD. Uzbekistan was the eighth most energy-intensive country in 2022 (Emerdata, 2023). It has been implementing reforms in recent years to reduce energy intensity. However, challenges remain associated with outdated infrastructure and slow-paced updates (IEA, 2022).

Resource productivity of the economy

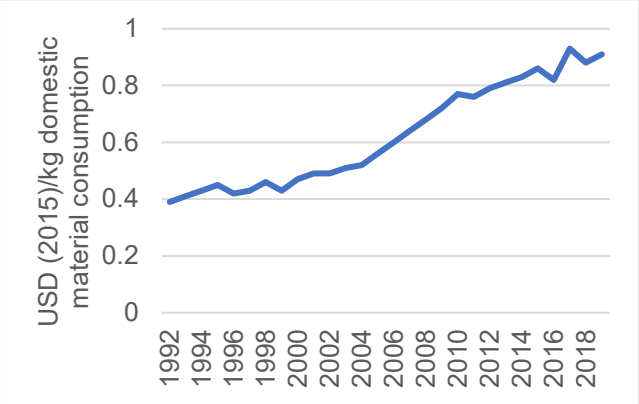
Resource productivity characterises the economic efficiency of using natural resources and materials in the production and consumption process. It reflects the results of policy measures that promote sustainable resource use and consumption. OECD (2017) indicates that countries are challenged to ensure efficient use of material resources at all stages of the material life cycle and to reduce the burden on natural resources. Thus, reducing the volume of waste and more recycling is essential.

Both agricultural land and water productivity indicators are vital for Uzbekistan. This report, however, only measures the water productivity indicator.

Indicators:

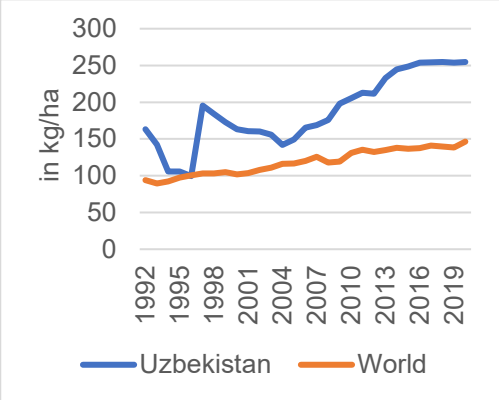
- domestic material (biomass, metallic and non-metallic) consumption (DMC) productivity
- fertiliser used on cropland
- solid waste generated and proportion recycled
- water productivity.

Figure 3.9. Material productivity



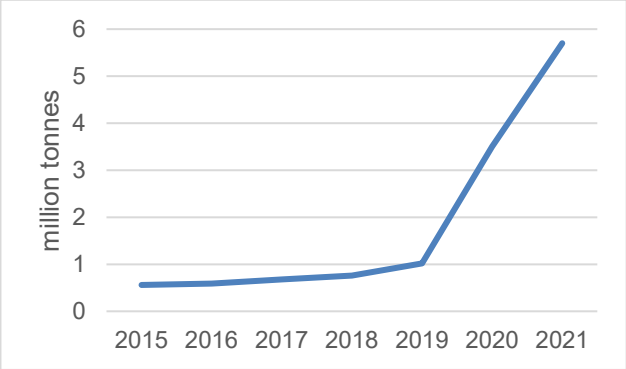
Source: OECD (2023).

Figure 3.10. Fertiliser use



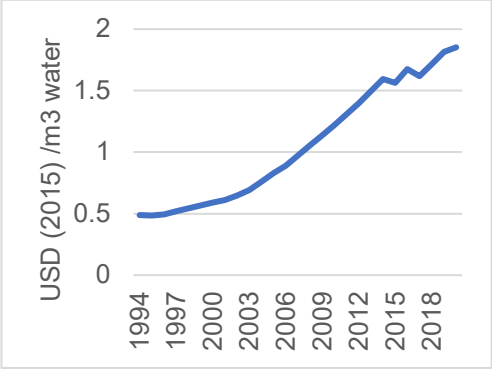
Source: World Bank (2023).

Figure 3.11. Household solid waste produced



Source: Statistics Agency (2023).

Figure 3.12. Water productivity



Source: World Bank (2023).

Main trends

Material productivity increased moderately between 1992-2019

Economic efficiency in Uzbekistan, reflected in its material productivity which measures output generated from a given amount of materials, is on the rise. In 2019, for every kg of material (metal, non-metal or biomass) used, the output doubled from USD 0.4 to USD 0.9 in 1992 (Figure 3.9). In CA, only Turkmenistan and Kazakhstan surpass Uzbekistan with DMC productivity values of USD 1.98 and USD 1.02, respectively (OECD, 2023).

Mineral fertiliser use per unit of cropland is increasing

Fertiliser consumption per ha of cropland in Uzbekistan increased by more than 50% in the past 30 years, amplifying environmental concerns. In 2020, this figure stood at an average of 255 kg, higher than the global average by 75% (Figure 3.10). Uzbekistan contributed 0.6% of global fertiliser pollution in 2009, derived from 94 kg of excess nitrogen per hectare (Roser, Ritchie and Ortiz-Ospina, 2021).

Household solid waste has increased sharply since 2019, while only a quarter of total solid waste was recycled by 2021

By 2021, Uzbekistan witnessed an annual household solid waste generation of 5.7 million t or 165 kg per capita (Figure 3.11). Government projections indicate this could reach 7.0 million t by 2030, with another 1.4 million t emanating from commercial and government sectors. The growing waste generation is not decoupled from economic growth. The waste composition includes 25% food, 10% paper and 50% polymers (Statistics Agency, 2023b).

National solid waste management (SWM) systems are rudimentary. As a result, most waste ends up in open landfills without substantial processing (IEA, 2022). All city residents have regular solid waste collection, but the total population covered by collection services was only 48% in 2018. However, this was a significant increase from the 6% covered in 2016 (Statistics Agency, 2023b).

Waste collection is improving. Solid waste recycling increased from 1.4 million t in 2019 (9%) to 1.7 million t (26%) by 2021 (Statistics Agency, 2023b). Furthermore, in 2019, a “Strategy for solid waste management in the Republic of Uzbekistan for 2019-2028” was approved to strengthen the legal framework in SWM (Resolution of the President of the Republic ofUzbekistan, 2019).

Water productivity increased since 2000

Uzbekistan's water productivity indicator – output per cubic metre of water – nearly quadrupled between 1994-2019, moving from USD 0.48 to USD 1.8 (Figure 3.12). This increase is attributed to recent policy interventions promoting water-saving technologies and efficient irrigation systems combined with GDP growth. Nevertheless, the water productivity level was ten times less than the world average (USD 20) and 23 times less than the ECA region average in 2020 (World Bank, 2023a).

Definition of indicators

Production-based carbon emissions: emissions related to the production process in the economy. This is carbon emitted from the burning of fossil fuels like coal and oil, and gas for energy production and industrial production of materials (such as cement, steel and other industrial processes in the country).

Carbon productivity of the economy: amount of output (in GDP produced per unit of CO2 emitted in the production process of the country).

TPES: energy input found in nature before transformation to final forms of energy for end-use (such as electricity or petrol for transport). It includes non-renewables (coal, oil, natural gas), minerals and renewables (OWD, 2023).

Renewable energy: energy derived from natural processes that are replenished constantly. It includes energy from hydro, geothermal, solar, wind, combustible renewables (solid biomass, liquid biomass, biogas) and waste (renewable municipal waste).

Share of renewable energy supply: the proportion of primary energy generated from hydropower, solar, wind, biomass, waste, geothermal, wave and tidal sources. This indicator looks at the data on renewable energy technologies, their share of energy supply and how quickly the proportion changes.

Share of renewables in electricity generation: the share of electricity generated from renewable sources of energy, including hydropower, solar, wind, biomass and geothermal sources.

Energy productivity: Income (in GDP) generated per unit of TPES in the process of production.

Energy consumption by sector: percentage of the total energy used by sectors (agricultural services, transport, industry).

Energy intensity: the ratio of primary energy consumption over GDP measured in constant US dollars. Energy intensity measures the amount of energy consumed per unit of GDP to identify how efficiently a country uses energy to produce a given amount of economic benefit.

DMC: the sum of the amount of materials biomass, non-metal and metal material resources (in terms of weight) used in an economy (i.e., materials extracted or harvested in the country, plus materials and products imported, minus material and products exported (OECD, 2017). It measures the amount of material used in an economy.

DMC productivity: output in the economy generated from using a unit of material.

Household solid waste: waste originating from households and collected by municipalities.

Recycling MSW: any reprocessing of material in a production process that diverts it from the waste stream.

Fertiliser use: the quantity of plant nutrients used per unit of arable land. Fertiliser products cover nitrogenous, potash and phosphate fertilisers.

Water productivity: measures how much output is produced in monetary terms per unit of freshwater withdrawn.

Technical comments on measurability and interpretation

Table 3.1 provides comments on the unit of measurement, measurability, interpretation, source and years of data for the indicators included in the chapter.

Table 3.1. Measurability, interpretation and data source on CO_2, energy, and material productivity

Indicators	Unit of measurement, measurability and interpretation	Data source and years covered
Production-based CO_2 emission	Tonnes of carbon emitted from the production process in the economy.	OECD 1990-2020 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Production-based CO_2 productivity	USD/kg of CO_2 emissions. This report uses OECD data. Uzhydromet collects data on carbon emissions until 2017.	OECD 1990-2020 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Total primary energy supply	Amount of energy supplied in tonnes of oil equivalent (toe).	SA 2018-21 https://stat.uz/en/official-statistics/industry.
Share of RES in TPES	Percentage of renewable energy of total primary energy supplied (TPES) in million toe. The indicator measures the share of low-carbonrenewable energy sources in the total energy mix supplied in Uzbekistan	OECD 1990-2020 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Share of RES in electricity generation	Percentage of renewable sources in total electricity generation. It shows Uzbekistan's progress in achieving a low-carbon electricity system.	OECD 1990-2020 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Energy productivity	GDP (in USD 2015) per toe energy use. The indicator measures the economic benefit of using a unit of primary energy. It indicates whether Uzbekistan is becoming more energy efficient and generating more output from a unit of energy consumption.	OECD 1990-2020 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Energy consumption by sectors	Percentage share of TPES consumed by the main sectors of the economy. This indicator shows the trends in total energy use by sectors of the economy, identifying which sector uses most of the energy supply.	OECD 1990-2020 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Energy intensity of GDP	Total energy consumed per unit of GDP. This is the inverse of energy productivity and shows the rate of efficient energy use.	SA 2020-22 https://stat.uz/en/official-statistics/industry.
Material productivity	GDP per unit of DMC. The indicator measures how much income is generated per unit of DMC (biomass, metal and non-metal materials) in the economy. Uzbekistan does not collect data on this indicator.	OECD 1992-2019 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Household solid waste generated	Total solid waste generated by households in a year. The SA started collecting such data on SW generated and recycled since 2016 as part of SDG monitoring.	SA 2015-21 https://nsdg.stat.uz/en/goal/14
Share of solid waste recycled	Percentage recycled of solid waste generated.	SA 2015-21 https://nsdg.stat.uz/en/goal/14
Nutrient flows in agriculture (N, P)	Amount of fertilizer applied per ha of agricultural land (kg/ha). This GGI measures the nutrient balances in agriculture for the two main fertilisers applied on farms – nitrogen (N) and phosphorus (P). It was not possible to calculate annual nutrient balance for Uzbekistan due to lack of data. This report identifies instead total fertiliser use in Uzbekistan compared to the world average. It also shows "excess nitrogen"–nitrogen lost to the environment.	World Bank (substitute fertilizer use) 1992-2020 https://data.worldbank.org/indicator/AG.CON.FERT.PT.ZS. https://data.worldbank.org/indicator/ag.con.fert.zs.
Water productivity	Value added in GDP (2015 USD) per cubic metre of abstracted water. It shows whether the country uses its water resources efficiently.	World Bank 1994-2019 https://data.worldbank.org/indicator/ER.GDP.FWTL.M3.KD?locations=UZ.

Note: SA: Statistics Agency of Uzbekistan.

References

Center of Hydrometeorlogical Service (2021), Updated Nationally Determined Contribution. Tashkent, Uzbekistan. Nationally Determined Contributions Registry | UNFCCC

Enerdata (2023), "Trends in global energy intensity" https://yearbook.enerdata.net/total-energy/world-energy-intensity-gdp-data.html.

IEA (2022), *Energy Policy Review: Uzbekistan*, https://iea.blob.core.windows.net/assets/0d00581c-dc3c-466f-b0c8- 97d25112a6e0/Uzbekistan2022.pdf.

IEA (2020), *Uzbekistan Energy Profile Country Report*, International Energy Agency, Paris.

IRENA (2022), *Energy Profile: Uzbekistan*, International Renewable Energy Agency, www.irena.org/media/Files/IRENA/Agency/Statistics/Statistical_Profiles/Asia/Uzbekistan_Asia_RE_SP.pdf.

Mirkasimov, B., Asfaw, EB, Askarov, Z. (2023), "Determinants of carbon emission and the potential economic impact of 'green' economy strategies" in *Central Asia: Kazakhstan and Uzbekistan*, CAREC Institute, Chapter-5.pdf (carecinstitute.org).

OECD (2014), Green Growth Indicators 2014, OECD Publishing, Paris http://dx.doi.org/10.1787/9789264202030-en

OECD (2017), Green Growth Indicators 2017, OECD Publishing, Paris.

OECD (2023), GGI OECD.Stat (database) accessed 05 2023) https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH (

OWD (2023), "CO_2 emissions", *Our World in Data* (database), https://ourworldindata.org/co2-emissions (accessed 13, 04 2023).

Resolution of the President of the Republic ofUzbekistan (2019), "On the approval of the Strategy on Solid Waste Management in the Republic ofUzbekistan for the period 2019-2028" strategy for the management of solid household waste, https://lex.uz/docs/4291733?query=%D0%BF%D0%BB%D0%B0%D1%81%D1%82%D0%B8%D0%BA

Roser, M., H. Ritchie and E. Ortiz-Ospina (2021), "Excess fertiliser: How over-fertilization harms the environment and food security", *Our World in Data* (database), https://ourworldindata.org/excess-fertilizer (accessed 05 06 2023).

Statistics Agency (2023a) 'energy' (database) https://stat.uz/en/official-statistics/industry (accessed 06 2023).

Statistics Agency (2023b) SDG report on on household solid waste generated and recycled: https://nsdg.stat.uz/en/goal/15 or ЦУР (stat.uz)

UNFCCC (2021), first biennial update report of the Republic of Uzbekistan: Tashkent. https://unfccc.int/sites/default/files/resource/FBURUZeng.pdf.

World Bank (2023a), " water productivity" (WB-WDI database) (accessed 06 05 23) (https://data.worldbank.org/indicator/ER.GDP.FWTL.M3.KD?locations=UZ

4 The natural asset base

This chapter measures the group of green growth indicators (GGIs) that reflect whether the natural asset base maintains sustainable thresholds in quantity, quality or value as the economy grows.
Uzbekistan's wealth and the livelihoods of its people are deeply rooted in its abundant natural resources.The indicators in the chapter help answer whether the economy of Uzbekistan grows with less pressure on the natural asset base. Progress in the natural asset base indicators can be monitored by tracking the changes in resource stocks and biodiversity. The indicators are grouped into three themes to measure changes in renewable natural resources, non-renewable resources, biodiversity and ecosystem services.

