



Towards a Greener Economy in Uzbekistan

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ACRONYMS AND ABBREVIATIONS

ALMP	Active Labor Market Policy
AQUASTAT	FAO's Global Information System on Water and Agriculture
BCAT	Border Carbon Adjustment Tax
BGU	Biogas Unit
BOD	Biological Oxygen Demand
CBAM	Carbon Border Adjustment Mechanism
CBU	Central Bank of Uzbekistan
CCDR	Country Climate and Development Report
CCGT	Combined Cycle Gas Turbine
CCIA	Climate Change Institutional Assessment
CGE	Computable General Equilibrium
CPL	Climate Policy Leader
CWON	Changing Wealth of Nations
DALY	Disability-Adjusted Life Year
ECA	Europe and Central Asia
EITE	Emissions-Intensive Trade-Exposed
ENVISAGE	Environmental Impact and Sustainability Applied General Equilibrium
ETS	Emissions Trading System
EU	European Union
EU-27	27 countries of the European Union
FAO	Food and Agriculture Organization
FFDC	Fossil Fuel-Dependent Country
FHH	Female-Headed Household
FISIM	Financial Intermediary Services Indirectly Measured
GBD	Global Burden of Disease
GDP	Gross Domestic Product
GGSF	Green Growth Strategic Framework
GHG	Greenhouse Gas
GLOF	Glacial Lake Outburst Flood
GRID	Green, Resilient, and Inclusive Development
GTAP	Global Trade Analysis Project
HIC	High-Income Country
IAWG	Inter-Agency Working Group
IEA	International Energy Agency
IFPRI	International Food Policy Research Institute
IHME	Institute for Health Metrics and Evaluation
IMF	International Monetary Fund

INFORM	Index for Risk Management
L2CU	Listening to the Citizens of Uzbekistan
LIC	Low-Income Country
LMIC	Lower-Middle-Income Country
LTS	Long Term Decarbonization Strategy
MEDPR	Ministry of Economic Development and Poverty Reduction
MHH	Male-Headed Household
NDC	Nationally Determined Contribution
ND-GAIN	Notre Dame Global Adaptation Initiative
NDVI	Negative Change in Vegetation
NTFP	Non-Timber Forest Product
PFM	Public Financial Management
PIM	Public Investment Management
PPP	Purchasing Power Parity
R&D	Research and Development
RCP	Representative Concentration Pathway
RISE	Resilience, Inclusion, Sustainability, and Efficiency
SCADA	Supervisory Control and Data Acquisition
SCEEP	State Committee on Ecology and Environmental Protection
SDGs	Sustainable Development Goals
SMEs	Small and Medium Enterprises
SNG	Subnational Government
SOE	State-Owned Enterprise
TFP	Total Factor Productivity
UFRD	Uzbekistan Fund for Reconstruction and Development
UMIC	Upper-Middle-Income Country
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
UZHSDROMET	Center of Hydrometeorological Service of the Republic of Uzbekistan
VAT	Value Added Tax
WDI	World Development Indicators
WHO	World Health Organization
YLDs	Years Lived with Disability

ABSTRACT

This report is an extended Country Environmental Assessment that identifies key issues and priorities for action as Uzbekistan transitions to a sustainable and inclusive market economy. Land degradation, water stress, and air pollution from particulate matter are the main environmental issues, with additional socio-economic risks to the country from its high energy and carbon intensity and the impact of climate change on vulnerable communities. The report analyzes strategies for greening the economic transition, including resource efficiency and landscape restoration, the low-carbon transition, resilience against natural disasters and climate change, urban air quality and sustainable cities, green employment and public institutions, and green finance. Additional follow-up studies to inform detailed policy formulation and action include distributional analysis, adaptation strategy and planning, a Long-Term Decarbonization Strategy, and Climate Change Institutional Assessment, among others.

BRIEF SUMMARY

Uzbekistan is poised for a remarkable transition to a market-based economy by building on the success of initial reforms. There is an opportunity to enhance the ongoing transition with a green approach to achieve a more sustainable and inclusive economy. Green policies support better resource allocation, more competitive enterprises, and the distribution of benefits. The Government of Uzbekistan recognizes the synergies between economic development and green principles and has embraced this with its 'Strategy for the Transition to a Green Economy.' This report applies a range of analytical tools to identify key environmental and other risks to the economy and how to recapture these economic costs through greening strategies.

Land degradation is causing economic losses equivalent to 4 percent of gross domestic product (GDP) and is the result of interlinked environmental and resource issues. There is excessive water withdrawal and inefficient use: the economic productivity of water is US\$14 lower than upper-middle-income countries (UMICs) for every cubic meter of water used. About 50 percent of irrigated lands are exposed to different degrees of salinity and up to 26 percent of croplands are severely degraded. Prioritizing water use efficiency will be among the most pressing issues, and should include resource pricing, water saving technology, and withdrawal limits. Landscape restoration should also be prioritized to control soil erosion and preserve ecosystem functions. A distributional analysis of the impact of water pricing reforms on low-income communities is needed as part of detailed policy formulation.

Climate change threatens to multiply these underlying risks. Based on data and models currently available, the economic cost of the physical impact of climate change is estimated at 1 percent of GDP by 2030 with the largest effect on agriculture, followed by water and biodiversity loss, labor productivity, and increased weather hazards. Climate change will be particularly harsh on vulnerable communities, including those in the Ferghana Valley and Karakalpakstan regions, making Uzbekistan more socially vulnerable than other Central Asian countries. Analysis finds that these groups suffer twice the loss of income and consumption during drought and flood events compared to affected communities in neighboring countries. Broad adaptation objectives have been identified in the country's Nationally Determined Contributions (NDCs), but **a national adaptation strategy** is needed to guide the design of adaptation actions and their prioritization according to cost. Given its risk profile and environmental situation, Uzbekistan should consider specific measures such as catastrophic insurance for drought risk and nature-based adaptation. Local communities are important stakeholders in designing adaptation actions.

Another priority is to adopt a package of **low-carbon policies**. Uzbekistan's energy use per unit of GDP is about three times higher than the average for the Europe and Central Asia (ECA) region. This also drives up carbon intensity and exposes the country to global low-carbon policies and border adjustment taxes by major trading partners. Scenario analysis has found that up to 40 percent of Uzbekistan's natural gas and petroleum exports could be affected by 2050, together with other carbon-intensive export sectors. Low-carbon policies such as **subsidy reform and carbon pricing** will create incentives to pivot away from energy- and carbon-intensive practices. Other priorities include maximizing the country's renewable energy potential and implementing low-cost energy efficiency measures such as retrofitting buildings with heat insulation and upgrading old infrastructure to reduce energy losses. Developing a robust Long-Term Decarbonization Strategy (LTS) is a priority as this aligns short- and medium-term actions with long-term goals.

The low-carbon shift will also have other public health benefits as air pollution will reduce with decreasing fossil fuel use. Major population centers are regularly exposed to air quality deemed unhealthy: an equivalent of 6 percent of GDP in non-accidental mortality can be attributed to air pollution. Further air quality benefits will accrue from improved urban planning with targeted expansion of central heating to address seasonal **air pollution** issues, including in the Kashkadarya region.

To help mitigate some of the social costs of the green transition, **strategies for green job creation and reskilling and redeploying** affected workers will be needed. With an increasing emphasis on resource efficiency, the general trend of economic diversification will be accompanied by a preference for higher value-added activities with lower environmental impact. Initial analysis finds the greatest potential for green job creation per dollar invested to be in health care, education, finance, and climate-smart agriculture. A longer list of other economic activities, such as nature-based enterprises, identified in the report deserves further study. The labor shift will occur across the economy but is likely to be more pronounced in **agriculture** given its large employment share. Also, the **fossil fuel and other carbon-intensive industries** will be affected by changes in the global market even without domestic low-carbon policies. Income and redeployment support for displaced workers can be partly financed by environmental taxation. A carbon tax of US\$35 per ton can deliver up to 5 percent of GDP in additional fiscal revenue while reducing carbon emissions by up to 11 percent compared to the business-as-usual scenario.

Financing the green transition will require more effective public spending and alignment of fiscal policy with green objectives. Uzbekistan has sufficient scope for financial mobilization and can address costly energy subsidies and raise revenue through environmental taxation versus other tax measures. Other measures to prioritize include better defining green investment projects through standard green taxonomies and setting green finance standards to better reach institutional investors.

The reward of a green and inclusive market economy awaits Uzbekistan. This report identifies the most urgent environmental and other risks, and analyzes some effective implementation strategies. Further detailed work is recommended to inform policy formulation and action, which can be conducted as part of the World Bank's upcoming analytical work.



EXECUTIVE SUMMARY

The past years of economic reforms have paid dividends for Uzbekistan and the country is now well positioned for the next phase of market-oriented reforms. Uzbekistan stands to gain much more by greening its economic transition and making the economy more sustainable.

Uzbekistan embarked on an ambitious transition from a planned economy to a market economy in 2016. Market reforms have gained traction in many vital sectors. The government has managed to push through changes while reducing poverty rates, sustaining growth, and steadying the economy during the COVID pandemic. The efforts have paid off, and people in Uzbekistan are now experiencing an improvement in well-being and prosperity. The next phase of economic reforms will aim to reduce poverty in half and make Uzbekistan an upper-middle-income country (UMIC) by 2030. By taking on green objectives as part of the economic transition, Uzbekistan can reinforce the transition and increase its benefits. The government's 'Strategy for the Transition to a Green Economy' acknowledges this synergy.

A green transition is not a separate undertaking but is an integral part of the broader economic transition to a sustainable and inclusive market economy. Green policies support better resource allocation, more competitive enterprises, and the distribution of benefits. The green approach emphasizes resource efficiency and environmental management, which frees up more resources for other growth areas while sustaining a productive natural resource base. Green policies support the use of green technology and solutions. This requires openness to new actors and their expertise, innovation, and capital, which creates new jobs and dynamism in an economy held back by less efficient state enterprises. Greening also pays heed to the negative effects of transition, by mitigating impacts on affected workers and prioritizing them for access to green benefits and opportunities. This strengthens society's acceptance of the economic transition and enables the transition to run its course.

To become a more sustainable and green economy, the country must address existing environmental issues and other risk factors that are already impeding the economy. It must also anticipate other challenges that will emerge; a shift in how resources are used and how essential goods are priced will likely affect low-income groups. Supporting green sectors and turning away from carbon- and resource-intensive activities will alter the pattern of investment and job creation, thereby creating winners and losers. Other factors will compound the challenges, such as the physical impact of climate change.

A diagnosis based on the World Bank Green, Resilient, and Inclusive Development (GRID) approach highlights areas for improvement relative to higher-income countries. Resource efficiency, measured at US\$0.8 in economic output per kilogram of material consumed, is much lower than the US\$2.9 average in the European Union (EU) and other UMICs. Water use in Uzbekistan is particularly inefficient: the economic productivity of water is US\$14 lower than UMICs for every cubic meter of water used. Uzbekistan's energy use per unit of GDP is about three times higher than the average for ECA and two times that of neighboring Kazakhstan. Particulate air pollution from urban and industrial sources is aggravated by windblown dust from degraded land. A significant share of the population is regularly exposed to air quality deemed unhealthy: an equivalent of 6 percent of GDP in non-accidental mortality can be attributed to air pollution (Section 3.3). Land degradation has been especially costly to the economy and is driven by these interlinking environmental issues. The Cost of Environmental Degradation (Section 3.2) related to degraded lands is estimated to be equivalent to 4 percent of GDP.

Uzbekistan is vulnerable to weather shocks and has a low Resilience Index. Analyses of drought and flood impacts have found that the most affected communities suffer a large loss of income and consumption. This has made Uzbekistan the most socially vulnerable of Central Asian countries even when other countries have a larger share of the population affected by severe weather. Analysis of the likely pattern of climatic change finds that the country's social vulnerability will only increase. Among the highly vulnerable areas highlighted by the analysis, the Ferghana Valley and Karakalpakstan regions stand out.

Natural Capital Accounting analysis suggests a link between the management of natural resources and the country's low Resilience Index. While better endowed with natural resources on a per capita basis than other Central Asian countries except Kazakhstan, Uzbekistan has a far greater share of natural capital in the form of pasture and cropland and less in forest and protected lands, which sustain ecosystem function. These factors, combined with the trend of water overuse, contribute to the spread of degraded lands.

Meanwhile other risks are emerging, from climate change to the global policy landscape. The physical impact of climate change has a direct economic price. Based on currently available data, the economic cost—affecting mostly the agriculture sector—is estimated at 1 percent of GDP by 2030 (Section 4.2). About half the costs come from habitat loss, on account of water and biodiversity losses, primarily affecting agriculture. Climate change also affects labor productivity, and in Uzbekistan's case can translate into 2 to 5 percentage points in reduced labor supply. Food production could partially adapt through climate-smart agriculture, and better management of land, water, and landscapes can further reduce impacts.

As part of collective action on climate change, countries will adopt low-carbon policies and global demand for fossil fuels will gradually decrease. An analysis of the impact on carbon-intensive exports (Section 4.3) finds that Uzbekistan's GDP and welfare will be substantially affected. Under various scenarios of policy coordination among Uzbekistan's major export markets, including through border taxes for carbon-intensive products, up to 40 percent of Uzbekistan's natural gas and petroleum exports could be affected by 2050. However, Uzbekistan can mitigate this impact by taking on its own low-carbon policies.

In short, the urgent issues to be tackled are land degradation, water stress, and air pollution from particulate matter. Uzbekistan's high energy and carbon intensity make the country vulnerable to global low-carbon policies and border adjustment taxes by major trading partners. And without an adaptation response to climate change, the country's environmental issues and low social resilience will worsen.

Most of these economic costs can be potentially turned into economic benefits by setting green priorities as part of the ongoing economic transition. These priorities are summarized in Table E.1 and presented according to the six themes of the government's Green Growth Strategic Framework (GGSF). Most of the priority areas listed are based on the report's analysis, and the remaining were identified from consultations accompanying the report, including the Green Growth Dialogue series involving several ministries and external stakeholders and led by the Ministry of Economic Development and Poverty Reduction (MEDPR).

This report also examines effective strategies for pursuing some of these priorities, such as low-carbon development, and promoting green job opportunities.

A low-carbon policy package will provide the necessary incentives for the shift toward low-carbon energy and energy efficiency (Section 5.1). A starting point will be to reduce large energy subsidies

currently embedded in various forms of government support for state enterprises, followed by carbon taxes or equivalent pricing for fossil fuels. These strategies are highly effective on emissions and they are also attractive because of their resource mobilization potential. Analysis from the International Monetary Fund (IMF)-World Bank carbon pricing assessment tool shows that in Uzbekistan's case, carbon pricing could deliver up to 5 percent of GDP in additional fiscal revenue, which could fund green projects or be used to mitigate the economic impact to households. A carbon tax of US\$35 per ton could reduce carbon emissions by up to 11 percent compared to the business-as-usual scenario. The cost of these measures is partially offset by the benefits of improved air quality. Reduced fossil fuel use, combined with landscape restoration and other measures to limit windblown dust, will bring public health benefits, particularly in urban areas. Further benefits will accrue from improved urban planning with targeted expansion of central heating to address seasonal air pollution issues, including in the Kashkadarya region.

Job creation and redeployment strategies can help mitigate some of the social costs of the green transition. A set of green sectors and industries has been identified using a new 'green job' analytical tool (Section 5.3) that considers investment multipliers and environmental performance. As sectors undergo structural changes, resources that are freed up, such as capital and the labor force, can be channeled to green and higher-value sectors. Among the best green candidates that optimize jobs and environmental outcomes are health care, education, finance, and climate-smart mining. A longer list of sectors that build on renewable energy and other innovative technologies with similar green potential also deserves further analysis. Already the largest employment sector in the country, agriculture still has the potential to provide more green jobs and improve livelihoods, by shifting to higher-value industries such as horticulture and supporting the livestock industry. Some communities and industries are more at risk than others when the economy shifts to a low-carbon model and resource efficiency leads to a repricing of essential services. Income restoration and redeployment programs for displaced workers in the fossil fuel industry are needed, and financing for this can be supplemented by revenue from environmental taxation. This provides early and demonstrable benefits to maintain society's commitment to the transition.

Substantial financing will be needed to green the economy, but green financing strategies can help close the gap. Initial analysis finds sufficient scope for improving public financial management (PFM) in the country and aligning it with green objectives (Section 5.2). There is also room for revenue mobilization through green taxes, which will have lower growth impacts than other tax rises. The greening of public finance is further enhanced by stimulating private flows toward green investments. A recent positive experience of the Sustainable Development Goals (SDGs) bond lays the groundwork for mobilizing green private capital.

Way Forward

This report provides an initial assessment of how Uzbekistan could green its economic transition by identifying the most pressing environmental and other risk factors and listing the green priorities that should be incorporated into the economic transition. While some strategies for implementation have been analyzed here, this report recommends further detailed work to better inform policy formulation and action. Given the rapid economic changes in the country, obtaining up-to-date economic data for reliable analysis and modeling remains a challenge. Further studies based on more recent data will be needed for policy calibration.

Such studies include, for instance, **distributional analysis to inform water and energy pricing and adaptation and resilience strategies based on investment costing and climate-informed risk assessments**. These studies were outside the scope of this report but can be conducted as part of the World Bank's upcoming analytical work program, including the Country Climate and Development Report (CCDR), the Climate Change Institutional Assessment (CCIA), and the Green Growth Programmatic Support.

Table E.1 Green priorities for economic transition

Green theme and its context	Recommended priorities	Agencies
<p>Sustainable land use: agriculture, water, and landscapes (SDG 15: Life on Land)</p> <p>There is a critical link between water efficiency, land productivity, and social vulnerability. A steep increase in water use efficiency will be a priority, with pricing and irrigation investments being highly effective means. Limits to water use will have to be considered. Landscape restoration indirectly supports agriculture. Agriculture employment can grow, including to higher-value activities, provided there is labor mobility, jobs access, and retraining.</p>	<p>Short term to midterm:</p> <ul style="list-style-type: none"> Prevent land degradation not only by curbing soil erosion but also by adopting reforestation and landscape restoration programs Adopt climate-smart agriculture Gradually adjust water prices for irrigation and water tariffs toward cost-reflective levels and remove tariff exemptions Upgrade the aging water infrastructure to reduce technical losses and non-revenue water <p>Midterm to long term:</p> <ul style="list-style-type: none"> Limit water withdrawals in line with environmental sustainability, while taking into account regional cooperation Support water-efficient technologies and climate-smart agriculture by mitigating investment risks in new technologies, advancing land reform, and enabling public-private partnerships Enable the transition from agriculture to higher-value and better-paid sectors by facilitating reskilling of the labor force, especially among the most vulnerable women and youth 	<ul style="list-style-type: none"> Ministry of Economic Development and Poverty Reduction Ministry of Agriculture Ministry of Water Resources State Forest Committee State Ecology and Environment Committee Ministry of Employment and Labor Relations
<p>Strengthening resilience to natural disasters and climate change (SDG 13: Climate Action)</p> <p>Climate change causes extreme social vulnerability with large income and consumption losses expected to hit rural communities in drought-prone areas and the densely populated Ferghana Valley affected by both dry and wet shocks.</p>	<p>Short term to midterm:</p> <ul style="list-style-type: none"> Operationalize resilience plans by preparing specific adaptation interventions including cost assessment and sources of finance Adopt nature-based solutions, where possible, to lower costs and achieve long-term results, with primary focus on the desertification hot spots like the Aral Seabed Strengthen local institutions structures to inform and protect the most vulnerable, women and youth, from the effects of climate change 	<ul style="list-style-type: none"> Ministry of Economic Development and Poverty Reduction Ministry of Emergency Situations State Ecology and Environment Committee Center for Hydrometeorological Service of the Republic of Uzbekistan (UZHYDROMET)