Renewable natural resources

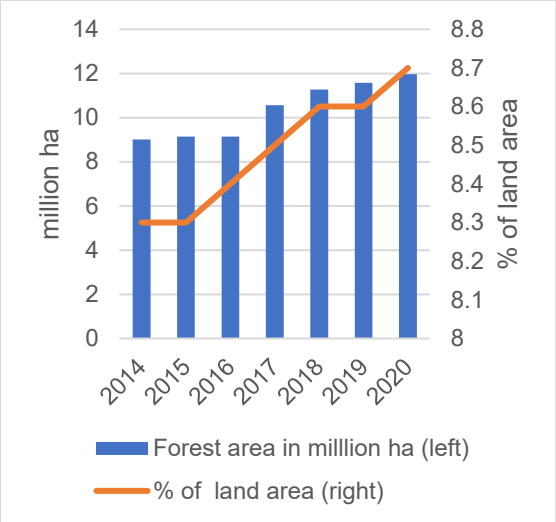
Renewable natural resources like water and forest are integral to the economy of Uzbekistan. Although forests perform many functions, including recreation and ecosystem services, their sustainable management is a challenge. Similarly, Uzbekistan's limited freshwater resources are of great ecological and economic importance. Their excessive withdrawal, however, creates stress on water resources.

Indicators:

- forest area
- forest stock
- freshwater withdrawal
- water stress
- freshwater use by sector.

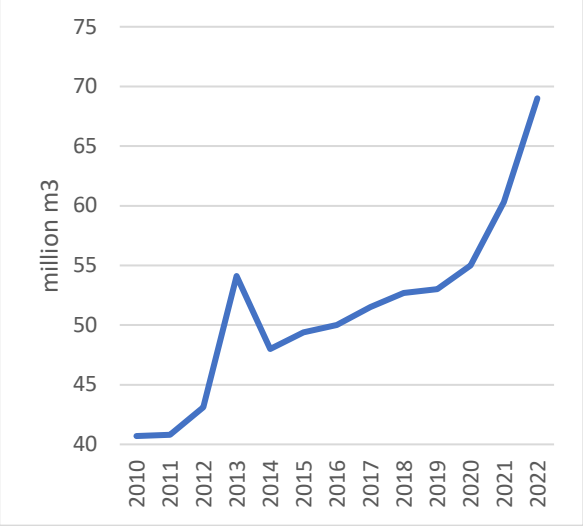
Although the Statistics Agency provides national data on forest and protected areas coverage, it does not report on freshwater withdrawn and consumed annually. Nevertheless, the Sustainable Development Goal reporting section on water (Indicator 6.4.2) has data on water stress (freshwater withdrawal as a proportion of available freshwater resources) (Statistics Agency, 2023a). The total renewable freshwater resource and withdrawal (use) indicators are vital to calculate trends in water productivity and efficiency. The Ministry of Water Resources collects such data. Here, these data are complemented by World Bank-WDI datasets.

Figure 4.1. Forest area



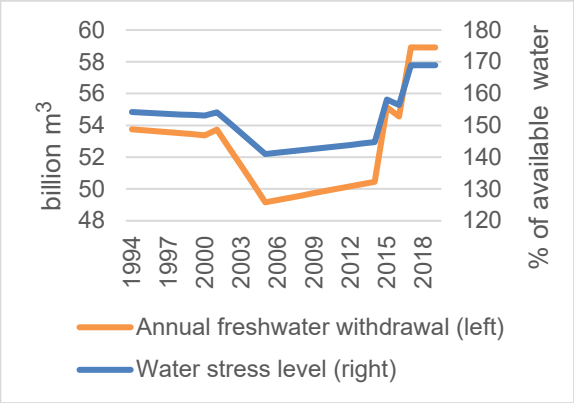
Source: Statistics Agency (2023c).

Figure 4.2. Forest stock



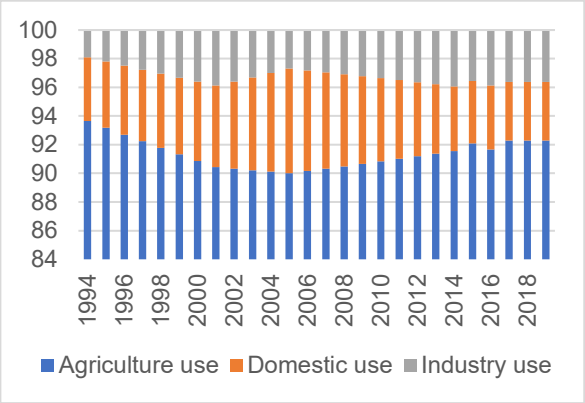
Source: Statistics Agency (2023c).

Figure 4.3. Freshwater withdrawal and stress



Source: World Bank (2023) and Statistics Agency (2023a).

Figure 4.4. Freshwater use by sector as percentage of freshwater withdrawn



Source: World Bank. (2023b).

Main trends

Uzbekistan's forest cover increased in 2014-20

In 2014-20, Uzbekistan's forest area increased by one-third – from 9 million hectares (ha) to 12 million hectares, representing 8.7% of the total land area in 2020 (Figure 4.1). By 2020, Uzbekistan ranked second after Turkmenistan in terms of forest area in Central Asia. Despite this increase, coverage remains below the Europe and Central Asia (ECA) average of 38.5% and the global average of 31.2% (World Bank, 2023a). The data on forest tree(biomass) stocks shows an increase from 40.7 million cubic meters (m^3) in 2010 to 69 million m^3 in 2022 (Figure. 4.2). Over 95% of the forest area is found in protected areas.

Pressure on freshwater resources has increased over the years

The annual freshwater withdrawal in Uzbekistan increased from 54 billion m^3 in 1995 to 59 billion m^3 in 2019 (Figure 4.3). This trend places the nation among the most water-stressed globally. On average, 52.6 billion m^3 of freshwater has been withdrawn annually over the past three decades to meet the nation's water demand. Notably, there was a marked surge post-2014. The heightened withdrawal rates are closely linked to agricultural reforms, particularly in the cotton and wheat sectors, which use over 90% of the withdrawn freshwater (Figure 4.4).

Surface water from two major rivers – Amu Darya and the Syr Darya – are the main sources for Uzbekistan's freshwater. These rivers, originating beyond its national borders and shared with neighbouring CA countries, often become focal points of allocation disputes. As a downstream nation, Uzbekistan's water supply remains vulnerable to any deviations in water flow, both in terms of quantity and quality.

Uzbekistan is putting more pressure on its water resources. The stress level, indicative of the water consumption ratio to its availability, increased from 53% to 68% in 1995-2019 (Figure 4.3). The level of water withdrawals largely exceeds the renewable freshwater resource level of 16 billion m^3 per year (World Bank, 2023b). Projections by the World Resources Institute suggest this stress level will persist until 2040 if current practices continue (WRI, 2023). Compounding the challenge, nearly 40% of agricultural water is lost to outdated irrigation infrastructure (Decree of the President of the Republic of Uzbekistan, 2019). In response, Uzbekistan is rolling out strategies to improve water management, modernise irrigation systems and emphasise water conservation.

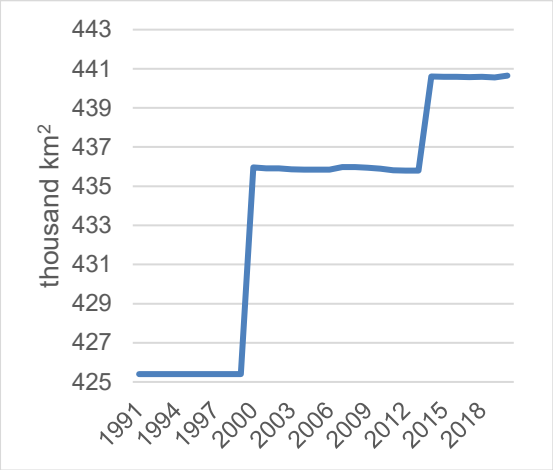
Non-renewable resources

The section focuses on land and natural gas resources. Land resource is critical for the Uzbekistan economy and the agriculture sector. Natural gas is also still important for the country's energy sector and economy.

Indicators:

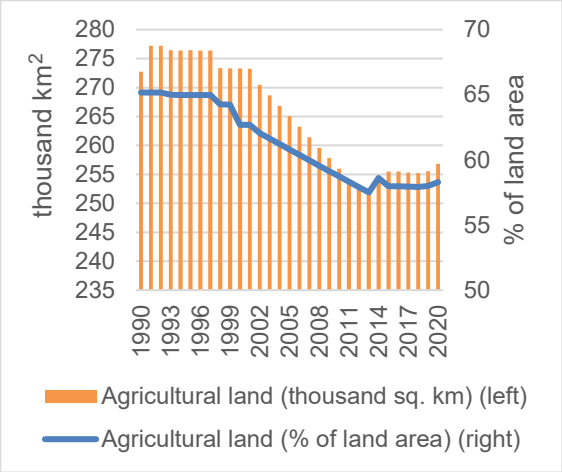
- land area
- agricultural land
- cultivated land
- natural gas resources.

Figure 4.5. Land area



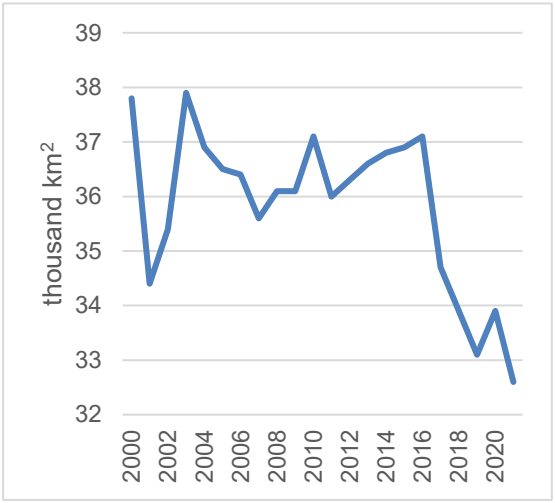
Source: Statistics Agency (2023b).

Figure 4.6. Agriculture land



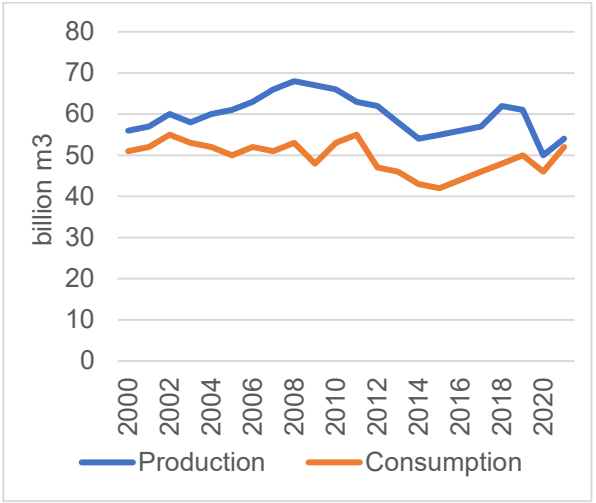
Source: World Bank (2023a).

Figure 4.7. Cultivated land area



Source: Statistics Agency (2023).

Figure 4.8. Natural gas production and consumption



Source: Statistics Agency (2023).

Main trends

Uzbekistan's land area has increased between 1991-2020 by 3.6%

Uzbekistan's land area increased, which may be due to the conversion of bodies of water, such as the Aral Sea, into terrestrial landscapes. Between 1991 and 2020, the land area increased from 425 400 km^2 to 440 650 km^2 (44 million ha) (Figure 4.5). Highlighting this change, the Aral Sea – once the world's fourth largest inland body of water – was reduced by 85%. Between 1960 and 2018, it shrank from 68 000 km^2 to 10 200 km^2 (Fangdi and Ma, 2019).

Severe degradation impacts around 30% (13 million ha) of the nation's land, with natural pasturelands making up half of the degraded land (World Bank, 2023b). Water stress, soil deterioration and salinisation are the primary causes of the degradation.

The share of agricultural land has decreased since 2000

In 2020, the share of agricultural land, including land for both temporary and permanent crops as well as pastures, decreased by 7% from its 1991 value. It accounted for 58% of the total land area, equivalent to 256 thousand km^2 (25.6 million ha) (Figure 4.6). The decline in agricultural land mirrors the decrease in the annually cultivated arable land, which went from 34 thousand km^2 (3.4 million ha) to about 32 thousand km^2 (3.2 million ha) of total land between 2000 and 2020, with significant drop as of 2017 (Figure 4.7). This was due to the government's strategy, introduced in 2017, to reduce irrigated cotton and wheat farms (Decree of the President of the Republic of Uzbekistan, 2019).

Agricultural land faces significant degradation for several reasons. Practices like improper irrigation, for example, result in soil salination. Other factors include poor pasture and manure management, as well as overgrazing. *Uzbekistan – Country Climate Development Report* (World Bank, 2023c) estimates the costs associated with severe land degradation equal 4.6% of gross domestic product (GDP). Among other factors, this considers the loss of agriculture productivity, increased soil erosion, reduced water availability, and loss of carbon sequestration and ecosystem services.

Although organic farming in Uzbekistan has grown since 2010, the land coverage is negligible. The share of organic farmland was only 932 ha representing 0.004% of total agricultural land in 2021 (Kodirkhonov, Uljabaev and Kholdorov, 2022). To scale up the practice, the government has launched pilot projects in certain regions. Non-governmental organisations and international institutions have also provided support to promote organic farming practices.

Natural gas production and consumption has increased since 2015

Uzbekistan ranks 11th in production and 14th in natural gas reserves. Natural gas production declined between 2008 and 2014, but it rebounded to 54 billion m^3 in 2021 (Figure 4.8). Over 80% of the natural gas produced is consumed domestically. Exports to nations like China, Russia Federation and Kazakhstan have been a mainstay since the early 2000s. Forecasts suggest that gas reserves might be depleted in 20-30 years. This has prompted the government's decision to halt exports by 2025, giving priority to domestic needs (World Bank, 2023c). Still, inefficiencies in the sector are common. Disparities in volume, from entry in the transmission and distribution system to the sales system, are evident. In 2022, such losses represented 2.4% of overall gas consumption, although national statistics remain undisclosed (World Bank, 2023c).

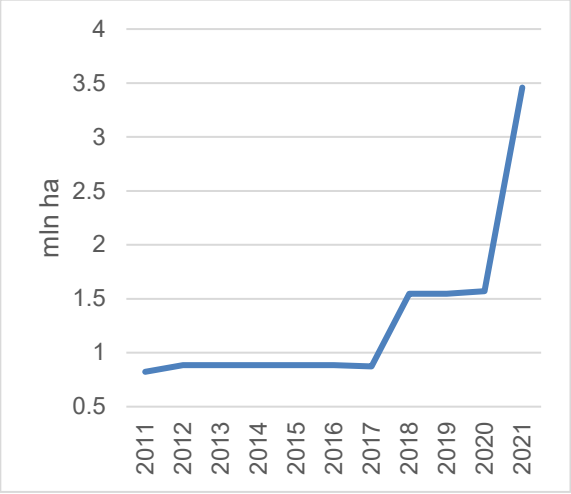
Biodiversity

The state of biodiversity can be measured by the growing number of endangered (threatened) plant and animal species. Accordingly, protected natural areas are important to restore natural habitats to protect rare and endangered species.

Indicators:

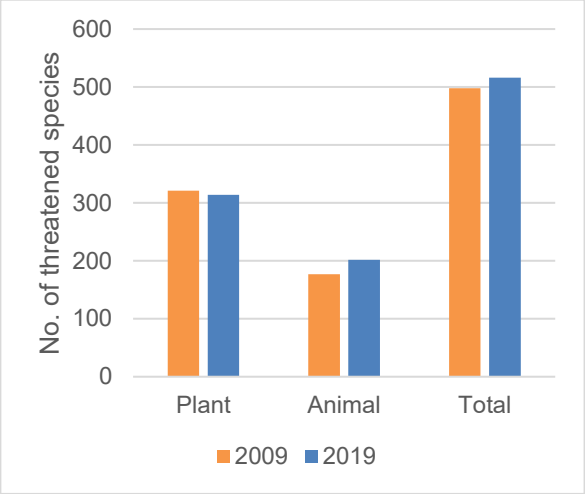
- protected area
- biodiversity and threatened wildlife
- surface temperature change.