Green theme and its context	Recommended priorities	Agencies
<p>Communities are even more vulnerable given limited access to catastrophic insurance. NDC adaptation objectives largely correspond with projected impacts of climate change, but detailed plans are still to be designed. Local communities are important stakeholders in designing adaptation actions.</p>	<p>Midterm to long term:</p> <ul style="list-style-type: none"> ■ Build a robust system of climate data and risk analytics to support an adaptation strategy ■ Develop post-disaster measures, including financial instruments to cope with contingent public liabilities ■ Strengthen insurance market as a core disaster risk financing mechanism, especially for drought risk 	
<p>Green and low-carbon development of industry and economy (SDG 7: Affordable and clean energy)</p> <p>A low-carbon transition in Uzbekistan will minimize trade-related impacts on its energy-intensive export sectors. The transition is a multiyear process requiring a robust long-term strategy that will lock-in short and medium-term actions. Renewable energy has major potential as well as low-cost energy efficiency measures. Subsidy reform and carbon pricing packages are needed to ensure sufficient incentive and momentum for the transition. Social impacts need to be mitigated.</p>	<p>Short term:</p> <ul style="list-style-type: none"> ■ Prepare a long-term decarbonization strategy to guide the process of reducing emissions and improve energy efficiency to achieve net-zero carbon emission goals while reducing local air pollution ■ Start implementing low-cost energy efficiency measures that do not require advanced technologies and training. These could include building insulation and upgrading old structures and production lines <p>Midterm:</p> <ul style="list-style-type: none"> ■ Proceed with gradual reduction of quasi-deficit through explicit budget subsidies to state-owned enterprises (SOEs) and their eventual elimination ■ Combine targeted support to the poor with subsidy elimination and eventual introduction of carbon pricing packages to speed up transition to low-emitting technologies ■ Mobilize private investments in renewable energy by completing regulatory and tariff reforms, power purchase agreements, priority dispatch, and investor rights ■ Aim climate-smart industries based on regenerative and circular systems to achieve sustainable development and employment 	<ul style="list-style-type: none"> ■ Ministry of Economic Development and Poverty Reduction ■ Ministry of Energy ■ Ministry of Investment and Foreign Trade ■ Ministry of Housing ■ Ministry of Transport
<p>Green jobs and support for the vulnerable (SDG 8: Decent work and economic growth)</p> <p>Labor flow will be a complex picture. There will likely be a shift toward higher-value activities in agriculture and flows outside the sector due to diversification.</p>	<p>Short term:</p> <ul style="list-style-type: none"> ■ In-depth analysis into a changing composition of labor demand and supply during the green transition ■ Preferential access to new employment positions for displaced workers, especially most vulnerable women and youth, and green reskilling, including entrepreneurship programs 	<ul style="list-style-type: none"> ■ Ministry of Economic Development and Poverty Reduction ■ Ministry of Employment and Labor Relations ■ Ministry of Investment and Foreign Trade ■ Ministry of Innovation ■ Regional and local governments ■ State Forestry Committee

Green theme and its context	Recommended priorities	Agencies
<p>New green sectors can generate additional jobs and require policies to attract investments and entry of new firms. New skills are needed as services, innovation, and technology sectors grow. Displaced workers in ‘brown’ sectors will require some form of income restoration until they can be redeployed. Preferential access to new green jobs and reskilling programs could be considered. Reskilling and jobs access programs should involve local governing bodies.</p>	<ul style="list-style-type: none"> Enhance vocational education for training and reskilling to improve transferability across firms and sectors, prioritizing regions and communities most affected (short to midterm) <p>Short to midterm:</p> <ul style="list-style-type: none"> Financial support and safety nets for individuals and businesses, which could be financed by environmental and carbon taxes Strengthen local governments’ and mahalla committees’ capacity to support communities in handling climate change risks and green transition challenges Engage mahalla committees in land and natural resource planning and management to ensure local ownership and sustainability and rural green infrastructure programs 	
<p>Green finance (SDG 17: Partnership for the Goals)</p> <p>There is scope for general PFM improvement and the greening of fiscal policy by aligning it with green objectives. There is room for green revenue mobilization but underlying issues in public spending, especially in subsidies, must be addressed. Experience of SDG bonds can be extended for further mobilization of private green finance. The Uzbekistan green fund has merits as a strategic vehicle for organizing public and other resources and does not displace other funding sources and institutions.</p>	<p>Short term:</p> <ul style="list-style-type: none"> Support early commercialization of green solutions through targeted public green procurement Explore the potential and suitable design of Uzbekistan green and/or sovereign fund for channeling public and private funding strategically to advance the government’s green policies Strengthen the capacity in issuing green and climate bonds and better defining green investment projects through standard green taxonomies <p>Midterm:</p> <ul style="list-style-type: none"> Align SOEs’ investments and decisions with long-term green priorities Apply excise tax based on environmental standards and introduce tax incentives for renewable energy deployment Consider repurposing subsidies to support sectors: differential value added tax (VAT), tariffs, import duties, and excise Support the greening of the financial sector by setting standards for green finance following the global regulatory trends and removing barriers of financing to green investments 	<ul style="list-style-type: none"> Ministry of Finance Ministry of Economic Development and Poverty Reduction Capital Market Development Agency

INTRODUCTION

Uzbekistan has embarked on an ambitious transition from a planned economy to a market economy with positive results. Market reforms have gained traction in many key sectors, including agriculture, and the government has managed to push through changes while reducing poverty rates, sustaining growth, and steadying the economy during the COVID pandemic. The next phase of the transition will be more challenging, as the country seeks to put itself on a more sustainable and greener pathway of growth. The greening of its economic transition will involve major shifts in how resources are used, where investments and jobs are created, and how essential goods are priced.

The **purpose of this report** is to analyze the key issues of this transition as part of supporting the government in its decision-making and policy design to navigate this change. This report is part of the World Bank's programmatic support (Figure 1.1) for the country's green economy transition vision and has been informed by the joint government-World Bank-United Nations Development Programme (UNDP) paper¹ and by the Green Growth Dialogue series with several ministries, under the leadership of the Ministry of Economic Development and Poverty Reduction (MEDPR) and other stakeholders. While the report concludes with a robust set of policy recommendations, its intent is to demonstrate challenges and opportunities for more efficient, resilient, and inclusive growth and provide a framework to pave the way for more detailed analyses and design of policy measures. The Country Climate and Development Report (CCDR)² that will follow this report is expected to have access to newly available data and modeling tools for a more comprehensive analysis. Also following this report will be the Climate Change Institutional Assessment (CCIA) as well as other detailed studies.

Figure 1.1 World Bank's programmatic support on green growth



¹ World Bank 2021a.

² The CCDR investigates how climate change and global decarbonization may affect a country's development path and priorities and how a country's actions in resilience, adaptation, and mitigation can improve development outcomes. The Long-Term Decarbonization Strategy describes a pathway for a country to decarbonize on time consistent with the Paris Agreement's objective of limiting global warming to 1.5°C.

This report uses a variety of analytical approaches such as sustainability benchmarking (the RISE/GRID indicators),³ which point to critical environmental issues that are hindering productivity and affecting well-being relative to peer groups. The Cost of Environmental Degradation and Natural Capital Accounting approaches help point to critical issues in Uzbekistan's natural resource base and how to better leverage its strength. This is complemented by analyses of new risks and vulnerabilities due to climate change. The report also includes an analysis of the effects of low-carbon policies among its major trading partners on Uzbekistan's carbon-intensive exports. A green jobs analytical framework identifies some promising sectors as candidates that can create jobs and promote sustainability and inclusivity.

The report is organized as follows:

- **Chapter 1:** Towards Greener Economic Development. This chapter reviews the economy and the relationship between green growth and the government's economic reforms.
- **Chapter 2:** Measuring the Sustainability of Uzbekistan's Development. This chapter presents an assessment of the country's sustainability using internationally used sustainability metrics.
- **Chapter 3:** The Hidden Cost of the Current Model (Business-as-Usual). This chapter presents the opportunity cost of not taking action to improve sustainability.
- **Chapter 4:** New Risks and Vulnerabilities: Climate Change and the Global Response. This chapter discusses the risks and impacts of climate change as it reinforces existing threats.
- **Chapter 5:** Tools for Implementing the Green Transition. This chapter analyzes tools for creating change and sustaining momentum for the green transition.
- **Chapter 6:** A Way Forward. This chapter recommends priorities for action and further work drawing from the analysis and other sources.

³ GRID = Green, Resilient, and Inclusive Development; RISE = Resilience, Inclusion, Sustainability, and Efficiency.

CHAPTER 1

TOWARDS GREENER ECONOMIC DEVELOPMENT



CHAPTER 1.

TOWARDS GREENER ECONOMIC DEVELOPMENT

1.1 Economic Profile of Uzbekistan

Uzbekistan experienced robust economic growth before 2016, ranging between 3 to 4 percent, which resulted in the doubling of per capita income and halving of poverty since early 2000. The government's program of reforms since 2016 has aimed at transitioning toward the market economy. Priorities included structural reforms, such as the privatization of the state-owned enterprises (SOEs), budget efficiency, import substitution to encourage entrepreneurship, the efficiency of public administration, and modernization of the public service. The reform agenda has laid the groundwork for future economic expansion. Recent macroeconomic analysis indicates that the economy rebounded to 7.2 percent in 2021, after a contraction of 1.9 percent in 2020.

The government's macroeconomic objectives aim to support sustainable economic growth while allowing structural reforms. The current account deficit is estimated at 6.6 percent of gross domestic product (GDP) in 2021 compared to 5 percent in 2020, on account of depressed trade flows. Inflation has remained elevated due to a spike in food and commodity prices, reflecting global trends triggered by supply chain factors. The Central Bank of Uzbekistan (CBU) tightened monetary policy to ease inflationary pressures from persisting, while maintaining a flexible exchange rate. The fiscal deficit widened to 6.2 percent of GDP in 2021, up from 4 percent of GDP in 2020, but is expected to narrow to 4 percent in 2022. This creates the needed policy space to support further COVID-19 measures with a view to enhancing the overall economic resilience. Macroeconomic stability coupled with structural reforms will be key to supporting growth to its medium-term trend of 5–6 percent per year. As shown in this report, Uzbekistan will need to incorporate green economy concepts into its next stage of transition.

The Resource-Intensive Growth Model

Uzbekistan's economic development reflects a state-driven industrial sector growth model with heavy reliance on natural resources and agriculture. The industrial and manufacturing sectors have expanded through significant capital investments that were financed by mineral and energy exports as well as agriculture surplus. Industrial contribution nearly doubled over the last decade and today accounts for one-third of GDP. However, since about 59 percent of total employment was informal,⁴ there is no conclusive evidence that the economic expansion was accompanied by strong growth in productivity.

Uzbekistan is endowed with abundant natural resources which it has exploited for export revenue. Uzbekistan ranks among the top 30 countries based on its subsoil assets,⁵ including natural gas, gold, copper, uranium, and coal. At per capita US\$5,045 (2018 estimate), Uzbekistan's natural resources are second only to Kazakhstan in the Central Asia region and substantially above the lower-middle-income country (LMIC) average. Three-quarters of exports in 2020 came from natural resources:⁶ 52 percent from minerals (mostly gold), 5 percent from natural gas, and 20 percent from agriculture.

⁴ World Bank 2022a, with data from 2019.

⁵ World Bank 2021d.

⁶ From trade data portal, Observatory of Economic Complexity, <https://oec.world/en/home-a>.

Table 1.1 Value added of domestic producers (current US dollars)

	GDP in 2019	Agriculture	Industry	Manufacturing subset	Services
	(US\$, billions)			(% of GDP)	
Europe and Central Asia (ECA)	22,792.8	2	23	14	65
Kazakhstan	181.7	4	33	11	56
Kyrgyz Republic	8.5	12	28	14	50
Tajikistan	8.1	19	27	11	42
Uzbekistan^a	57.9	23	32	20	40
Turkey	761.4	6	27	18	57
Poland	595.9	2	29	17	58
Russian Federation	1,699.9	3	32	13	54

Source: World Development Indicators (WDI), World Bank, 2021.

Note: Shares may not add up to 100 percent. Manufacturing value added is a subset of industry. Value added from services excludes financial intermediary services indirectly measured (FISIM) and net indirect taxes.

^a Information for Uzbekistan is from the National Statistics Database, <https://stat.uz/en/official-statistics/national-accounts>.

Natural resources are intensively used by industry and agriculture but inefficiently so with a resulting impact on the environment. Energy use in Uzbekistan is high and largely based on fossil fuels, even though the country has significant renewable energy potential in solar and wind. The dominant energy source is natural gas (83 percent of the primary energy consumption), and consumption is supported by elevated subsidies and energy-intensive industrial sectors like cement production. It is the most greenhouse gas (GHG) emission-intensive economy in ECA and the fifth most intensive globally (World Bank 2022a). Agriculture accounts for about one-quarter of GDP and has changed little since 1990. As shown in this report, land productivity remains below the average of LMICs with relatively low water use efficiency. Over 90 percent of water is used for irrigation, which is largely inefficient and energy-intensive pumped irrigation, and half of the irrigation is for cotton, wheat, and rice production.

The environmentally sensitive sources of growth call into question sustainability and the quality of future growth. This report analyzes some of the risks and economic impacts of the current growth pattern. Uzbekistan's current carbon-intensive economic structure is exposed to the changing global policy environment and consumer preferences in a carbon-constrained future. With the current carbon-intensive growth model, Uzbekistan faces transition risks from a global policy environment that is shifting rapidly in favor of climate action. With the adoption of carbon border adjustment taxes, Uzbekistan's carbon-intensive production may face barriers in key export markets. The global low-carbon transition may sharply reduce the value of primary export commodities, which may affect fiscal revenue and cause stranded assets for the financial sector. High levels of pollution from economic activities carry costs to the economy; air pollution-related mortality rates, for example, are more than twice the EU average (as of 2019). Widespread land degradation caused losses equivalent to 4 percent of GDP in 2016 due to a failure to protect land (Quillérou et al. 2016). Inefficient practices and neglect of the environment will have increasingly large negative impacts on productivity, earnings, and health, and risk, undermining some of the potential benefits of urbanization.

Climate change will further exacerbate the risks. Uzbekistan ranks 96 of 191 countries in climate vulnerability.⁷ Uzbekistan is prone to earthquakes and floods that have affected 1.4 million people on average and caused US\$3 billion in losses every year (World Bank 2017). Climate change-related risks are assessed in this report and presented in Chapter 4. Climate change is expected to increase weather-related risks, including the risk of severe drought. Uzbekistan is projected to experience higher than the global average temperature increases because of global warming with negative implications for public health and livelihoods, for the poor and the vulnerable.

Having produced impressive results from its early transition from planning to market, Uzbekistan is now entering the next phase of reforms that will be far reaching and crucial for the country's long-term future. Economic growth in the last two decades was fueled by the expansion of industrial and manufacturing sectors, with agriculture providing a large share of employment alongside industrial job creation. The government focused on liberalizing prices while supporting external trade, which has produced strong growth and a sound macroeconomic position. The development model has thus far relied on the abundant use of natural resources, a focus on growing the stock of physical capital, and limited investment into human capital development. High-quality jobs are relatively scarce. The World Bank Systematic Country Diagnostic has concluded that continuing with environmentally unsustainable practices will jeopardize Uzbekistan's social and economic future.

1.2 Government Strategies Supporting a Green Economy

In 2016, the government announced a broad market-oriented reform program (Uzbekistan's Development Strategy 2017–2021) followed by a reform roadmap in 2018 outlining the government's economic reform priorities for 2019–2021. Importantly, this includes environmental sustainability among the five key pillars. Because of their multisectoral nature, green growth and climate change strategies need to be systematically embedded into the overall policy and institutional framework of government. The MEDPR is well placed to coordinate economic policies for cross-cutting green growth issues. The public institutional setup for climate change, another similar cross-cutting issue, is another reference point and is the subject of a separate study.

Box 1.1 Sustainable Development in Uzbekistan

Environmentally unsustainable practices jeopardize Uzbekistan's social and economic future. Uzbekistan is among the most water- and gas-dependent countries in the world and is highly sensitive to climate change. The country is also one of the world's most unsustainable and inefficient users of water and energy. Widespread land degradation and dust storms caused losses equivalent to 4 percent of GDP when last measured in 2016. Moreover, Uzbekistan's carbon intensity is among the highest in the world. The energy intensity is equally high. A delay in transitioning to green forms of energy production also risks locking-in obsolete technologies and investments that are costly to reverse and may close the country off from valuable export markets. A focus on green growth can propel Uzbekistan toward a more sustainable future while creating new jobs in emerging fields.

Source: World Bank 2022a.

⁷ Notre Dame Global Adaptation Initiative (ND-GAIN), Country Index, <https://gain.nd.edu/our-work/country-index/>.

1.2.1 Strategy for Transitioning to the Green Economy 2019–2030

The Government of Uzbekistan is already taking steps to advance the green economy agenda. In 2019, it approved 'the Strategy for the Transition to a Green Economy (2019–2030)'⁸ which set out targets to improve energy efficiency in core economic sectors, diversify energy supply toward renewable energy sources, adapt to the consequences of climate change, increase efficient use of natural resources, and develop financing mechanisms. The targets foreseen by 2030 a reduction of emissions of GHG per unit of GDP by 10 percent of the 2010 level; a twofold increase of energy efficiency indicators and a decrease in the carbon intensity of GDP; further development of renewable energy sources, with coverage of more than 25 percent of the total volume of power generation; an increase in the energy efficiency of industrial enterprises by at least 20 percent; development of electric vehicles; introduction of drip irrigation technology into an area up to 1 million ha and increase in the yield of crops cultivated by 20–40 percent; achievement of a neutral balance in the degradation of land; and an increase in the average productivity of the main types of agricultural food products by 20–25 percent.

In close consultation with key stakeholders, the government is updating the Strategy for the Transition to a Green Economy 2019–2030 with action plans and is to cover a long-term decarbonization strategy with a 2050 time frame. Detailing of actions will cover areas: improvement of energy efficiency in the basic sectors of the economy, diversification of energy generation and development of the use of renewable energy sources, adaptation and mitigation of the effects of climate change, increase in the efficiency of natural resources and preservation of natural ecosystems, and development of financial and nonfinancial support mechanisms for the green economy.

1.2.2 Preparing a Roadmap

To advance the Strategy for the Transition to a Green Economy, the MEDPR is preparing a Green Growth Strategic Framework (GGSF), which includes the government structure and framework of green growth priorities. An Inter-Agency Council led by the MEDPR is the overarching body responsible for the implementation of the Strategy for the Transition to a Green Economy 2019–2030 as foreseen in Resolution No PP-4477. The council should provide strategic guidance and serve as a decision-making authority for the advancement of green growth in Uzbekistan, including the GGSF.

Heads of ministries and agencies are members of the Inter-Agency Council, totaling 19 persons. A Technical Secretariat will be established within the MEDPR to support the work of the Inter-Agency Council, including coordinating the development of the GGSF. A technical Inter-Agency Working Group (IAWG) will serve as a platform for substantive discussions, intersectoral analysis, formulation of technical/cross-sectoral proposals, development, and implementation of the GGSF, ensuring a consultative process and stakeholder coordination.

The IAWG will be organized thematically around six green growth policy priorities:

- Sustainable and efficient use of natural resources
- Strengthening response to disasters and climate change
- Green and low-carbon development of the economy
- Sustainable and inclusive urban and rural development

⁸ Resolution of the President of the Republic of Uzbekistan PP-4477, April 10, 2019. World Bank Country Economic Memorandum https://stat.uz/images/upload/reliz2021/tashqi-savdo_dekabr_210122ru.pdf.

- Effective and green public and private expenditure
- Leaving no one behind in the green transition process.