Figure 4.9. Protected natural areas



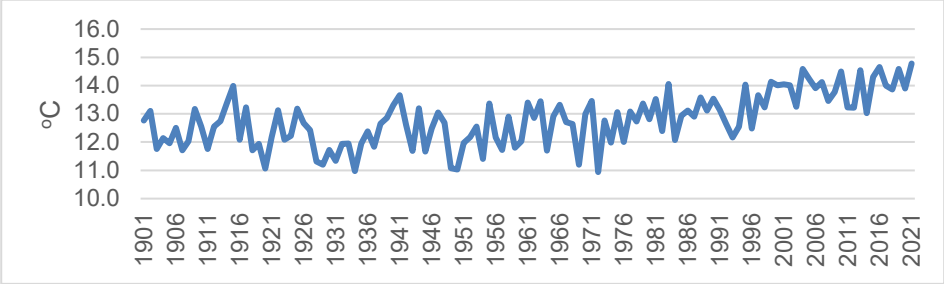
Source: Statistics Agency (2023b).

Figure 4.10. Threatened species



Source: Academy of Science (2019).

Figure 4.11. Annual mean temperature



Source: OECD (2023).

Main trends

The number of protected natural areas in Uzbekistan tripled between 2011-21

Uzbekistan has 41 protected natural areas essential for preserving biodiversity and ecosystems (UNEP-WCMC, 2023). Protected natural areas tripled in size from 0.8 million ha in 2011 to 3.5 million ha or 34 578 km^2 (8% of the land area) in 2021 (Figure 4.9). As of 2021, Uzbekistan had established protected areas in 8 of 13 regions, with 75% in the Republic of Karakalpakstan region (Statistics Agency, 2023). The Ministry of Ecology, Environment Protection and Climate Change manages protected areas and enforces regulations. Uzbekistan has committed to increasing the total protected areas coverage to 12% of its territory by 2028, as outlined in the National Biodiversity Strategy and Action Plan and the "Biodiversity Conservation Strategy for 2019-2028" (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan 2019).

Uzbekistan has an increasing number of rare and endangered species in the "Red Book"

Uzbekistan's biodiversity comprises more than 4 300 species of plants (flora) and 15 000 animals (fauna), with many endemic species reflecting the country's diverse ecosystem (UNDP, 2015). In 2019, the fifth edition of the Red Book of Uzbekistan, which enlists the rare and endangered species of wild animals and plants, had 516 endangered species, up from 498 in 2009 (Figure 4.10)**.** Factors like climate change, unchecked grazing, indiscriminate hunting, and poaching cast a shadow over the survival of these species. For instance, the Bukhara deer and the Turkestan lynx populations are dwindling, a loss primarily attributed to hunting and poaching (Ministry of Agriculture, 2019).

The annual average temperature (°C) in Uzbekistan escalated by 35% in 50 years

The annual surface mean temperature in Uzbekistan has increased by 35% (3.5°C) over five decades (Figure 4.10). For example, the mean annual temperature in 1972 of 11°C climbed to 14.8°C in 2021. The temperature rise has altered ecosystems, resulting in the loss of natural habitats and the rich biodiversity they supported. Regions like the Aral Sea area bear the brunt of these changes.

Definition of indicators

Land area: the FAO and World Bank databases define a land area as a country's area, excluding area under inland water bodies (rivers and lakes). Uzbekistan follows a similar definition. Land resources are critical for food production, biodiversity conservation and carbon sequestration. Land includes natural and semi-natural vegetated land, bare land, cropland and artificial (built-up) surfaces.

Agriculture land: the share of land area that is arable (temporary crops), under permanent crops and permanent pastures (World Bank).

Cultivated (arable) land: part of the agricultural land that is cultivated annually (arable land) for growing food and feed.

Forest area: the share of the total land area covered by forest. Forest resources are essential in regulating climate, protecting biodiversity and providing ecosystem services.

Forest stock: a stock of standing trees in forest areas with a certain diameter at breast height, measured in cubic metres (FAO). It is the volume over the bark of all living trees with a minimum diameter of 10 cm at breast height, including the stem from ground level up to a top diameter of 0 cm (excluding branches) (OECD).

Renewable freshwater resources flow: internal river flows and surface water from rainfall in the country. This flow is both permanent and seasonal surface water, including inflows from neighbouring countries.

Water consumption: the level of freshwater withdrawal by all major sectors (agriculture, domestic use, and industry) as a proportion of available freshwater resources.

Water stress: water withdrawal intensity. The level of water stress can show the degree to which the country exploits its water resources to meet water demand.

Protected areas: national parks, nature reserves and wildlife sanctuaries designated by national authorities as scientific reserves with limited public access.

Threatened species: critically endangered and vulnerable species i.e., those plants and animals in danger of extinction or soon likely to be.

Technical comments on measurability and interpretation

Table 4.1 provides comments on the measurability, interpretation and source of data for theindicators included in the chapter.

Table 4.1. Measurability, interpretation and data sources on natural assets base

Indicator	Unit of measurement, measurability and interpretation	Data source and years covered
Forest area	Forest area (million hectares) percentage forest area as a share of total land area. The indicator shows if Uzbekistan has experienced afforestation or massive deforestation over the years.	Statistics Agency (SA) 2014-20 https://stat.uz/en/official-statistics/environment
Forest stock	The indicator provides information about wood resources measured in millions of cubic metres (m^3). It also provides the basis for estimating the amount of CO_2 the forest contains.	SA, 2000-2022 https://nsdg.stat.uz/en/goal/17
Freshwater abstraction	The amount of freshwater in billion m^3 that Uzbekistan withdraws annually for different purposes.	World Bank, 1994-2019 https://data.worldbank.org/indicator/ER.H2O.FWAG.ZS?locations=UZ.
Water stress	This measures water withdrawal as a percentage of available water resources. The SA also reports on this indicator as part of the clean water SDG goal.	World Bank, 1994-2019 https://data.worldbank.org/indicator/ER.H2O.FWAG.ZS?locations=UZ. https://nsdg.stat.uz/en/goal/9\.
Water consumption by sector	This measures percentage of total freshwater withdrawal. The indicator shows which sectors of the economy consume most of the freshwater.	World Bank, 1994-2019 https://data.worldbank.org/indicator/ER.H2O.FWAG.ZS?locations=UZ.
Land resource	The indicator measures the inhabitable area of the country (km^2), including the agriculture and forest area.	SA, 1991-2019 https://stat.uz/uz/rasmiy-statistika/demography-2.
Agriculture land	This measures the percentage of land area available for agriculture (crops, orchards and pasture) in km^2.	World Bank & FAO, 1990-2020, https://data.worldbank.org/indicator/AG.LND.AGRI.ZS?locations=UZ.
Cultivated/ arable land	Percentage of agriculture land cultivated for annual crops.	SA, 2000-20, https://stat.uz/uz/rasmiy-statistika/agriculture-2.
Natural gas resource	Volume (billion m^3) of natural gas produced and consumed.	SA, 2000-20 https://stat.uz/en/official-statistics/industry.
Protected area	Area (ha) and percentage of land area protected from open access to human activities.	SA 2011-21 https://stat.uz/en/official-statistics/ecology.
Threatened wildlife	Number of species (animal and plant) threatened by extinction among species assessed or known. The Ministry of Ecology, Environment Protection and Climate Change takes inventory periodically and publishes in the "Red Book". The 5th edition was published in 2019.	Red Book of Uzbekistan,2019 www.researchgate.net/publication/334913462_Red_Book_Uzbekistan or https://kun.uz/en/news/2019/12/10/uzbekistan-publishes-a-new edition-of-the-red-book.
Annual surface temperature change	Changes in annual mean surface temperature expressed in degree Celsius (°C).	OECD 1901-2021, https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.

Note: SA= Statistics Agency

References

Decree of the President of the Republic of Uzbekistan (2019), on approval of the strategy for the development of agriculture of the Republic of Uzbekistan for 2020-2030, 23.10.2019, no. up-5853 https://lex.uz/ru/docs/4567337.

Fangdi, S. and R. Ma (2019), "Hydrologic changes of Aral Sea: A reveal by the combination of radar altimeter data and optical images", *Annals of GIS*, Vol. 25/3, pp. 247-261, https://doi.org/10.1080/19475683.2019.1626909.

Kodirkhonov, B., J. Uljabaev and S. Kholdorov (2022), "Organic agriculture in Uzbekistan: SWOT analysis", OP Conference Series: Earth and Environmental Science, Volume 979, International Scientific and Practical Conference "Improving Energy Efficiency, Environmental Safety and Sustainable Development in Agriculture" (EESTE 2021) 19/10/2021 - 24/10/2021 Moscow B M IOP Conf. Ser.: Earth Environmental Science Vol. 979/012140, http://doi.org/10.1088/1755-1315/979/1/012140.

Ministry of Agriculture (2019), *Protected Natural Areas of Uzbekistan*, https://uzbekistanembassy.in/docs/Protected_Natural_Areas_of_Uzbekistan.pdf.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan (2019), On approval of the strategy for conservation of biological diversity in the republic of Uzbekistan for the period 2019-2028, 1.06.2019 № 484 at https://lex.uz/docs/4372841#4376308.

Statistics Agency (2023a), 'Clean water and sanitation' at https://nsdg.stat.uz/en/goal/9.

Statistics Agency (2023b), 'Protected area' (database): https://stat.uz/en/official-statistics/ecology.

Statistics Agency (2023c), 'Forest stocks', https://nsdg.stat.uz/en/goal/17 .

United Nations Development Program (UNDP) (2015), *Fifth National Report of the Republic of Uzbekistan on Conservation of Biodiversity*. Tashkent Uzbekistan, www.cbd.int/doc/world/uz/uz-nr-05-en.pdf.

United Nations Environment Program (UNEP-WCMC) (2023), Protected Area Profile for Uzbekistan from the World Database on Protected Areas, August 2023, www.protectedplanet.net

World Bank, (2023a), 'Forest area' (WB-WDI database) https://data.worldbank.org/indicator/AG.LND.FRST.ZS (accessed on 12 July 23)

World Bank, (2023b), 'Freshwater withdrawal' (WB-WDI database) https://data.worldbank.org/indicator/ER.H2O.FWAG.ZS?locations=UZ (accessed on 10 06.23).

World Bank (2023c), *Uzbekistan Country Climate Development Report*, Tashkent. https://documents1.worldbank.org/curated/en/099111423124532881/pdf/P1790680f452f10ba0a34c06922a1df0003.pdf.

World Resource Institute (2023), Water Stress, https://www.wri.org/data/water-stress-country.

5 The environmental dimension of quality of life

This chapter covers the indicators that reflect how environmental conditions and risks interact with people's quality of life and well-being. They show the extent to which income growth in Uzbekistan is accompanied by people's quality of life. The chapter explores whether green growth generates improved well-being, grouping indicators into two themes based on the OECD framework: environmental health risks and economic costs as well as access to environmental services.

Environmental health risks and costs

The state of the environment in Uzbekistan impacts the health of its population and can thus reduce quality of life and increase welfare costs. Air pollution from particulate matter (PM) poses the greatest problem on human health. The section focuses on outdoor air pollution.

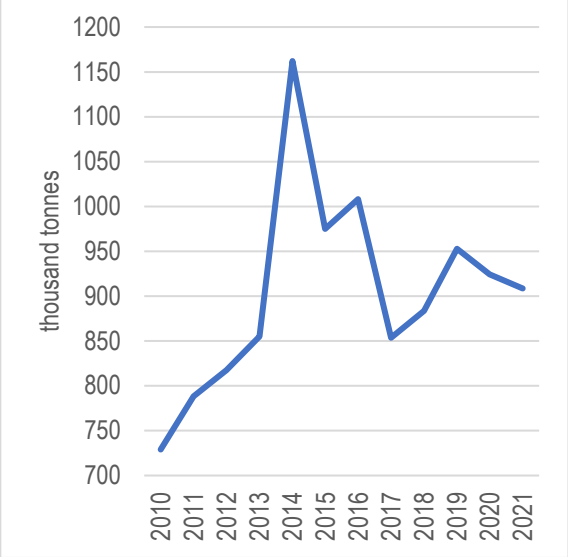
Indicators:

- air pollution
- annual mean concentration of PM
- population exposure to $PM_{2.5}$
- death due to respiratory diseases
- mortality and costs of exposure to $PM_{2.5}$
- mortality and costs of exposure to ozone gas
- mortality and cost of exposure to lead gas.

Data from national statistics on most indicators of the environmental dimension of quality of life were unavailable at the time of writing. The Statistics Agency publishes data on the volume of air pollution and causes of death, including respiratory problems. As part of the Sustainable Development Goals monitoring, it also provides data on environmental services, including access to safe drinking water and sewerage services. However, it does not provide data on pollutant types and particulate matter (PM) concentration. Nor does it estimate the welfare and economic costs of the population exposed to environmental risks.

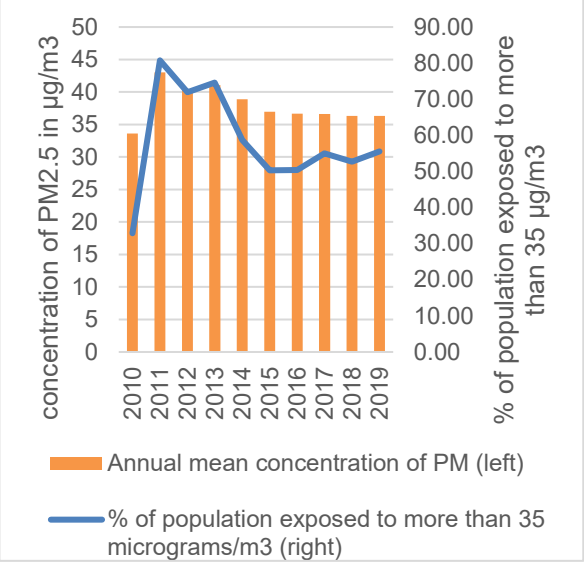
Regular monitoring of the PM level in the air is crucial as PM is proven to contribute to health problems. Thus, it is important to issue health advisories when PM levels are unhealthy. The chapter complements the measurement of the quality-of-life indicators with statistics from the OECD dataset.

Figure 5.1. Air pollution



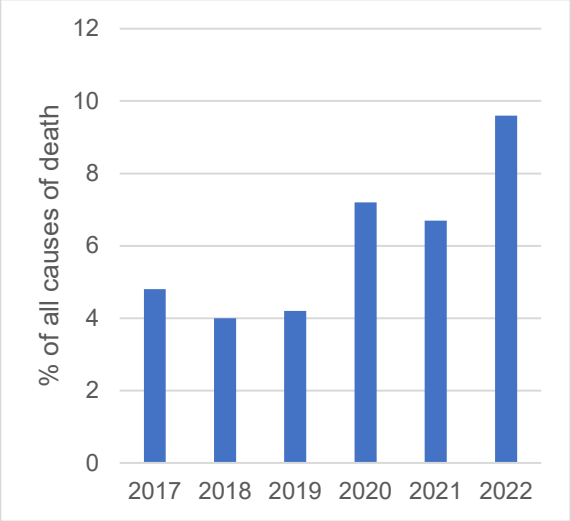
Source: Statistics Agency (2023).