1.2.3 NDC Update and Draft Climate Strategy

The Nationally Determined Contribution (NDC) submitted in October 2021 more than tripled the previous target for GHG emission reduction per unit of GDP foreseen in the Presidential Resolution to 35 percent by 2030. The NDC is an important guidance for the green transition process. This follows government plans to increase the share of renewable energy sources to 25 percent of total power mix, double the energy efficiency indicator relative to the 2018 level, halve the energy intensity of GDP, and decrease industrial consumption of natural resources. Several indicators to monitor the progress of these targets are included in the country's National Development Goals, the Strategy for the Transition to a Green Economy, the Climate Change Strategy, the National Biodiversity Strategy, and the Concept for the Development of the Electric Power Industry. The Climate Change Strategy, currently in draft, outlines measures to (a) mitigate the impact of economic sectors on climate change, (b) adapt to climate change, (c) advance climate monitoring, and (d) build capacity in GHG control.

1.3 Supporting the Government Framework

This report conducts analytical work that feeds into the government's priority areas, particularly in these areas:

- **Sustainable and efficient use of natural resources.** Analysis supporting this area includes estimates on the economic cost of environmental degradation, presented in Section 3.2 and Section 4.2.
- **Strengthening response to climate change and disasters.** Resilience benchmarking and climate risk analysis in Sections 3.1 and 4.1 supports future resilience and adaptation planning. Section 4.2 covers analysis of the economic impact of climate change on food prices, which will help set priorities for the agriculture sector in the face of climatic and environmental effects.
- **Green and low-carbon development of the economy.** Analysis on how to manage the risk of economic dependence on energy-intensive production is covered in Section 4.3. This report also analyzes trade and other economic effects as the EU considers adopting carbon border adjustment taxes. The use of carbon pricing instruments is analyzed in Section 5.1.
- **Sustainable and inclusive urban and rural development.** Analysis for this topic focuses on the cost of air pollution in urban centers in Section 3.3 and how the cost can be partially avoided as a co-benefit from the low-carbon transition. In this report, the air pollution issue is discussed and presented under Section 6.3 on green and low-carbon development.
- **Effective green public and private expenditures.** Analysis of the fiscal context and scope for greening public expenditures and private capital mobilization is covered in Section 5.2.
- **Leaving no one behind in the green transition process.** Analysis presenting job creation potential of a green economy is presented in Section 5.3, in which Uzbekistan implements low-carbon policies of its own as more countries do the same.

CHAPTER 2

MEASURING THE SUSTAINABILITY OF UZBEKISTAN'S DEVELOPMENT



CHAPTER 2.

MEASURING THE SUSTAINABILITY OF UZBEKISTAN'S DEVELOPMENT

The government has incorporated sustainable development objectives into its plans and will be measuring its progress toward sustainability goals as part of its National Development Strategy. These cover a broad range of socioeconomic goals, but on environmental and green aspects, more specific indicators and analytical tools can be used. For instance, a first step to understanding priorities for greening policies and investments in Uzbekistan would include reviewing the country's performance based on more detailed metrics used internationally for measuring environmental sustainability and resilience. Recent work in this vein includes the Third Environmental Performance Review (2020) conducted by the United Nations (UN) Economic Commission for Europe. This chapter adds and updates this body of work by applying the following tools with a more environmental focus to measure the Uzbekistan's sustainability profile: the GRID/RISE framework and natural capital accounting. These analytical approaches add value by focusing on the economic dimension of environmental indicators to provide insights into the greening of growth.

2.1 Incorporating Sustainability into National Plans

Sustainability has been incorporated into the government's development goals, and progress toward the set targets will be measured. The Sustainable Development Goals (SDGs) have been included into Uzbekistan's national development policy framework and can serve as a gauge for progress being made toward broad sustainability objectives. With the adoption of 'Uzbekistan 2017–2021 National Action Strategy' and '2030 Agenda for Sustainable Development' in 2018, Uzbekistan reinforced its commitment to align SDGs to national strategies and programs. The agenda requires developing SDG baselines and target values that reflect national aspirations to 2030. It also assumes gradually integrating the SDG targets and indicators into central, sectoral, and regional strategies as well as into annual legal, budgetary, and reporting processes and indicators (Izvorski et al. 2021). An overview of the SDG indicators based on currently available data is presented in Annex 1. The rest of the chapter focuses on more specific indicators of environmental health and socioeconomic risk indicators and analysis.

Box 2.1 Sustainable Development Goals

The SDGs cover different dimensions of sustainable development that are useful for tracking progress in the green transformation. Progress toward creating economic opportunities can be measured by the SDG for providing quality education (SDG4); delivering opportunities for decent work and economic growth (SDG8); and introducing sustainability measures in industry, innovation, and infrastructure (SDG9). Achieving environmental and resource productivity of the economy can be measured by progress in delivering affordable and clean energy (SDG7). The environmental dimension in quality of life is linked to the provision of clean water and sanitation (SDG6), building of sustainable cities and communities (SDG11), and sustainable land use (SDG15).

2.2 Focus on Environmental Sustainability and Resilience: The GRID Approach

Useful and more detailed insights on environmental health and socioeconomic risks can be gleaned from a comparative approach, where the sustainability of the Uzbekistan economy is measured relative to higher-income countries and other peer groups. One methodology for this is the World Bank's RISE framework that assesses how well countries do in GRID.⁹ Table 2.1 presents a selection of RISE/GRID indicators that characterize resilience and sustainability of the Uzbekistan economy.

Based on these indicators, Uzbekistan can aspire to improve on several sustainability dimensions compared to other Eastern Europe and Central Asia countries and upper-middle-income countries (UMICs). Table 2.1 highlights the areas where Uzbekistan has room to improve. Several of these relate to natural resource sustainability, such as water use, land degradation, and biodiversity. The issue of water scarcity is indicated by low availability of internal freshwater per capita and higher rates of attributable mortality. The share of land found to be degraded in Uzbekistan is above the UMIC average. Uzbekistan also has a much higher energy intensity per GDP than other ECA countries, including fugitive emissions from its energy systems. The amount of solid waste per capita that is adequately managed is low compared to the ECA average. The percentage of the population exposed to harmful air pollution is also higher relative to comparators, while environment expenditures as a percentage of GDP are low.

Table 2.1 GRID/RISE benchmarking¹⁰

Indicator	Key sources and main issues	UZB	Benchmark	
Air pollution: PM_{2.5}	Percentage of population exposed to PM _{2.5} above the World Health Organization (WHO) guideline (25 ug/m ³)	72.2 ¹¹	56.6	UMIC
	Defined as the portion of a country's population living in places where mean annual concentrations of PM _{2.5} are greater than 25 ug/m ³			
	Total non-accidental mortality from ambient air pollution (% GDP equivalent 2019) ¹²	6.4	4.6	ECA
Municipal waste	Waste generation rates (kg per capita per day) ¹³	0.40	1.18	ECA
Resource efficiency	GRID uses a measure of resource efficiency that expresses the amount of economic output generated (in terms of GDP) per unit of materials consumed Total materials or non-energy materials, US dollars/kilogram, 2019	0.8	2.9	EU-27
Water scarcity and quality	Water quality, nutrients, salts, chemicals (SDG 6.3.2)	-5.9	-2.8	UMIC
	Mortality rate attributable to inadequate water supply, sanitation, and hygiene (per 100,000) ¹⁴	0.4	2.6	UMIC
Land	Land degradation (degraded land as % of total land area) ¹⁵	29.0	20.4	LIC
			21.2	UMIC

⁹ In the RISE framework, the selected indicators broadly represent the sustainability/efficiency/resilience pillars of the GRID. The choice of indicators is based on global availability and recommendations of sector experts. All indicators come from global, publicly available databases with data for at least 100 countries.

¹⁰ Red cells indicate where Uzbekistan is lagging selected benchmarks.

¹¹ World Bank, Open Data portal, indicator: PM2.5 pollution, population exposed to levels exceeding WHO Interim Target-2 value (percentage of total).

¹² GBD 2019.

¹³ What a Waste 2.0. World Bank 2018. Uzbekistan data are reported for 2012.

¹⁴ GBD 2019.

¹⁵ UN SDG database. SDG 15.3.1- Proportion of land that is degraded over total land area.

Indicator	Key sources and main issues	UZB	Benchmark	
Total environmental expenditures (% GDP)	Expenditures (% GDP in 2018)	0.05 ¹⁶	2.00	EU-27
Natural hazards and disasters risks	Population exposure from disasters (% of total population exposed)	0.7	1.3	UMIC
	Population exposure from dry shocks (% of total population exposed)	14.4	14.9	LIC
			16.8	UMIC
Energy and carbon intensity	Building, electricity, heat, transport, fugitive (tCO ₂ e per million dollar GDP)	4,670	258	ECA
	Fugitive emissions (tCO ₂ e per million dollar GDP)	1,054	42	ECA
	Total energy supply by GDP (purchasing power parity [PPP]) (GJ per thousand 2015 US dollars) ¹⁷	8.0	3.1	EU-27 + UK
	Total energy supply: coal (4%), natural gas (86%), oil (8%), hydro and biofuel/wastes (<2%) ¹⁸			
Electricity	CO ₂ emissions in electricity (tCO ₂ e per million dollar GDP)	1,050	114	ECA

Note: The approach is described in Balseca et al. (2022).

ECA = Eastern Europe and Central Asia countries; EU-27 = 27 countries of the European Union (EU); UZB = Uzbekistan.

Risk ratings show the country to be somewhat vulnerable to environmental and natural disasters.

Overall, Uzbekistan is currently ranked 111 out of 191 countries in terms of natural hazard risks, with earthquake, flood, and drought risks as the main natural hazards, based on the Index for Risk Management (INFORM).¹⁹ In terms of relative ranking, Uzbekistan appears to be less vulnerable than other Central Asian countries, including Tajikistan. The INFORM Risk Index for natural hazards (shown in Table 2.2) can be readily disaggregated to show risk components by types of hazards and coping capacity (World Bank and ADB 2021). The lack of coping capacity, ranked 3.9 out of 10, indicates a modest ability of the government to cope with natural hazards in terms of formal, organized activities, and low preparedness of the existing infrastructure.