Figure 5.2. Annual mean concentration of $PM_{2.5}$ and population exposure to it



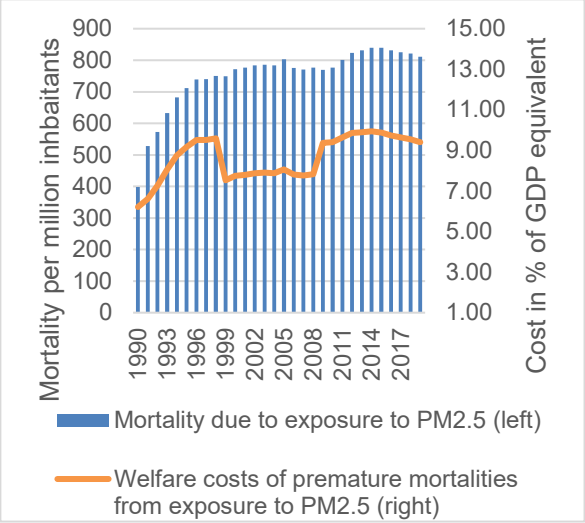
Source: OECD (2023).

Figure 5.3. Death due to respiratory disease



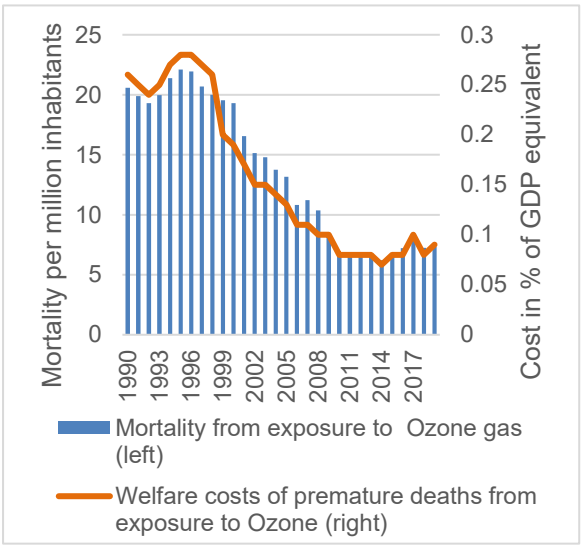
Source: Statistics Agency (2023)

Figure 5.4. Mortality and welfare costs of exposure to $PM_{2.5}$



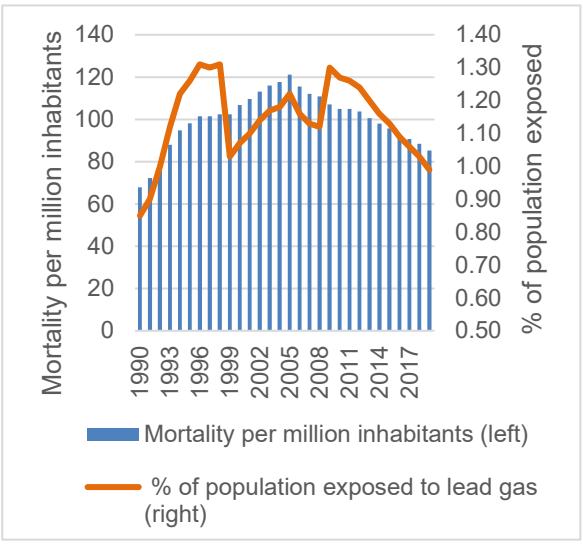
Source: OECD (2023).

Figure 5.5. Mortality and welfare cost from exposure to Ozone gas (O_3)



Source: OECD (2023).

Figure 5.6. Mortality and welfare cost from exposure to lead gas



Source: OECD (2023).

Main trends

Air pollution is increasing in Uzbekistan, making it one of the most air polluted countries in the world

Air pollution, in terms of the volume of pollutants emitted in the atmosphere, has spiked since 2010. It reached its annual maximum of 975 000 tonnes (t) in 2015 before declining slightly to 909 000 t in 2021 (Figure 5.1). The major components of pollutants are sulphates, nitrates, ammonia, sodium chloride, black carbon, mineral dust, and water. The concentration of fine particulate matter of 2.5 micrometres in dimension ($PM_{2.5}$) in the air is generally high. Over the past decade, it exceeded the 35 microgrammes per cubic metre (µg/m^3) level considered unhealthy by the World Health Organization (WHO) (Figure 5.2).[14]

In 2022, Uzbekistan had the 20th worst air quality worldwide with average annual $PM_{2.5}$ concentration of 33.5µg/m^3 and it was the second most polluted Central Asian (CA) country, next to Tajikistan (IQAIR, 2023). Most air pollution issues in the country are attributed to the Aral Sea desertification and dust storms carrying iron oxide and other toxic PM. Meanwhile, pollution in Tashkent City is primarily due to vehicle use, which constituted around 60% of the source in 2021 (Eurasianet, 2022).

The news channel UPL Uzbekistan publishes daily real time measures of air quality for $PM_{2.5}$ and PM_{10} in Tashkent City based on the World Air Quality Index (AQI) standards.[15] It also compares the daily air pollution concentration in µg/m^3 with the WHO-recommended acceptable threshold.

Over half of the Uzbekistan population has been exposed to unhealthy levels of air pollution since 2010

The share of the population exposed to unhealthy concentration levels of $PM_{2.5}$ declined from around 80% to 56% over the past ten years. However, more than half of the Uzbekistan population has been exposed daily to unhealthy $PM_{2.5}$ concentrations of above 35µg/m^3 since 2010 (Figure 5.2). This population exposure level is more than five times higher than the world average of 10% (IQAIR, 2023).

Mortality due to air pollution and the cost of premature death is high and increasing above the world average

In 2022, respiratory diseases caused almost 10% of deaths (Figure 5.3). Instances of chronic bronchitis in the arid area of the Karakalpakstan region are 2.5-3.0 times higher than in the rest of the country (IQAIR, 2021). Deaths related to outdoor air pollution in Uzbekistan are the third highest globally (US Embassy in Uzbekistan, 2019). Specifically, over 750 people in 1 million inhabitants died annually in Uzbekistan over the last 30 years from exposure to $PM_{2.5}$ (Figure 5.4), higher than the world average of 645 people in 2019 (OECD, 2023).

As a result, the economic cost of premature death in Uzbekistan from exposure to $PM_{2.5}$ shows an upward trend. It represents, on average, 8.7% of gross domestic product (GDP) equivalent measured in purchasing power parities (PPP), higher than the 6.4% EECCA region average in 2019 (OECD, 2023).

---

[14] The WHO global Air Quality Guidelines (AQG) provide interim targets to promote a gradual shift from high to lower PM concentrations. According to the AQG, the level of $PM_{2.5}$ concentration in the air is linked to four interim targets: 35 µg/m^3 (target level 1) unhealthy, 25 µg/m^3 (target level 2), 15 µg/m^3 (target level 3) and 10 µg/m^3 (target level 4). The ultimate WHO target level of healthy $PM_{2.5}$ concentration in the air is 5 µg/m^3. See www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health?gclid=CjwKCAjwkeqkBhAnEiwA5U-uM8k3kA864cfPDB9gNrxaps2JNqdJyYQtWSRvZ9432VyvDf_MZ-_0zRoCKSsQAvD_BwE

[15] See daily real time air quality reports for Tashkent city at www.iqair.com/ru/uzbekistan/toshkent-shahri/tashkent.

Mortality and welfare costs due to exposure to ozone and lead gases decreased

Mortality due to exposure to ozone gas pollution decreased during 1990-2019 (Figure 5.5). Exposure to ozone caused 7 deaths per million inhabitants in 2019 compared to 21 deaths in 1990. The annual welfare cost due to ozone exposure decreased from 0.26% to 0.09% of the GDP (PPP) equivalent during the same period (Figure 5.5). Similarly, on average, during 1990-2019, 100 people per million inhabitants died annually due to lead poisoning (Figure 5.6). The economic loss due to lead poisoning was, on average, equivalent to 1.2% of the GDP (PPP).

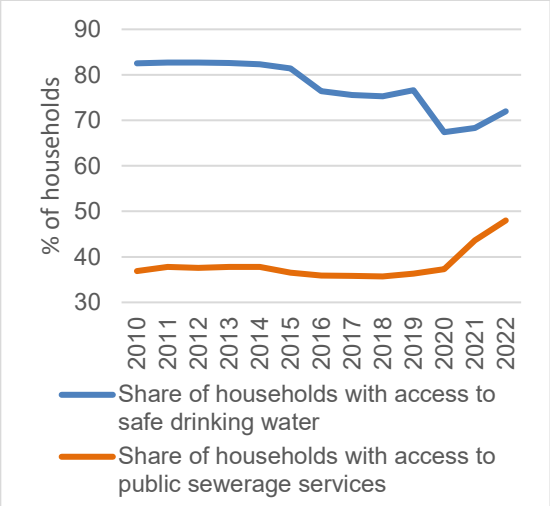
Environmental services

Access to adequate safe drinking water, sanitation and sewerage systems is vital for a country's economic growth and public health (OECD, 2014). Access to clean water and sanitation represents goal 6 of the Sustainable Development Goals (SDGs). The main challenge in Uzbekistan is to increase the coverage of remote areas and rural access to centralised drinking water and sewerage systems.

Indicators:

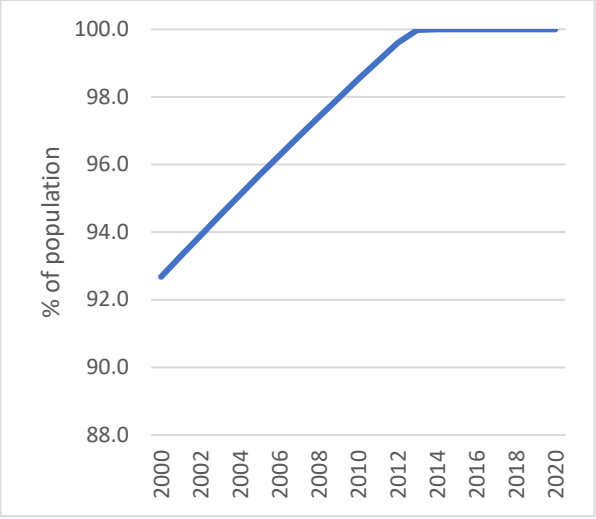
- share of households with access to safe drinking water
- share of households with access to a sewerage system
- share of population with access to sanitation.

Figure 5.7. Access to safe drinking water and sewerage service



Source: Statistics Agency (2023).

Figure 5.8. Population with access to sanitation



Source: World Bank (2023).

Table 5.1. Access to drinking water and sewerage service (% of households) by region in 2021

Region	Access to drinkingwater (percentage of households)	Access to sewerage (percentage of households)
Republic of Uzbekistan	**68.3**	**43.6**
Republic of Karakalpakstan	57.5	15.6
Andijan	77.3	28.5
Bukhara	50.9	27
Jizzakh	63.2	28.5
Kashkadarya	35.8	22.5
Navoi	72.5	36.5
Namangan	85.5	40.7
Samarkand	63.7	42.2
Surkhandarya	78.4	35.4
Syrdarya	84	36.8
Tashkent	75.4	63.8
Fergana	68.7	52.7
Khorezm	40.6	29
Tashkent City	97.2	100

Source: Statistics Agency (2023)

Main trends

The share of households with access to safe drinking water supply has fallen since 2015, and access is still a challenge in rural areas

The share of households' access to drinking water from an improved and safe source on-premises, when needed, declined by 10% over the past ten years. In 2022, 72% of Uzbekistan households had access to safe drinking water, a decline from 82.5% in 2010 (Figure 5.7). The proportion declined and stagnated mainly due to outdated water supply infrastructure and water services despite increased population and housing (World Bank, 2022). The proportion is less than the world average, and there is high inequality between cities and rural areas. While over 97% of houses in Tashkent City have access to drinking water, the Kashkadarya region has the lowest access rate (Table 5.1).

The share of households with access to a sewerage system has grown in the last three years

Uzbekistan made some progress in expanding public sewerage systems moderately and steadily since 2020 (Figure 5.7). Nevertheless, in 2022 less than half (48%) of households is connected to a sewerage system with inequality between cities and regions. For instance, all households in Tashkent City are connected to a sewerage treatment system. However, in Karakalpakstan, only 16% of households are connected (Table 5.1). The World Bank (2022) indicates that most households in rural areas only have self-built onsite sanitation-dry pit latrines or septic tanks with onsite disposal. Moreover, collected wastewater is not treated according to international standards.

Uzbekistan has achieved 100% population access to improved sanitation

All of Uzbekistan's population had access to improved sanitation as early as 2014, showing progress from 93% in 2000 (Figure 5.8). Thus, the country has achieved the 2030 SDG towards goal six of universal access to sanitation.

Definition of Indicators

Particulate matter (PM): air pollutants that contain microscopic solids or liquid droplets that can be inhaled and cause serious health problems and premature death. Some PMs (less than 10 micrometres in diameter) can enter human lungs and the bloodstream. The report includes data on $PM_{2.5}$, which pose the most significant health risk.

Population exposure to air pollution by fine particulate matter: the proportion of the populationexposed to outdoor air pollution concentration of average $PM_{2.5}$ to which a typical resident is exposed throughout a year (derived from satellite observation or ground monitoring and measured in μg/m³). This report shows the proportion of the population living in areas with annual concentrations exceeding the value of 35μg/m³.

Share of households with access to safe drinking water: households using improved drinking water sources, which include piped water into dwellings, yards or plots, publictaps or standpipes, boreholes, or tube wells, protected dug wells, protected springs, packaged water, delivered water and rainwater. Improved water sources should be located on the premises, available when needed and contamination-free.

Share of households with access to sewerage treatment: households connected to an urban wastewater collecting system through public sewerage network. Individual private treatment facilities such as septic tanks are not covered.

Population using improved sanitation: households with basic handwashing facilities and toilets, including flush or pour-flush toilets to sewerage systems, septic tanks, or pit latrines, ventilated improved pit latrines, pit latrines with a slab and composting toilets.

Technical comments on measurability and interpretation

Table 5.2 provides comments on the measurability, interpretation and source of data for the GGIs included in the chapter.