Table 2.2 Natural hazard risk rating (1–10) (INFORM)

Country	Inform risk	Hazards and exposure	Earthquake	Flood	Drought	Vulnerability	Lack of coping capacity
Kazakhstan	1.8	2.3	6.5	6.0	5.0	0.7	3.6
Kyrgyz Republic	3.3	3.7	8.6	5.6	6.0	2.3	4.3
Tajikistan	4.4	5.0	9.3	5.4	7.6	3.4	5.0
Uzbekistan	3.1	3.9	8.1	6.3	6.6	2.0	3.9

Source: European Commission 2022.

¹⁶ Climate Change Dashboard (IMF). <https://climatedata.imf.org/pages/go-indicators>.

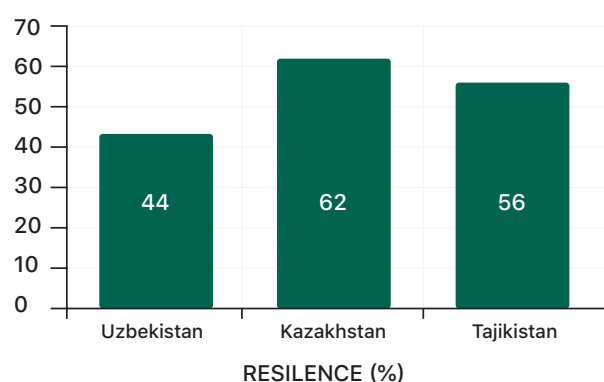
¹⁷ International Energy Agency (IEA) data. Total Energy Supply excludes electricity and heat trade. <https://www.iea.org/data-and-statistics/data-browser?country=UZBEKISTAN&fuel=Energy%20supply&indicator=TESbyGDPPP>.

¹⁸ Ibid.

¹⁹ An alternate measure of disaster risk is the ND-GAIN index which calculates a country's vulnerability to climate change and other global challenges as well as their readiness to improve resilience, where Uzbekistan ranks 80 out of 182 countries. The most at-risk country is ranked last.

But considering the full economic impact on the affected population, Uzbekistan is found to be more socially vulnerable than other countries in the region. Uzbekistan's Resilience Index—referring to an economy's ability to minimize the impact of asset losses on well-being—is lower (44 percent) than in compared ECA countries (Figure 2.1). This measure of resilience is a particularly effective indication of the impact of disasters on poor people. It models the effect of asset losses on loss of income and consumption, that is, loss of well-being. In Uzbekistan, the share of population that is affected by geophysical, meteorological, hydrological, or climatological natural disasters is below the UMIC or LMIC average (Table 2.2). However, the impact of dry shocks (Damania et al. 2019) to agricultural productivity is more severe and the impact on agricultural communities in poor regions is greater. The low Resilience Index reflects the impact on income and consumption losses by this group.

Figure 2.1 Resilience Index



Source: Hallegatte et al. 2017.

Weak physical resilience is compounded by low financial resilience, which stems from limited availability of financial services. Only about 10 percent of households have catastrophic insurance, while the remaining uninsured homeowners require government financial support in the event of a major disaster (World Bank 2021b). It is particularly important to strengthen the financial resilience of vulnerable households in Uzbekistan, including low-income families, many of whom live in rural areas and rely directly or indirectly on agriculture. By conservative estimates, only 50 percent of Uzbekistan's population have bank accounts and only about 15 percent use mobile apps or internet banking (World Bank 2021a). Full-fledged digital banking is in its infancy and has room to grow.

Female-headed Households (FHHs), persons living with disabilities, and communities depending on agriculture and natural resources for income are particularly vulnerable to climate change and natural disasters. FHHs, which make up 20 percent of households in Uzbekistan, have lower incomes than male-headed households (MHHs) and are already 30–50 percent less likely than MHHs to be able to afford utilities or food.²⁰ FHHs rely on coping mechanisms such as reducing food consumption, selling assets, or taking out loans to meet their basic needs. Natural disasters and climate shocks, which often destroy homes and assets or affect agricultural yields and income-earning opportunities, are likely to worsen existing vulnerabilities for these households and eliminate existing coping mechanisms. Persons living with disabilities spend more time collecting water than people without disabilities²¹ and reduced rainfall will worsen this burden. Women and the poor also bear the disproportionate costs of ongoing poor environmental practices and shortages of gas and electricity. Women are responsible for most household cooking and are therefore directly exposed to the health and environmental risks of indoor air pollution. Poor households with inadequate access to heating often cope with low winter temperatures by residing in one room; covering windows, doors, and floors with film, cloth, or blankets; using electric ovens as space heaters; and shifting from centralized energy services to solid fuels like wood or charcoal. These practices increase poor households' exposure to indoor pollutants.

²⁰ World Bank Group 2019a.

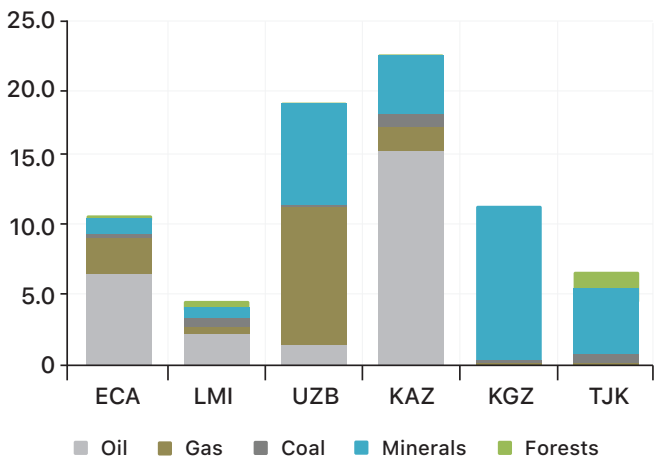
²¹ Based on an analysis of the Listening to the Citizens of Uzbekistan (L2CU) survey.

Fragility stemming from natural disasters and climate shocks has a strong spatial characteristic in Uzbekistan. The fertile Ferghana Valley is a vital source of agricultural production, but intensive agriculture creates demand and conflict for natural resources, especially land and water. Climate change and demographic growth in the region exacerbate resource shortages and contribute to conflicts over land and property, especially among ethnic minority groups in the border regions.²² The Aral Sea ecological disaster has worsened the socioeconomic, environmental, and health conditions of local communities, including the Karakalpak ethnic group. Uzbekistan’s border regions with Afghanistan and the Kyrgyz Republic, where poverty and conflict rates are among the highest in the country, are especially exposed to air pollution, climate risks, and natural disasters.

2.3 Natural Capital Accounting

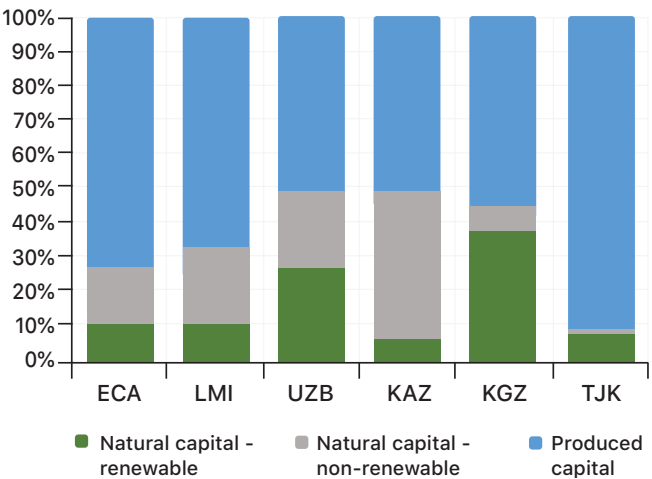
Natural capital plays a significant role in Uzbekistan’s economy and is a critical source of income for households in rural areas. Rents derived from natural resources were equivalent to nearly 19 percent of GDP in 2018 (Figure 2.2). This is four times the LMIC average and 75 percent greater than the ECA average. Within Central Asia only Kazakhstan is more resource dependent than Uzbekistan. Natural resources also contribute substantially to government revenues, with revenues from oil, gas, and minerals estimated to contribute around 15 percent of the state budget.²³ Natural resources are particularly critical as a source of income for households in Uzbekistan’s rural areas—the agriculture sector (resource based) accounts for 27 percent of employment and many working in the sector are from the poorer segments of society.

Figure 2.2 Natural resource rents as % GDP, 2018



Source: WDI.

Figure 2.3 Natural capital per capita, 2018, constant US\$



Source: CWON.

Note: Per capita wealth assessment excludes human capital as data are unavailable for Uzbekistan

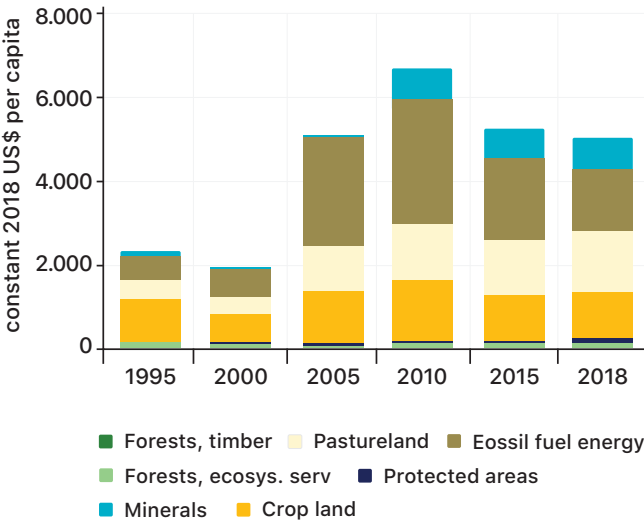
²² World Bank, United Nations, United Kingdom Foreign, Commonwealth, and Development Office 2021.

²³ World Bank, 2021c

Uzbekistan is rich in natural resources but is highly dependent on them. Estimates from 2018 suggest that the value of Uzbekistan’s natural resources, at US\$5,043 on a per capita basis,²⁴ is second only to Kazakhstan in the Central Asia region and substantially above the LMIC average (Figure 2.3). Besides fossil fuels and minerals, the country also has significant wealth in cropland and pastureland (Figure 2.4).