Table 5.2. Measurability, interpretation and data source for GGIs on environmental dimension of quality-of-life indicators

Indicators	Measurability and measurement unit	Data source and years covered
Air pollution	The Statistics Agency (SA) provides the amount of pollutants emitted into the atmosphere in thousand tonnes of pollutants per year.	SA 2010-21 https ://stat.uz/en/official-statistics/ecology.
Air pollution by fine PM concentration	The standard measure of air pollution computes the mean annual concentration of fine suspended particles of less than 2.5 microns in diameter ($PM_{2.5}$). The concentration of pollutants is expressed in micrograms per cubic metre of air (µg per m^3) – a unit of air pollution measurement. The public health unhealthy level of average concentration is more than 35µg/m^3 .	OECD, 2010-19 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Population exposure to $PM_{2.5}$	Percentage of the population exposed to air pollution above the average concentration of 35µg/m^3 of air pollution.	OECD, 2010-19 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Death due to respiratory diseases	In percentage of all deaths. The SA has published this indicator since 2017.	SA, 2017-22 https ://stat.uz/en/official-statistics/demography.
Mortality due to exposureto $PM_{2.5}$	Mortality from exposure to $PM_{2.5}$ in deaths per million inhabitants.	OECD, 1990-2019 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Economic loss due to exposure to $PM_{2.5}$	Welfare costs from exposure to $PM_{2.5}$ expressed in GDP equivalent (PPP) percentage points.	OECD, 1990-2019 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Mortality due to population exposure to ozone gas (O_3)	Mortality from exposure to ozone gas in deaths per million inhabitants. The indicator monitors the mortality induced by exposure to ozone gas pollution, which causes lung problems and premature death. Outdoor workers in areas with high ozone levels are at the most risk.	OECD 1990-2019 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Economic loss due to population exposure to ozone gas	Welfare costs due to exposure to ozone in GDP equivalent percentage points.	OECD 1990-2019 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Mortality due to population exposure to lead gas	Mortality from exposure to lead in deaths per million inhabitants. Humans may be exposed to lead by eating food and drinking water contaminated with lead, which mostly occurs in industry sectors.	OECD 1990-2019 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Economic loss due to exposure to lead gas	Welfare costs from mortality due to exposure to lead in GDP equivalent percentage points.	OECD 1990-2019 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Access to drinking water	The indicator constitutes a key component in measuring the environmental quality of life (OECD, 2017). It measures the proportion (percentage) of households with access to safe drinking water sources not shared with other houses. The SA collects data on percentage of houses with access to safe drinking water as part of SDG-6 monitoring.	SA, 2010-22 Environment (stat.uz).
Access to sewerage systems	Percentage of households connected to public sewerage treatment.	SA, 2010-22 https://w3.unece.org/SDG/en/Indicator?id=52. https://stat.uz/en/official-statistics/environment.
Access to sanitation	Percentage of the population using improved sanitation facilities. This indicator measures the proportion of the population with access to basic sanitation services (e.g., hand washing).	World Bank, 2000-20 https://data.worldbank.org/indicator/SH.STA.BASS.ZS?locations=UZ.

References:

Eurasianet (2022), “ Uzbekistan: Tashkent bemoans worsening pollution”, 19 October.

OECD (2014), Green Growth Indicators 2014, OECD Publishing, Paris http://dx.doi.org/10.1787/9789264202030-en

OECD (2017), Green Growth Indicators 2017, OECD Publishing, Paris.

OECD (2023), mortality and welfare cost from exposure to outdoor air pollution (PM, Ozone, lead), (OECD.Stat database) https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.(accessed on 05 02 23).

IQAIR (2023), *World Air Quality Report: Region & City PM2.5 Ranking*. https://www.iqair.com/us/world-most-polluted-countries

US Embassy in Uzbekistan (2019), “Let’s take a breather: The importance of air quality for health, the economy, and the environment”, https://uz.usembassy.gov/lets-take-a-breather-the-importance-of-air-quality-for-health-the-economy-and-the-environment/.

World Bank (2022), *Uzbekistan Public Expenditure Review. Better Value for Money in Human Capital and Water Infrastructure*, World Bank, Washington, DC.

6 Economic opportunities and policy responses

This chapter explores Uzbekistan's investments in the transition to a green economy and the economic opportunities and benefits green growth generates. The indicators help assess policy effectiveness in green technology and innovation, environment investment and financing, prices, environmental taxes (revenues) and financial transfers. In this way, they capture the economic opportunities associated with green growth. The indicators are grouped into three themes: technology and innovations of relevance in green growth, financial flows in green growth and prices and transfers of relevance in green growth.

National and international data on value added and employment in environmental goods and services sectors (green jobs) are lacking for Uzbekistan; hence, they are not included. The Statistics Agency does not collect data on environmental expenditure or economic opportunities from ecosystem services. Different government bodies collect administrative data relevant to green growth indicators in this chapter, including expenditures on environmental protection and revenue by the Ministry of Ecology, Environment Protection and Climate Change; energy subsidies by the Ministry of Energy; and financial transfers (data on expenditure for Sustainable Development Goal 13) by the Ministry of Economy and Finance. Thus, data are fragmented. In this report, statistics on environmental innovations are complemented by OECD. Stat.

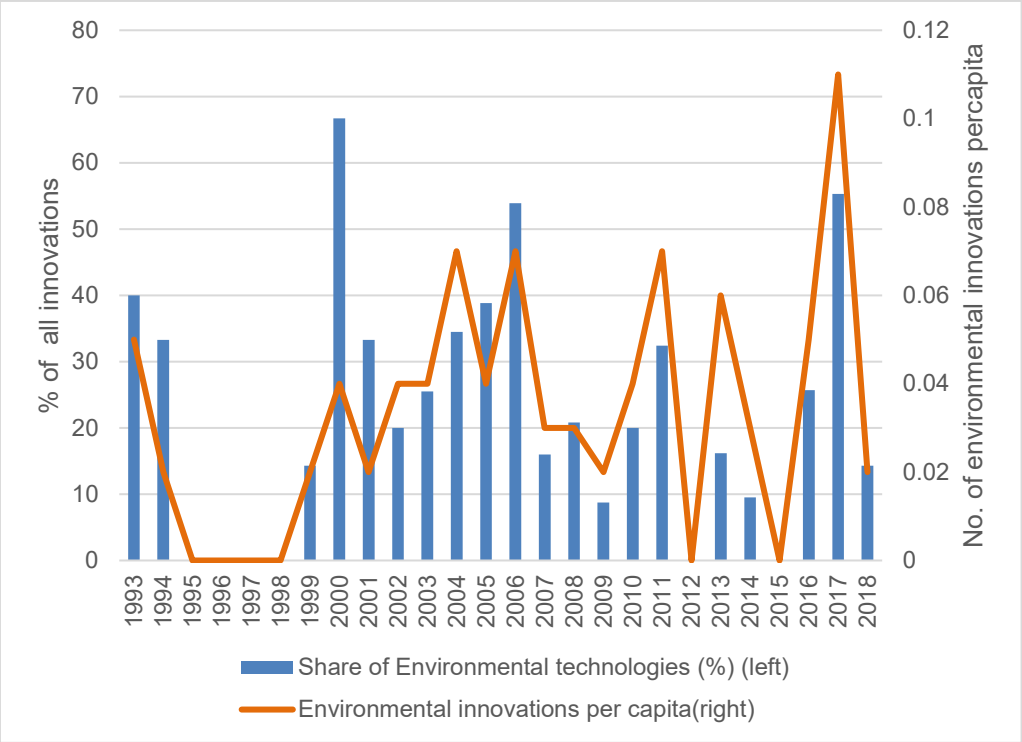
Technology and innovations

Green technology and innovation is an integral part to accelerate the green economy transition in Uzbekistan. The challenge is to guide the direction of inventions towards more environmental benefits. Progress can be assessed by analysing the share of environment-related technologies or innovations in the total number of technologies developed based on patent data.

Indicators:

- proportion of environmental innovations out of total innovations
- number of environmental innovations per capita.

Figure 6.1. Share of environment-related innovations and its per capita



Source: OECD (2023).

Main trends

The share of environment-related innovations in total innovations by Uzbekistan and its per capita fluctuated during 1993-2018

Although no data are available for the last five years on environmental technologies, the previous trend captured by the OECD (OECD, 2023) shows that Uzbekistan developed environmental technologies and innovations in the early 1990s. The OECD calculates the innovation indicator based on patent data, that is application for patent of invention by Uzbek inventors, extracted from the worldwide patent statistical database (EPO-PATSTAT, 2023). Uzbekistan's annual share of environmental innovations in total innovations varied without any clear trend (Figure 6.1). Over 14% of the innovations in Uzbekistan in 2018 were environment-related, which was higher than the global average of 10%. However, environmental technologies per capita was 0.02, while the global average was 4.9 (OECD, 2023), indicating low development of environmental innovations and its patent application among Uzbeks.

Uzbekistan contributed to 0.01% of world environment-related technologies in 2018 (OECD, 2023). Given lack of available OECD data since then, the report does not describe the current trend. Nevertheless, in 2021, environment related innovations accounted for 4.8% of all patent applications published by the World Intellectual Property Organization (WIPO).[16]

Financial flows

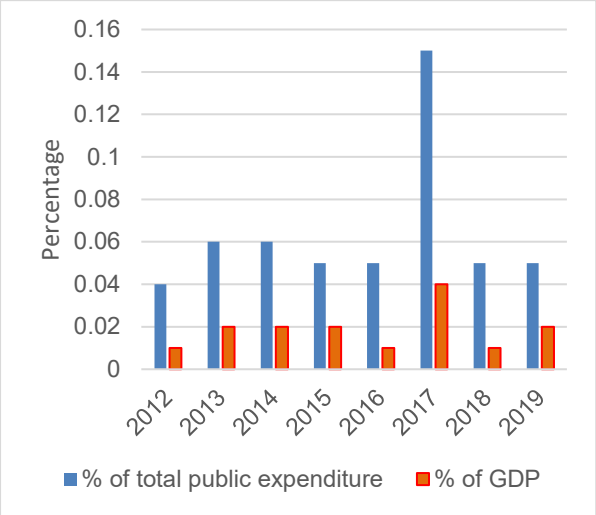
Public and private sources of financial flows are important to stimulate green technologies and growth. Attracting foreign and private investments, as well as technical assistance for the green economy transition, is a strategic priority for the Uzbekistan government. Progress can be measured by systematically monitoring or green tagging the financial flow in the economy, including international development assistance.

Indicators:

- public expenditure in environmental protection
- public expenditure in Sustainable Development Goal (SDG) 13 (climate action)
- international financial flow for green growth

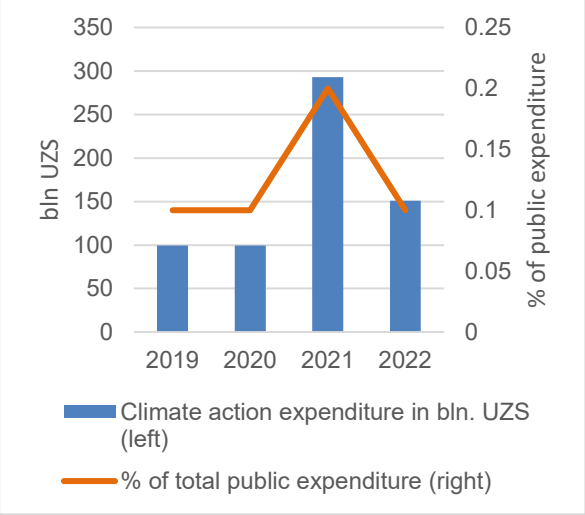
[16] See Uzbekistan's country profile for patent application at: https://www.wipo.int/edocs/statistics-country-profile/en/uz.pdf. The Country Profile provides a comprehensive overview of intellectual property (IP) activities in Uzbekistan..

Figure 6.2. Public expenditures in environmental protection



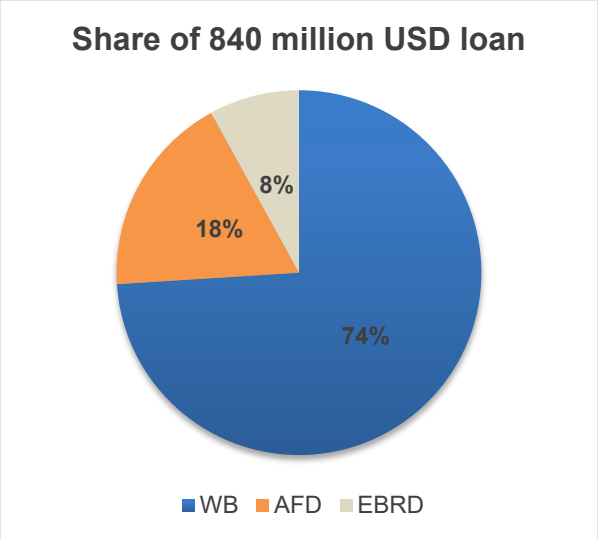
Source: Ministry for Ecology, Environmental Protection and Climate Change (2019)

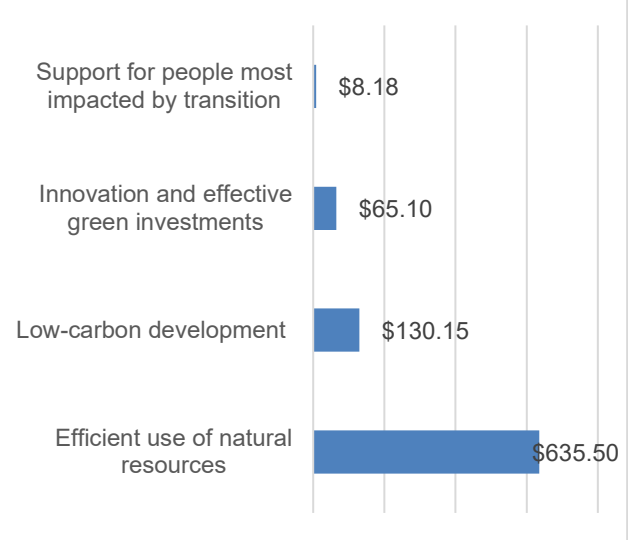
Figure 6.3. Public expenditures in SDG- 13 (Climate action)



Source: Ministry of Economy and Finance (2022), Uzbekistan Citizen Budget.

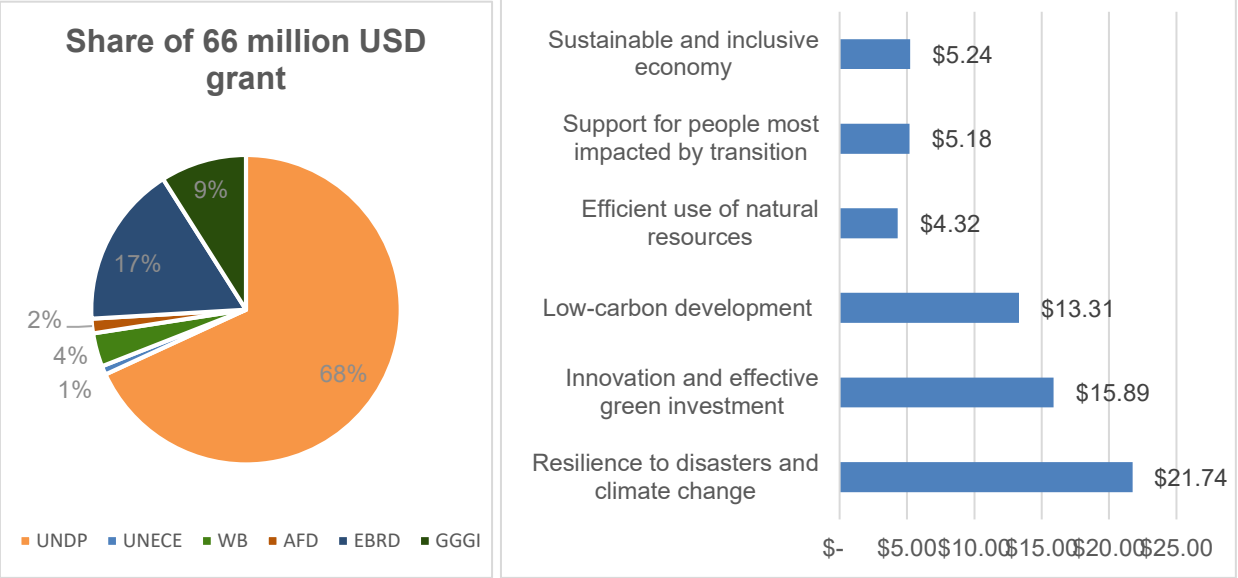
Figure 6.4. Share of loan financing by IFIs (percentage) and by thematic areas of GGSF, 2023





Note: AFD = French Development Bank; EBRD = European Bank for Reconstruction and Development; GGSF = Green Growth Strategic Framework; IFIs = international financial institutions; WB = World Bank.
Source: UNDP (2023), Donor Working Group Meeting (presentation).

Figure 6.5. Share of grant financing by development partners (in percentage of USD 66 million) and by thematic areas of GGSF, 2023



Note: AFD = French Development Bank; EBRD = European Bank for Reconstruction and Development; GGGI = Global Green Growth Institute; GGSF = Green Growth Strategic Framework; IFIs = international financial institutions; WB = World Bank.
Source: UNDP (2023), Donor Working Group Meeting (presentation).

Main trends

Environmental protection expenditures between 2012-19 are underfunded by the government

Public environmental expenditures are generally increasing, but the value remains small. On average, environmental expenditure accounted for only 0.06% of total government expenditures, or 0.02% of gross domestic product (GDP), in 2012-19 (Figure 6.2). This value may be underestimated as Uzbekistan lacks systematic budget tagging/marking for "green" expenditures. It is thus hard to assess all the investments in the transition to a green economy.

The government (the former Ministry of Finance, now the MoEF) started providing information on budget expenditures as a breakdown of SDG finance since 2019. This shows an upward trend in the budget allocated for SDG 13 (Climate Action) (Figure 6.3). However, investment dropped and was only 0.1% of the total in 2022, due to priority post-COVID recovery expenditures.

International financial flows to green growth are modest

Uzbekistan attracts modest green growth finance through grants and loans from multilateral institutions and the United Nations (Figures 6.4 and 6.5). By 2023, Uzbekistan had mobilised USD 840 million in loans and USD 66 million in grants from international financial institutions (IFIs) and development partners to support the green growth strategic priorities. The lack of systematic monitoring of development assistance for green growth does not allow for monitoring the trends. This report used the work of the United Nations Development Programme in this area, but data is inconclusive.

As part of the national Green Economy Transition Strategy until 2030, Uzbekistan has started implementing blended finance to establish special funds and green bonds to unlock green investments, both from public and private sources. In July 2021, Uzbekistan became the first country in CA and the second in the world to issue sovereign SDG Bonds worth USD 235 million (denominated both in US dollars and Uzbek soums), with a 14% coupon rate, for a period of three years. The Bond is expected to facilitate

financial flows from global investors to public SDG-oriented projects in seven areas: Education (SDG 4), Water Management (SDG 6), Health (SDG 3), Green Transportation (SDG 11), Pollution Control (SDG 11), Management of Natural Resources (SDG 15), and Green Energy (SDG 7) (UNDP, 2022).

And in October 2023, Uzbekistan launched green sovereign Eurobonds worth more than USD 800 million (UZS 4.25 trillion) denominated in national currency on the London Stock Exchange. The proceeds from the green bonds will go towards environmentally focused projects, such as the implementation of water-saving technologies, the expansion of railway and metro transportation systems, sanitation initiatives and the establishment of protective forests to combat wind erosion and water body siltation (UNDP, 2023).

The country also mobilises investment in renewable power generation in the framework of public-private collaboration. However, it does not participate in a competitive carbon trading market.

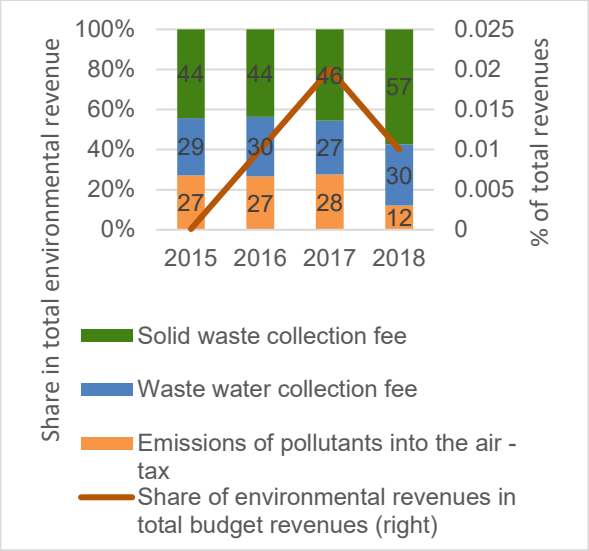
Prices and transfers

Environmental taxation encourages cost effectiveness among polluters and reduction in environmental pressure (OECD, 2017). Revenues from such taxes can be a source of financial support for the green economy transition in Uzbekistan. On the other hand, fossil fuel subsidies can negatively affect progress towards a greener economy. Accordingly, both are important indicators to track.

Indicators:

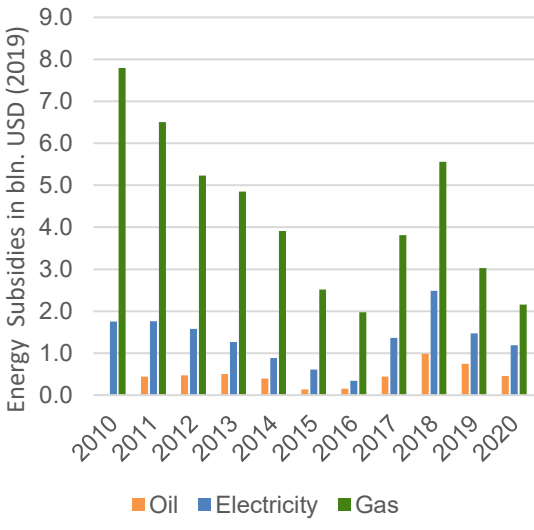
- environmental revenues from pollution tax
- environmental subsidies
- energy pricing
- water pricing

Figure 6.6. Revenues from environmental taxes & fees



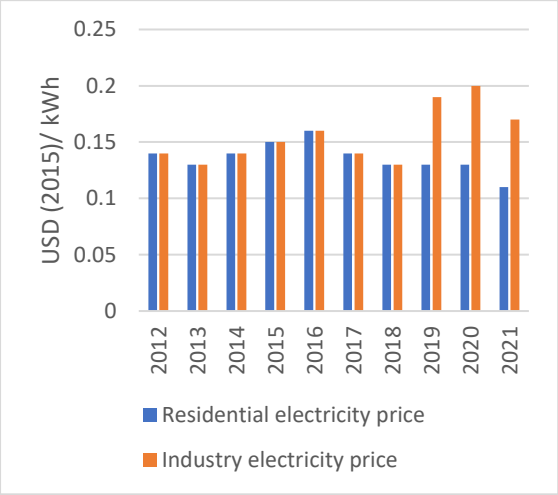
Source: Ministry of Ecology, Environmental Protection and Climate Change (2019).

Figure 6.7. Energy subsidies



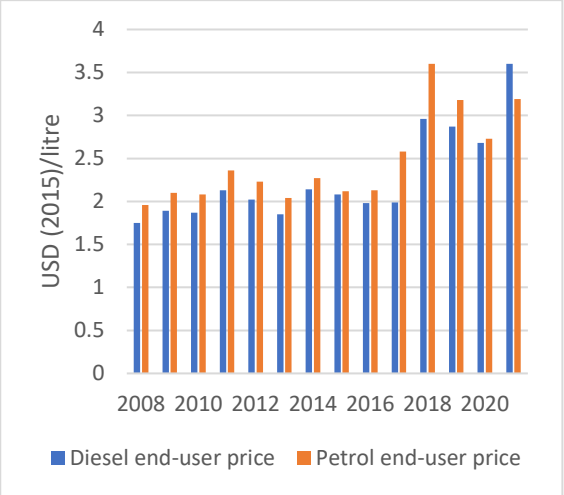
Source: IEA (2021).

Figure 6.8. Price of electricity



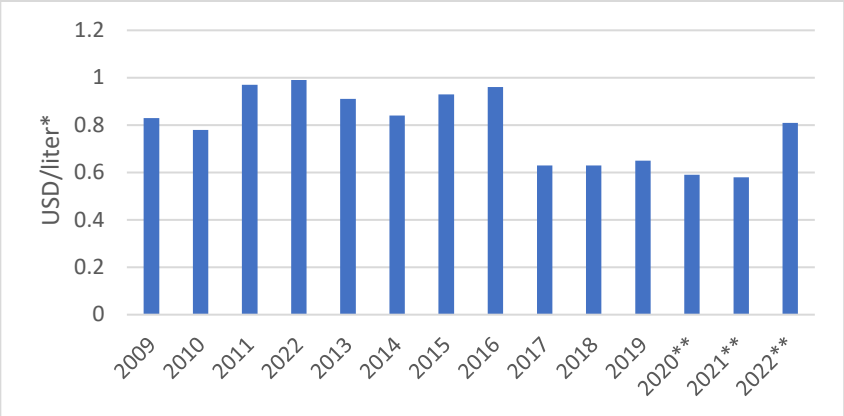
Note: the end-user price is calculated based on PPP using 2015 as base year.
Source: OECD (2023).

Figure 6.9. Price of diesel and petrol fuel



Note: the end-user price is calculated based on PPP using 2015 as base year.
Source: OECD (2023).

Figure 6.10. Average retail price of petrol



Note: * price is average for the three different quality grades of petrol(AI-80, AI-92 & AI-95). Using exchange rate by the comercial bank of Uzbekistan
** for 2020-2022 prices are available for Tashkent city, following the fuel price liberalization policy in 2019.
Source: Adapted from Golden Pages (2023), (Authors calculation)

Table 6.1. Cold water average annual tariff in Tashkent City in UZS

Type of residence	Tariff type	2019	2020	2021	2022
Apartment (with central hot water supply)	Per person/month	10 263	12 697	16 060	17 033
	Per m^3 (measured by a water meter)	1 050	1110	1400	1 400
Individual house with local heating systems	Per person/month	9 083	10 826	13 606	12 242
	Per m^3 (measured by a water meter)	380	410	500	500

Source: Golden Pages (2023).

Main trends

The share of revenues from pollution taxes in total revenue was constant at 0.01% during 2015-18, except in 2017 when it increased to 0.02%

The share of environmental tax revenues in the state budget remained constant and averaged about 0.01% of the total budget for 2015-18 (Figure 6.6). Solid waste collection fees made up 57% of the environmental tax revenues in 2018. Environmental revenues from pollution fees in general have increased with economic growth. These revenues were almost four times higher in 2018 (the latest year for which data are available) than in 2010, amounting to around USD 1.7 million (1 USD = 8 069 UZS in 2018). The 56% spike in the share of environmental revenues between 2016-17 reflects the effect of fast-paced economic activity. This led to increased emissions and discharges of pollutants, doubling pollution fees. The report cannot assess more recent trends due to lack of access to data.

Except for data on the pollution fees recorded by the State Committee for Ecology (now the Ministry of Ecology, Environment Protection and Climate Change), Uzbekistan does not classify all classical green tax revenues like energy tax, resource tax and transport tax in the total revenue. Moreover, there are no data on non-tax revenues generated from green licence fees and administrative charges. Hence, measuring revenues from all environmental taxes and fees is difficult. Moreover, since the environmental revenues are channeled to the general government budget, it is difficult to track if they are spent explicitly for environmental protection. Thus, it is impossible to correlate environmental tax/fee revenues with environmental expenditure.

Uzbekistan's Green Economy Strategic Framework Program and Action Plan (2022) envisages preparing legislation and a regulation that provides for full implementation of the "polluter pays" principle. The plan also envisions improving the system of pollution taxation by increasing the established tax rate for pollution and expansion of the list of pollutants by 1 July 2023.

Uzbekistan still provides high, but declining, subsidies for fossil fuel energy

Fossil fuel subsidies for oil or petroleum, natural gas and fossil fuel electricity generation gradually declined between 2010-20 (Figure 6.7). In 2020, Uzbekistan's subsidies for fossil fuel energy were reduced by 60% from the 2010 level. However, they still amounted to USD 3.8 billion, making up 6.6% of the GDP equivalent. The most significant subsidy reduction was observed in 2016, when total subsidies declined by 75% from 2010. The subsidy value, however, roughly doubled in 2019 before declining again in 2020. About 75% of the total fossil fuel support goes for consumer support (OECD, 2023).

Uzbekistan's energy sector aims to phase out fossil fuel subsidies gradually to protect the low-income population during the transition to a green economy by 2030. In addition, the government introduced an

energy transition “tax credit mechanism” to stimulate consumer investment incentives in green energy.[17] The investment incentive is expected to encourage use of renewable energy and energy-efficient technologies.

Energy prices for electricity and fossil fuels are increasing but do not represent the cost of production

From 2012-21, the electricity price increased for industrial uses, while it decreased for residential users (Figure 6.8). During this period, the price per kilowatt-hour (kWh) increased from USD 0.14 to USD 0.17 for commercial use, while decreasing slightly from USD 0.14 to USD 0.11 for residential use.

Tariffs for energy resource use do not represent production cost, yet energy price reform is debated due to social protection policies for the low-income population (IEA; World Bank). Accordingly, various tariff schemes are set as of 2019 for different categories of consumers rather than a single tariff for all consumer categories. Thus, the tariff for commercial consumers is 30- 50% more than for residential use.

The government policy specifies a more gradual transition for electricity tariffs by 2023 (Decree of the Cabinet of Ministers, 2019). The policy also states that profitability should be between 10% and 20%]. As of 2023, the policy indicates that people will pay for electricity depending on the time of day that they use it. Similarly, from 2008-21, the real price (2015) of diesel doubled, while the price of petrol increased by 63% (Figure 6.9). Fuel prices for petrol and diesel that used to be fixed by the government are determined by international market and exchange trading as of 2020. The nominal price of petrol increased between 2009-2016 and declined since 2017 (Figure 6.10).

The nominal price of natural gas in 2017-19 for residential buildings with gas meters also increased from UZS 246/m^2 to UZS 380/m^2 (Golden pages- Uzbekistan, 2023).

The price of water use increased in the last four years, but is still subsidised

In 2019-22, the price of water use in Tashkent City increased by 33% on average (Table 6.1). Water tariffs vary by region, residence type (individual house or apartment) and by availability of water meters. For instance, water prices are higher in regions than in Tashkent City, and apartments than houses. The Uzsuvtaminot joint stock company revises the water tariffs several times.[18] Although water tariff levels and collection rates have increased, they do not cover operational costs, which are still subsidised (World Bank, 2022). Historical data on water prices are not shown as directory books (Golden book of Uzbekistan) used in the report only published prices for 2019-22.

Definition of indicators

Public expenditures in environmental protection: public budget for environmental protection. E.g., environmental research and development in renewable energy sources.

[17] The requirement for the energy investment incentive is set by the Uzbek authority engaged in the formation of tariff policy rather than market principles, https://kun.uz/en/news/2020/05/02/uzbekistan-will-introduce-differential-electricity-tariffs-from-2022.

[18] See how the government sets regional water tariffs at https://uzsuv.uz/en/tariffs-and-criteria.

Environment-related innovations: environment-related inventions to ensure the protection and recovery of the environment. These are inventions for various environment-related technologies, including environmental management, water-related adaptation and climate change mitigation technologies.

International financial flows for green growth: international loans or grants for environment-related interventions from IFIs or multilateral institutions.

Environment-related tax revenues: income collected by the government through environment-related taxes. Taxes can include (i) energy products for transport purposes (petrol and diesel); (ii) motor vehicles and transport (one-off import or sales taxes, recurrent taxes on registration or road use and other transport taxes); (iii) waste management); (iv) emissions of pollutants and (v) other. In this report, only pollution tax and waste management are tracked.

Environment-related subsidies: government support to assist the energy sector to keep prices low. For example, coal, gas and electricity. It measures how much the government subsidises fossil fuels and the extent of support for renewable energy.

Technical comments on measurability and interpretation

Table 6.2 comments on the measurability, interpretation and data source for the indicators included in the chapter.