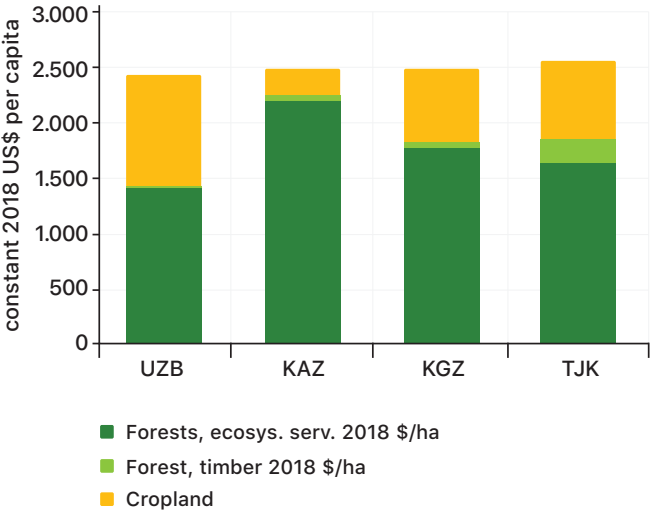
However, different forms of natural resources each play an important role. The value of forests and protected lands, which are critical for preserving the value of croplands and strengthening resilience to climate change and natural disasters, accounts for only 5 percent of total natural capital in Uzbekistan (Figure 2.5). Typically, forests provide ecosystem services and contribute a high natural capital value per hectare of land compared to croplands. Forests also perform other important functions such as water conservation, soil erosion control, and reduction of sedimentation in irrigation canals and roads, and forests have the potential for tourism and recreational value. They can also perform carbon sequestration services, by removing carbon dioxide from the atmosphere to supplement other carbon abatement actions of the country. This points to the importance of forests and landscape restoration to preserve the integrity of ecosystems.

Figure 2.4 Natural capital per capita, constant US\$



Source: CWON.

Figure 2.5 Natural capital (US\$/ha), 2018



Source: CWON. Production Forest data 2018 (ha) are from CWON background assumptions. Cropland data (ha) are from FAOSTAT.

²⁴ In 2018 prices.



CHAPTER 3

HIDDEN COSTS OF THE CURRENT GROWTH MODEL



CHAPTER 3.

HIDDEN COSTS OF THE CURRENT GROWTH MODEL

This chapter complements and deepens the assessments in the previous chapter by discussing the opportunity cost of not taking action to improve the above sustainability indicators. The Cost of Environmental Degradation approach estimates the aggregate cost of environmental impacts of current production practices that lead to pollution, natural resource degradation and increasing risk of natural disasters. Air pollution is associated with an increased morbidity and mortality of the exposed population; soil erosion from poor land management, mismanagement of water resources, and excessive loss of forest cover leads to degraded lands and loss of economic productivity.

A summary of the cost of environmental degradation as well as climate risks linked to severe weather events is given in Table 3.1. The costs are estimated on an annual basis and expressed as a percentage of GDP in the year of the study.

Table 3.1 Summary of the estimated environmental degradation and climate risks and their economic impacts

Issue	Key sources of economic impact	UZB	Benchmark ECA/UMIC	
Natural hazards and disasters risks	Natural disaster risk to assets (% of GDP in 2015)	0.25	0.60	UMIC
	Natural disaster risk to wellbeing (% of GDP in 2015)	0.57	0.90	UMIC
	Risk to economy from flood – rare event – once in 100 years (% of GDP in 2015) ²⁵	5		
	Risk to economy from earthquake and capital loss – rare event – once in 250 years (% of GDP in 2015)	49		
Land degradation	Loss of land productivity and ecosystem services (% of GDP, 2016)	4		
Air pollution	Total non-accidental mortality from ambient air pollution (% of GDP equivalent in 2019)	6.4	4.60	ECA
	Total non-accidental mortality from household air pollution (% of GDP equivalent in 2019)	0.70	0.30	ECA
Water use and quality	Total non-accidental mortality from poor access to clean water, sanitation, and hygiene (% of GDP equivalent in 2019)	0.10	0.05	ECA
	Gap analysis:			
	Productivity of water use (US\$ per m ³ water withdrawals)	1.4	16.10	UMIC
	Productivity gap versus UMI (US\$ per m ³ water withdrawals)	1.4		

Sources: FAO AQUASTAT 2021; GBD 2019; Hallegatte et al. 2017; Quillérou et al. 2016.

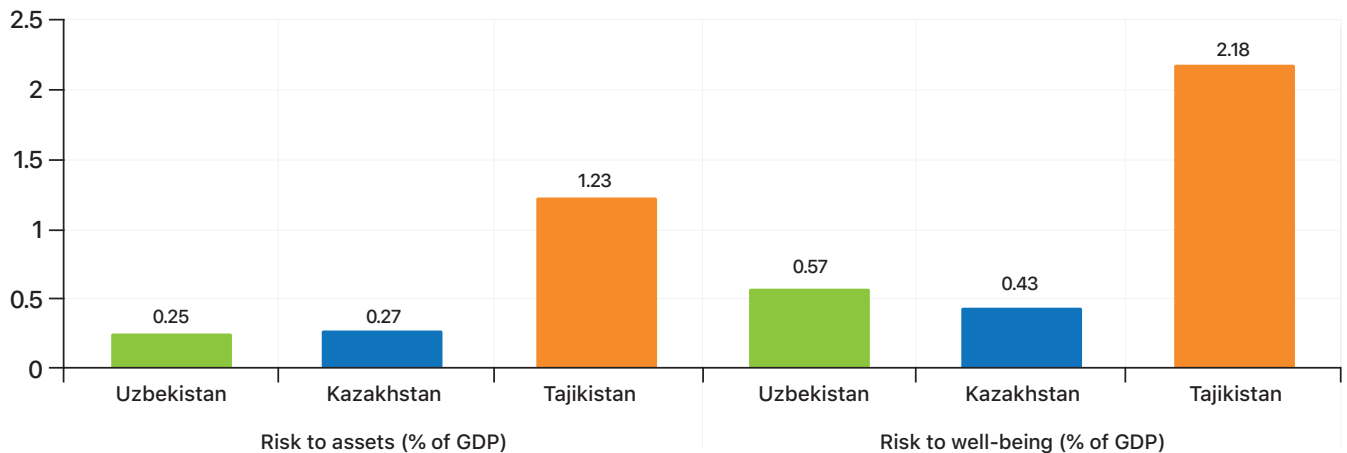
Note: ECA: Eastern Europe and Central Asia countries; UZB: Uzbekistan.

²⁵ World Bank 2017.

3.1 Cost of Natural Disasters

The cost of natural disasters to well-being is 0.57 percent of GDP. Although Uzbekistan shows a relatively low exposure to natural disasters in terms of both assets and people on average, asset losses for low-income population are almost twice larger. Exposure to the risk of natural hazards can be found by estimating the population and assets located in an affected area. Risk to assets can be estimated as the average monetary value of the damages that disasters inflict on assets (Figure 3.1). Risk to well-being is estimated as a ratio of expected asset losses to socioeconomic resilience. The low risk to assets in Uzbekistan can be explained by the fact that a small share of country population is exposed to natural disaster. At the same time, this exposed population is mostly from a low-income group. These households tend to experience asset losses that may be below average in the region (amounting to 0.25 percent of GDP), but their well-being losses from natural disasters are almost twice larger (0.57 percent of GDP) (Hallegatte et al. 2017).

Figure 3.1 Risk to assets and well-being



Source: Hallegatte et al. 2017.

3.2 Cost of Land Degradation

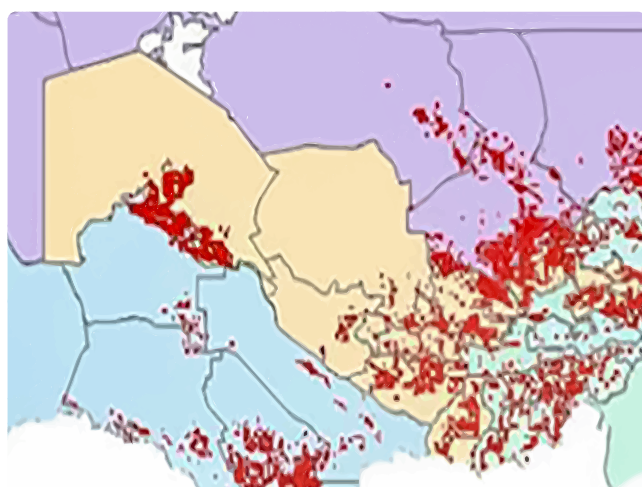
Land degradation has high costs for rural communities and the national economy, causing losses equivalent to 3–4 percent of GDP in 2016. This estimate is based on rigorous studies where land cover characteristics and their economic value are mapped, and the cost of land degradation is computed based on changes in land cover characteristics over time (known as the ‘total economic value of ecosystems’ approach). These losses are caused by active destruction of land and were five times higher than the estimated cost of measures to protect land (Quillérou et al. 2016). Between 2001 and 2009, changes in land use and land cover led to a loss of US\$0.85 billion in ecosystem services, equivalent to 3 percent or more of GDP in 2009 (Mirzabaev et al. 2016).

Land resources are an important part of natural assets and the environment. Land resources have a key role in agricultural production and forestry, protection of biological diversity, carbon sequestration, and ecosystem productivity. Land degradation can have substantial economic implications. Main drivers

of degradation are soil erosion, unsustainable land use practices, excessive water use for irrigation and soil waterlogging and salinization, and livestock grazing practices (Nkonya, Mirzabaev, and von Braun 2016). There has been extensive degradation of pasturelands since the 1990s, mainly due to unsustainable use of pastures for livestock grazing, lack of management, and other human activities. Deterioration of biodiversity and habitats is a challenge, which is associated with degradation of natural ecosystems, and leads to loss of ecosystem services that are key for a productive and resilient landscape with impact on the resilience of agriculture, people, and the landscape.