Table 6.2. Measurability, interpretation and source of data on economic opportunities and policy responses

Indicators	Measurability and measurement unit	Data source and years covered
Environment-related innovations	Percentage share of environment-related inventions of all domestic technologies. The indicator measures the number of new products and technologies developed domestically based on patent data extracted from worldwide patent statistical database (PATSTAT) (OECD, 2017:153).	OECD, 1992-2018 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.
Public expenditure in environment-related technology	Percentage of total GDP, government expenditure on green growth (GG). This measures how much the government invests in green initiatives.	Ministry for Ecology, Environmental Protection and Climate Change MEEPCCh, 2012-19 Ministry of Economy and Finance MoEF (SDG 13) 2019-22 https://admin.openbudget.uz/media/post_attachments/budjet_dlya_grajdan2022.pdf.
International financial flows of importance to GG	USD investments in GG include loans and grants from international financial institutions.	UNDP office in Uzbekistan, 2023 Power point presentation.
Environment-related tax revenue	Percentage of total tax revenue. The indicator measures a payment based on the quantity of pollutants discharged into the environment e.g. energy-related or transport-related.	Ministry for Ecology, Environmental Protection and Climate Change (new name) MEEPCCh, 2015-18 https://admin.openbudget.uz/media/post_attachments/budjet_dlya_grajdan2022.pdf.
Environment-related subsidies	Percentage of total subsidies (for coal, gas, electric). The indicator measures benefits and privileges provided to energy production sectors.	IEA, 2010-20 www.iea.org/reports/uzbekistan-energy-profile. https://iea.blob.core.windows.net/assets/0d00581c-dc3c-466f-b0c8-97d25112a6e0/Uzbekistan2022.pdf.
Energy pricing/ tariffs electricity diesel/petrol	Real price per litre for diesel and petrol (in USD 2015) using purchasing power parity (PPP) Nominal price of petrol in USD using exchange rate of the Commercial bank of Uzbekistan. Price per kWh of electricity (in USD 2015. The indicator measures changes in the end-user price for electricity(residential and industry use), using	OECD, 2012-21; 2008-21 https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH. Golden pages 2009- 2022 https://www.goldenpages.uz/benzin-cena/archiv-benzin/2022/

	2015 price as base year. The dynamics in the energy tariffs over time show policy reforms for valuing energy sources.	https://www.goldenpages.uz/benzin-cena/archiv-benzin/2021/ https://www.goldenpages.uz/benzin-cena/archiv-benzin/2020/
Water pricing	Tariffs in UZS for cold water in Tashkent City by residential type (apartment or house). The tariff is set by Uzsuvtaminot in person/month or by m^3 of water used (when water meters are installed).	Golden book- Uzbekistan 2019-22 www.goldenpages.uz/komunal-tarifi/.

References

Decree of the Cabinet of Ministers (2019), "On the main directions of tariff policy in the electric energy industry of the Republic of Uzbekistan for the period up to 2030", https://lex.uz/uz/docs/4289882.

EPO – PATSTAT (2023), 'Worldwide patent statistical database', Worldwide Patent Statistical Database.

Golden pages Uzbekistan (2023), tariffs for natural gas use at www.goldenpages.uz/komunal-tarifi/.

OECD (2017), *Green Growth Indicators, 2017,* OECD Green Growth Studies, OECD Publishing, Paris, https://doi.org/10.1787/9789264268586-en.

OECD (2023), 'OECD. Stat' (GGI database) https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH. (accessed 06 July 2023).

UNDP (2022), Uzbekistan SDG Bond Allocation and Impact Report, July 2021. https://jointsdgfund.org/publication/uzbekistans-first-sdg-bond-allocation-and-impact-report#:~:text=In%20July%202021%2C%20Uzbekistan%20has,a%20period%20of%20three%20years. (accessed 12 September 2023).

UNDP (2023), Uzbekistan Issues First Ever Green Sovereign Eurobonds Worth 4.25 Trillion UZS on the London Stock Exchange. Retrieved on October 10, 2023, from *https://www.undp.org/uzbekistan/press-releases/uzbekistan-issues-first-ever-green-sovereign-eurobonds-worth-425-trillion-uzs-london-stock-exchange*.

UNDP and Ministry of Economy and Finance of Uzbekistan (2023), "Citizens' Budget: Execution in 2022". Tashkent.

World Bank (2022), *Uzbekistan Public Expenditure Review. Better Value for Money in Human Capital and Water Infrastructure*, World Bank, Washington, DC.

PART II. Monitoring the National Green Economy Strategy, Programme and Action Plan for 2030

7 Monitoring Uzbekistan's Green Economy Strategy for 2030

This special chapter monitors Uzbekistan's strategic framework for transitioning to a green economy by 2030. It focuses on the eight indicators approved by the government to monitor implementation of the Green Growth Strategy, Programme and Action Plan in achieving its objectives and targets. The chapter also uses national indicators to capture the progress in implementing the Green Growth Strategy in 2022.

National policy framework for a transition to a green economy

On 4 October 2019, the President of Uzbekistan approved a decree on “approval of the Strategy for the transition of the Republic of Uzbekistan to a green economy for the period 2019-2030” (Decree of the President, 2019) (hereafter “Green Economy Strategy”). The decree set four strategic directions:

- improvement of energy efficiency
- development of renewable energy sources
- climate change adaptation and mitigation, improving the efficiency of natural resource use
- preservation of natural ecosystems and development of financial and non-financial mechanisms supporting a green economy.

The decree appoints the Ministry of Economy and Finance to co-ordinate, implement and monitor the green economy strategy through specialised working groups.

In December 2022, in line with the green economy strategy and also with the ‘Development Strategy of New Uzbekistan for 2022-2026’ (2022), Uzbekistan adopted the national “Programme on the transition to a green economy and ensuring green growth in the Republic of Uzbekistan until 2030” and its Action Plan (Decree of the President, 2022).

The programme (hereafter ‘Green Growth Strategic Framework’, or GGSF) stipulates the importance of establishing a monitoring framework. This should track progress and ensure regular data collection and institutionalisation of the process to track the transition to a green economy. The action plan has more details under activities number 50-53 in the appendix of the document, including:

- improving inter-ministerial co-ordination
- aligning sectoral strategies
- developing tools for modelling and forecasting green transition
- improving data collection
- creating a system for the monitoring, reporting and verification of greenhouse gas emissions as of January 2024.

In consultation with stakeholders, the government selected eight indicators at the approval stage of the action plan in December 2022 to monitor implementation of the Green Economy Strategy by 2030. The eight were selected from the initial 17 indicators proposed in 2021. The GGSF indicators are accompanied by sets of ambitious targets in increasing energy efficiency, share of renewables, access to drinking water, expanding forest stocks and greening cities by 2030, as stipulated in Table 7.1, with intermediate targets for 2022, 2024, 2026 and 2028.

Table 7.1. Targets in the Green Growth Strategic Framework until 2030

No.	Indicators	Unit of measurement	2022 targets	2024 target	2026 targets	2028 targets	2030 targets
1	Energy intensity of GDP	Percentage decrease of tonnes of oil equivalent energy use	5	14	22	27	30
2	Energy consumption in the industry sector	Percentage share of total energy consumption	26	25	23	21	20
3	Share of renewable energy sources	Percentage share increase in total electricity generation	8	9	24.3	29.0	30.5
		kWh	6.5	8.6	25.0	34.0	40.7
4	Construction of small solar photovoltaic power plants	MW	10.0	150.0	400.0	800.0	1 500.0
5	Population with access to	Percentage of the total population	69.7	80.93	87.12	88.5	90.0

No.	Indicators	Unit of measurement	2022 targets	2024 target	2026 targets	2028 targets	2030 targets
	improved sources of drinking water						
6	Stocks of trees and shrubs on the lands of the forest fund	Million m^3	64.2	68.1	77.0	85.5	92.3
7	Share of green areas in cities within the green land project	Percentage of the total area of the city settlement	8.3	12.4	15.8	23.8	30.0
8	Proportion of municipal solid waste recycled	Percentage of municipal solid waste generated	30.0	40.0	50.0	60.0	65.0

Source: Uzbekistan GGSF Programme and Action Plan, 2022.

Table 7.2 presents GGSF indicators alongside strategic priorities in the 2019 Strategy. It shows the GGSF programme and action plan does not have indicators for all the priorities of the green growth transition. Moreover, the plan does not clearly indicate how data for the eight selected monitoring indicators will be calculated or collected. The baseline values are also not clearly defined for each indicator.

The first set of target values for 2022 coincides with programme adoption in December 2022, raising the question of whether the values are targets or baseline values. The lack of identifying "data sources" for calculating the proposed indicators also raises a question of data availability in national statistics for the indicators. Thus, the future monitoring framework might face some risks associated with the above points, jeopardising monitoring. It requires additional clarifications and methodological discussion, baseline values, methods of calculation, data sources, responsible bodies collecting the data, frequency of reporting and verification methods.

For this report, baseline data values for 2021 are set for some indicators (as in Table 7.2) through communications with the Ministry of Economy and Finance and available data. However, not all data is complete. Several potential sources of data were also identified during the project experts' meeting on 12 July 2023.

Table 7.2. National green economy strategic priorities, indicators and measurability

№	Green economy transitions strategic priority (six)	GGSF indicators (eight)	Unit of measurement	Data source and verification	Baseline value –2021	Target – 2030
1	Ensuring efficient use of natural resources	Energy intensity of GDP	Kilogramme of oil equivalent (koe)/per unit of GDP	Statistics Agency/ Min. of Energy	159 koe/USD	Decrease by 30%
2	Strengthening the resilience of the economy to natural disasters and climate change	No indicator				
3	Ensuring low-carbon emissions of the economy in the industry sector	Energy consumption in the industry sector	Percentage of total energy	Ministry of Energy	24.9%	Decrease to 20%
		Share of renewables in total electricity production	Million kilowatt-hour (kWh) and percentage in total electricity production	Ministry of Energy	49.5 million kWh and 7.1% of total electricity	Increase to 31%
		Construction of small solar PV power plants	in MW	Ministry of Energy	5.6 MW	Increase to 1 500 MW
4	Introducing innovations and attracting green investments	No indicator				
5	Developing sustainable urbanisation	Share of recycled MSW; level of solid waste recycling	Percentage of total MSW generated	Ministry of Ecology, Environmental Protection and	26% of waste	Increase to 65%

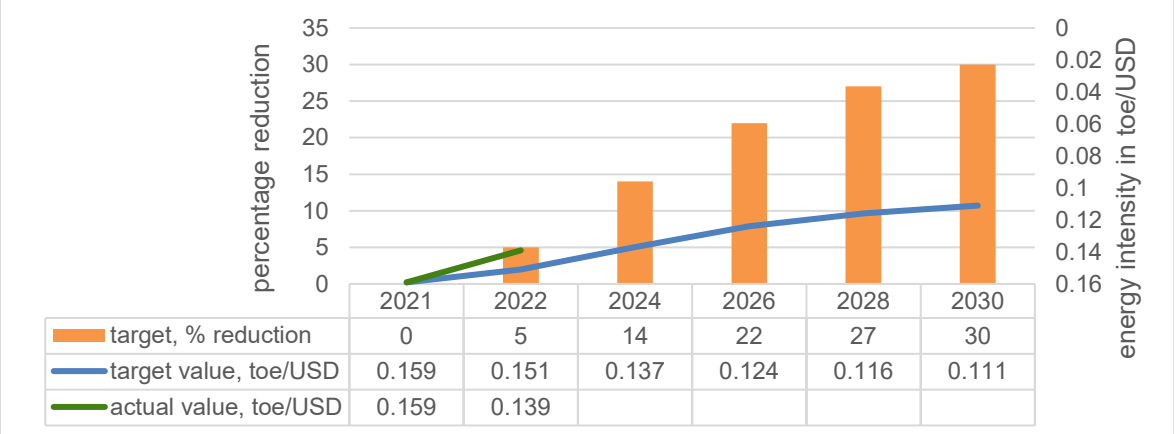
№	Green economy transitions strategic priority (six)	GGSF indicators (eight)	Unit of measurement	Data source and verification	Baseline value –2021	Target – 2030
				Climate Change (MEEPCC)		
		Green spaces in cities	Hectares and percentage of total area	Forestry Agency	No data	Increase to 30%
		Stocks of trees and shrubs on the lands of the forest fund	Million cubic metres (m^3)	Forestry Agency	60.9 million m^3	Increase to 92.3 million m^3
6	Supporting the population most affected during the green economy transition	Access to safe drinking water	Percentage of households	Statistics Agency-SDG reporting in percentage of households	68.3%	Increase to 90%

Note: koe = kilogrammes of oil equivalent; kWh = kilowatt hour; MW = megawatt; MSW = municipal solid waste.
Source: Authors' compilation

Measuring progress towards the green economy transition until 2030

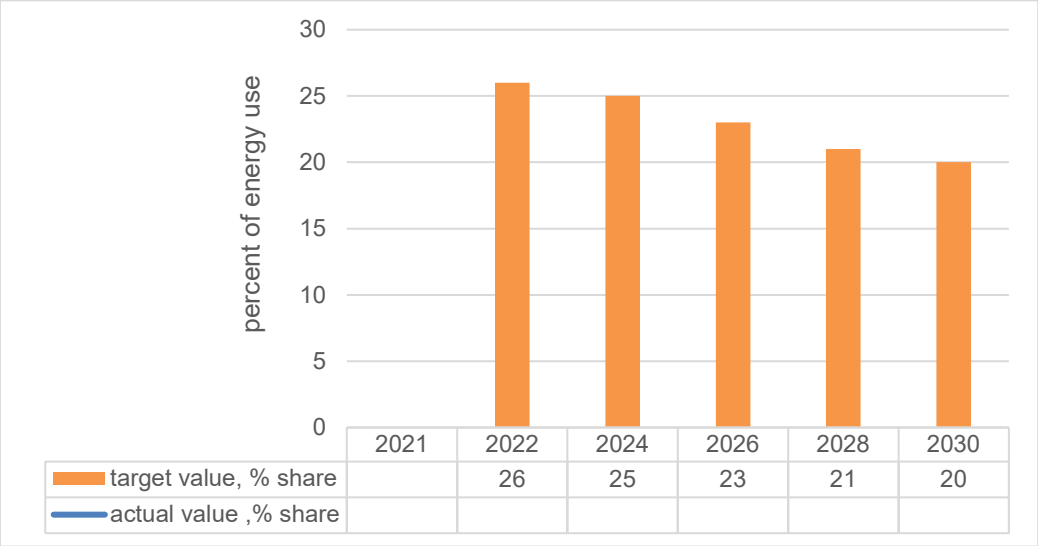
This part attempts to measure the progress in the eight national indicators of the GGSF Action Plan to monitor the green economy transition. It assesses, where possible, actual progress in 2022 versus the established target for the year against the 2021 base year values.

Figure 7.1. Reduction in energy intensity of GDP



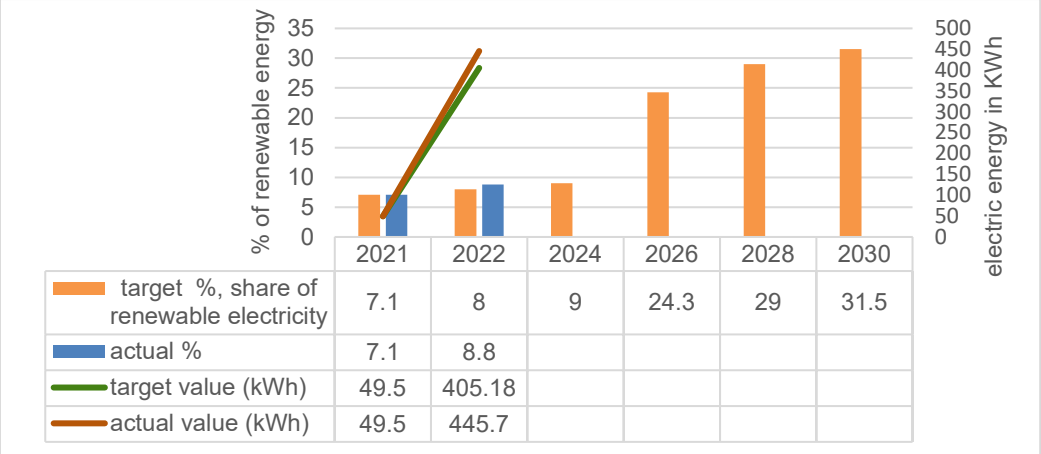
Note: toe = tonnes of oil equivalent.
Source: GGSF, 2022; Figure 3.8 of the report and authors' calculations.

Figure 7.2. Reduction in energy use by the industry sector



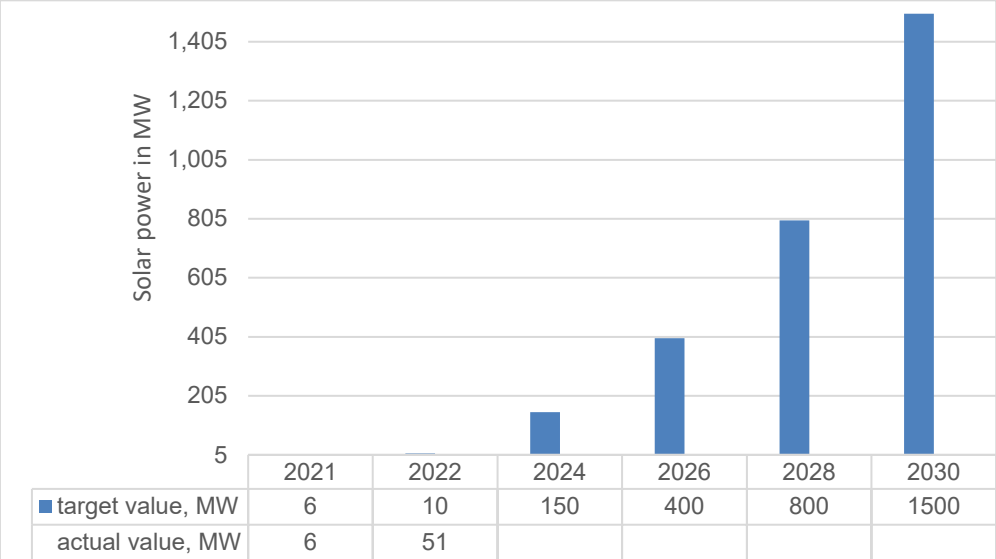
Source: GGSF, 2022.

Figure 7.3. Share of renewables in electric generation



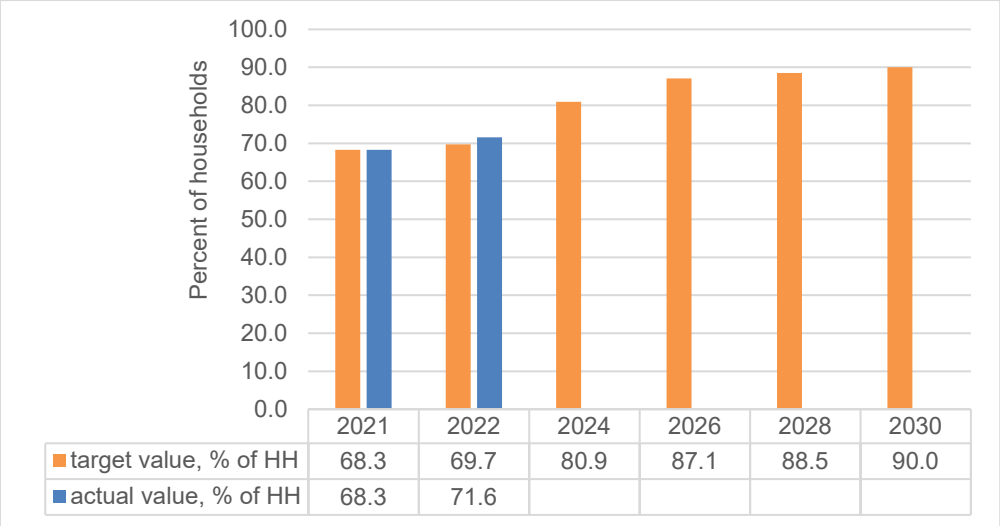
Note: kWh = kilowatt-hour.
Source: GGSF, 2022; Figure 3.5 in the report and authors' calculation.

Figure 7.4. Construction of solar PV power plants capacity



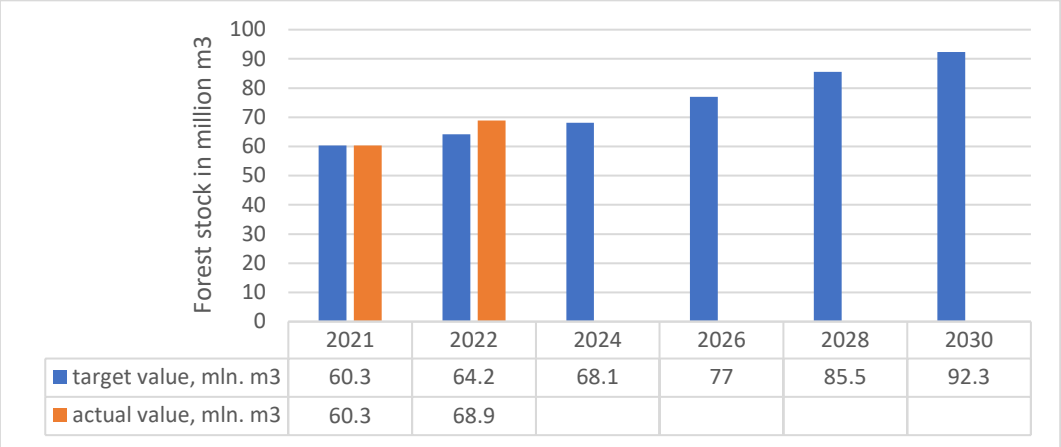
Source: GGSF, 2022; Statistics Agency, 2023 Industry (stat.uz) and authors' calculation.

Figure 7.5. Population access to drinking water



Source: Uzbekistan GGSF, 2022; Figure 5.7 and authors' calculation.

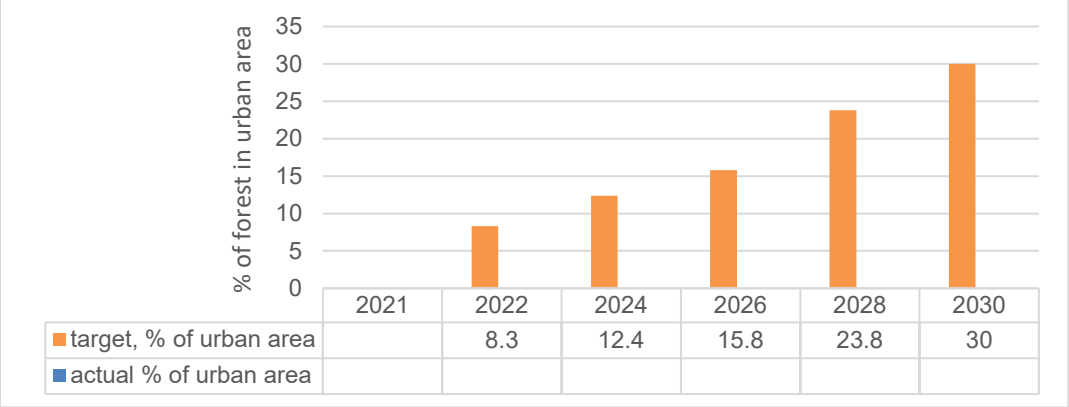
Figure 7.6. Increase in forest tree and shrub stock



	2021	2022	2024	2026	2028	2030
target value, mln. m3	60.3	64.2	68.1	77	85.5	92.3
actual value, mln. m3	60.3	68.9				

Source: GGSF 2023 and baseline value from the MoEF.

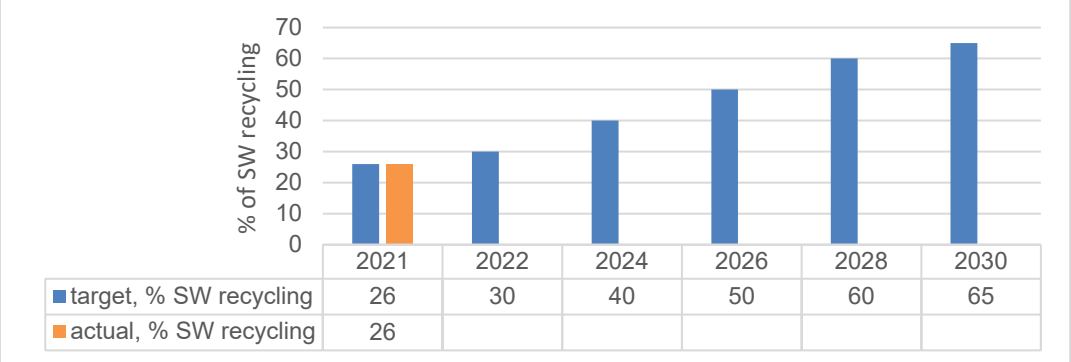
Figure 7.7. Share of green areas in cities



	2021	2022	2024	2026	2028	2030
target, % of urban area		8.3	12.4	15.8	23.8	30
actual % of urban area						

Source: GGSF, 2022.

Figure 7.8. Solid waste recycling



	2021	2022	2024	2026	2028	2030
target, % SW recycling	26	30	40	50	60	65
actual, % SW recycling	26					

Note: SW= solid waste
Source: Uzbekistan GGSF, 2022; SDG report by the SA, authors' calculation.

Main trends in 2022

Energy intensity of the economy decreased

In 2022, Uzbekistan capped the first target of reducing energy intensity by 5%, set in the national GGSF, by reducing it by 12.6% (Figure 7.1). The decline illustrates the country is already doing better in energy intensity reduction compared to the 2022 target value: 0.139 tonnes of oil equivalent (toe)/USD versus targeted 0.151 toe/USD. The trend is a good start for the country in reaching its 2030 target.

It was not possible to measure reduction in share of energy use in the industry sector

There is no clarity in the baseline value and definition of "energy consumption by industry" that can be used to monitor progress. The Statistics Agency (SA) has data on "net electricity consumption by sector". and accounts for 24.9% in 2021; if the shares of industry and construction consumption out of total supply are aggregated, it is 27% (20 249 million kWh). [19] Nevertheless, "electricity consumption" does not mean "energy consumption" as electricity is part of the total energy supply. Thus, it is vital to distinguish between the two terms. Also, SA data on electricity use by sector do not add up to the total value, thus calling for a check.

The OECD dataset for Uzbekistan, used in Figure 3.7 in this report, shows primary energy consumption by sector. Yet it does not have data for 2021. Meanwhile, available data show the value of the share of primary energy consumption by industry was already 20.5% by 2020.

The share of RES in the total electricity generated increased over the target

Uzbekistan has overachieved the 2022 target of 8% share of renewable sources in total electricity generation. The share of renewable electricity in 2022 was 8.8% and in actual value 445 million kWh. The target for 2030 is four times the 2022 value; thus, Uzbekistan must gain more momentum in installing renewable energy generation plants in the coming years.

The capacity for solar energy increased over the target

Figure 7.4 illustrates that Uzbekistan has overachieved the solar capacity targets for 2022 by five times. The calculation was not straightforward. Here, the indicator is interpreted as the cumulative solar power capacity (MW) installed. Although the SA publishes the annual capacity of thermal and hydroelectric power plants, it does not account for the capacity of solar plants, which is negligible. Nevertheless, the SA provides data on solar energy (in million kWh) produced annually. Accordingly, in 2021 (base year), Uzbekistan produced 49 million kWh of solar energy. Thus, the annual capacity of solar power plants in 2021 would be 5.59 MW (calculated as 49 million kWh/24 hrs x 365 hrs).

In 2022, the SA reports the actual amount of solar energy increased to 445.7 million kWh; thus, when converted to megawatts thermal power (MW), capacity increased to 51 MW (calculated as 447 700 000/24 x 365).

Uzbekistan should install solar power plants more quickly to achieve its ambitious 2030 target of 1 500 MW.

Access to safe drinking water increased by more than the target

In 2022, the share of the population provided access to drinking water was 71.6%, slightly higher than the target (69.7%) set for the year. Here, the report measures the proportion of houses with access to safe drinking water (not a share of the total population), as also reported by the SA. Thus, clarity in defining the indicator is essential.

[19] See Statistics agency database: Industry stat.uz)

Forest stocks have increased

In 2022, the forest biomass stock increased to 68.9 million from 60.3 million m^3 in 2021. This is an overachievement by 7% compared to the target of 64.2 million m^3 for the year. The GGSF action plan aims to increase forest stock from 60.9 million m^3 (based on information from the Ministry of Economy and Finance) in 2021 to 92.3 million m^3 in 2030. A clearer contextual definition of the indicator would, nevertheless, be useful.

It is not possible to measure the trend in the share of green areas in cities

The action plan does not define the baseline value for city or urban green areas in 2021. Uzbekistan targets an expanded proportion of green areas in cities to 30% of the area by 2030. The source for forest-related data is the Forestry Agency, thus records on city green areas should be clearly defined.

It was not possible to measure progress in the recycling of solid waste

No data are available for 2022 at the time of this report compilation. The green economy transition action plan intends to increase solid waste recycling capacity from 26% in 2021 to 65% by 2030. The actual value of processed solid waste in 2021 was 1.6 million tonnes. The SA collects data on solid waste recycling as part of the SDG 12 monitoring.

References

Decree of the President of the Republic of Uzbekistan (2019), on 'approval of the strategy for the transition of the Republic of Uzbekistan to a green economy for the period 2019-2030' (President Decree No. PP-4477) dated 4 October 2019. https://lex.uz/ru/docs/4539506

Development Strategy of New Uzbekistan for 2022-2026. https://lex.uz/ru/docs/5841077

Decree of the President of the Republic of Uzbekistan on GGSF Programme and Action Plan (2022), No. PP-436 03.12.20), dated 2 December 2022. https://lex.uz/docs/6303233

Greening the Economy in Uzbekistan: State of Play in 2023

Monitoring progress based on the OECD Green Growth Indicators

The report tracks Uzbekistan's green growth performance by collecting data for 23 OECD Green Growth Indicators between 1990 and 2022 and measuring progress on eight national targets adopted in Uzbekistan's Green Growth Strategy and Action Plan to 2030. It covers all main areas of green growth and contains data such as production- and demand-based CO_2 emissions, kilograms of solid waste produced, welfare costs from exposure to ambient fine particles and water stress.

It shows that carbon, energy, material and water productivity are rising, resulting in fewer emissions and more efficient energy and resource use alongside economic growth. The share of forest and protected natural areas is increasing. It also highlights several areas where more efforts are needed: Uzbekistan's total greenhouse gas emissions are the second largest in Central Asia after Kazakhstan, and the carbon and energy intensity of its economy is one of the highest in the world; air pollution is among the highest in the world; water stress levels are high and rising; and only a quarter of solid waste produced is recycled. Going forward, Uzbekistan can continue to monitor progress on green growth by institutionalising data collection on OECD Green Growth Indicators to ensure they are updated regularly, further harmonise existing data and address data fragmentation across government bodies.

Contact information:

Isabella Neuweg: isabella.neuweg@oecd.org
Irina Belkahia: irina.belkahia@oecd.org
Krzysztof Michalak: krzysztof.michalak@oecd.org