Land degradation and salinization caused by inadequate irrigation practices are a major environmental problem causing a loss of topsoil and nutrients and reduced soil fertility and productivity (Zhao et al. 2019). Secondary salinization in the irrigated lands (Figure 3.2) is caused by a high level of groundwater, improper irrigation, and poor drainage (Mirzabaev et al. 2016). About 50 percent of irrigated lands are exposed to different degrees of salinity, posing a threat to food security (Zhao et al. 2019). Soil salinization impacts crop yields. For cotton, depending on the salinity of soils, the yield reduction can be 20-80 percent.

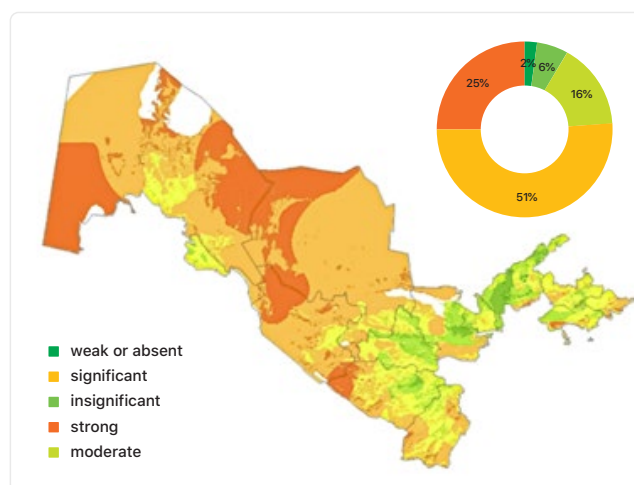
Figure 3.2 Land degradation hot spots in Central Asia (in red), a negative change in vegetation (NDVI) between 1982 and 1984 and 2006



Source: Mirzabaev et al. 2016.

Note: Land degradation hot spots are evaluated by three major types of degradation: (a) secondary salinization in the irrigated lands; (b) soil erosion in the rain-fed and mountainous areas; and (c) loss of vegetation, desertification, or detrimental change in the vegetation composition of rangelands.

Figure 3.3 Integrated map of the exposure of the territory to the processes of desertification (2016)



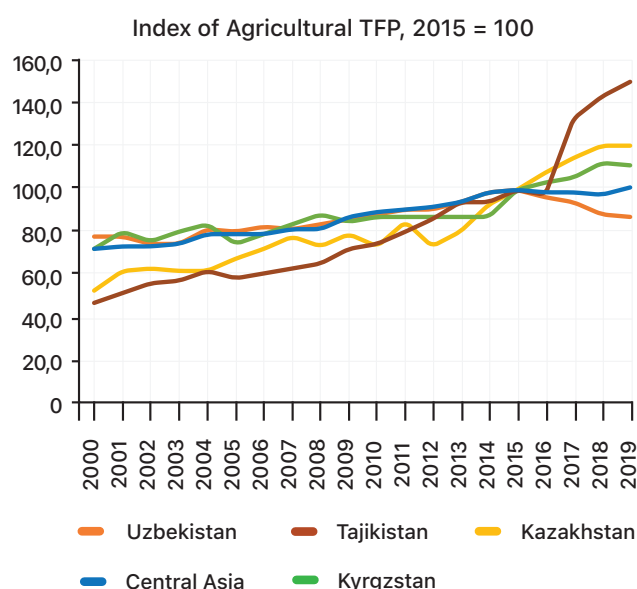
Source: Rakhmatova, Shardakova, and Taryannikova 2016.

Agricultural land productivity²⁶ ranks well below the average for LMICs. Land degradation hot spots cover about 26 percent of the area of croplands and 17 percent of rangelands in Uzbekistan (Mirzabaev et al. 2016). Failure to address inefficient management of natural resources in the face of a changing climate raises severe risks to the country's agricultural sector, on which the Uzbekistan's rural population (which

²⁶ Gross production value as a share of total agricultural land.

accounts for around 80 percent of the country's poor) is highly dependent. Total factor productivity (TFP) in agriculture is also significantly low compared to the Central Asia region (Figure 3.4). Widespread land degradation will have increasingly large negative impacts on productivity, earnings, and health and risk undermining some of the potential benefits of urbanization.

Figure 3.4 TFP in agriculture



Source: United States Department of Agriculture, Economic Research Service.

Table 3.2 Agricultural land use by crop

Crop type	2019 actual area
Wheat	1,319 (37%)
Other grains	266 (7%)
Fodder	262 (7%)
Cotton	1,065 (30%)
Potatoes	88 (2%)
Vegetables	216 (6%)
Fruits and berries	211 (6%)
Melons	54 (1%)
Wine grapes	119 (3%)
Total sowing areas, 1,000 ha (% of total)	3,599 (100%)

Source: World Bank 2020.

Agricultural productivity is enhanced by forest cover and sustainable landscapes. Forests direct economic contribution was less than 1 percent of GDP in 2019, but it makes an important contribution through the protection of soil and water. Uzbekistan has 3.2 million ha of land covered with forests (under the national definition,²⁷ this includes trees, shrub, and bushes), corresponding to 7.3 percent of the land area—comparable to forest cover of 8.7 percent in Turkmenistan and 4 percent in Tajikistan.²⁸ A major share (69 percent) of the State Fund Forest area plays a protective role by preserving the productivity of agricultural lands, protecting settlements from water and wind erosion, preventing the occurrence of mudflows, and restricting movement of sand. The remainder area serves to preserve biodiversity, while only 0.2 percent of the area (around 6,900 ha) is used for timber and wood production.²⁹

Forests also support livelihoods of rural households, including as an important source of fuel for heating and cooking and non-timber forest products (NTFPs). These include berries, nuts, mushrooms, and pasture for grazing and fodder and for subsistence and income. Forests and forest products also increasingly provide opportunities for rural households to establish small businesses,

²⁷ World Bank, forthcoming.

²⁸ FAO and UNECE 2019.

²⁹ Uzbekistan statistics - national accounts.

which have seen an increase in the last two years.³⁰ Simultaneously, the growing urban and suburban populations are increasingly using forests for recreational activities. In densely populated settings, urban forests and green spaces provide value in the form of improving aesthetics and the physical and mental health of inhabitants. According to the Ministry of Foreign Affairs, in 2018, a total of 15.4 million people took domestic trips to recreational areas in Uzbekistan.³¹ Tourism is important for the national economy and can directly benefit rural populations by integrating them into nature-based tourism.

Estimating only the ecosystem value of forests that is lost in Uzbekistan as a share of the total cost of land degradation is technically challenging. But given the multiple benefits that forests are known to provide, there is still a strong case for reforestation and landscape restoration. In wider studies, the value of forest ecosystem services by 2035 in Central Asia is estimated at US\$1,527 billion (Li et al. 2019). Other studies also estimated that total forest services and products could generate US\$10 billion annually.³² Although the presented estimates have a high uncertainty due to the limited studies done on the valuation of environmental services as well as limited data on forest products in Uzbekistan, sustainable landscape restoration deserves more attention given the multiple benefits they provide.³³ Restoring forests, shrubs, and grass cover also has the advantage of increasing Uzbekistan's carbon sequestration potential, which for now appears to be not fully utilized for offsetting. At COP26, Uzbekistan supported the Glasgow Leaders' Declaration on Forests and Land Use which aims to end deforestation by 2030.

3.3 Cost of Air Pollution

The impact of air pollution is estimated to be 6 percent of GDP or more. According to GBD 2019 estimations, the annual mortality rate (per 100,000 inhabitants) from air pollution in Uzbekistan was 89 in 2019, compared to an ECA average of 50 and an EU average of 38. This mortality range corresponds to the lower and upper bound of losses in economic welfare due to pollution in the range of 6–12 percent of GDP (2019 US\$ value).³⁴ The main sources of air pollution are residential heating, transport, industry, power generation, agriculture, and dust from municipal activities or/and desertification. Given the energy intensity of the economy, the consumption of fossil fuels over 2000–2019 remained relatively stable even with some improvement in reducing energy intensity. This is because GDP rose 3.4 times during that period.³⁵

³⁰ For the combined sectors of agriculture, forestry, and fisheries, there were a total of 24,000 small businesses registered in 2019 that remained active. Source: Uzbekistan statistics – economic activity.

³¹ Ministry of Foreign Affairs, 2018, New Opportunities for Tourism, Presentation.

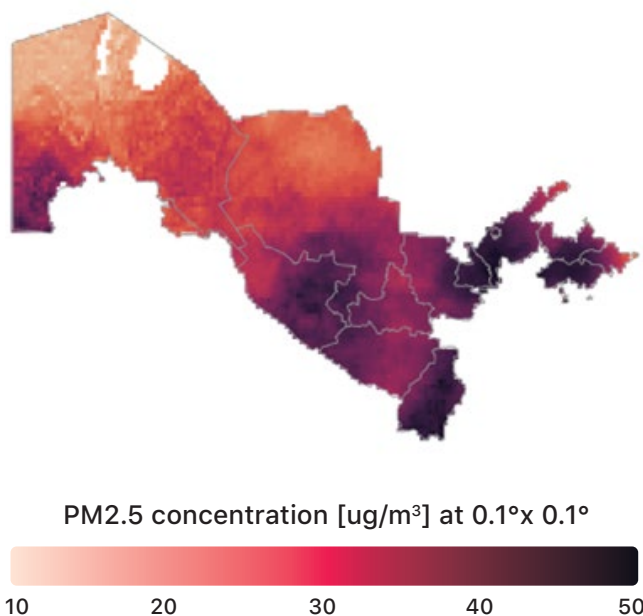
³² APFNet, Forest development and best practices of forest management in Uzbekistan.

³³ Akramkhanov et al. (2021) have estimated benefits of landscape restoration in the Aral Seabed of Uzbekistan at US\$28–44 million annually.

³⁴ The World Bank estimates based on the methodology described in Narain and Sall (2016) and the estimations of Ward (2021): local, regional, and national mortality among young people aged 10–24 years, 1950–2019: a systematic analysis for the Global Burden of Disease Study 2019.

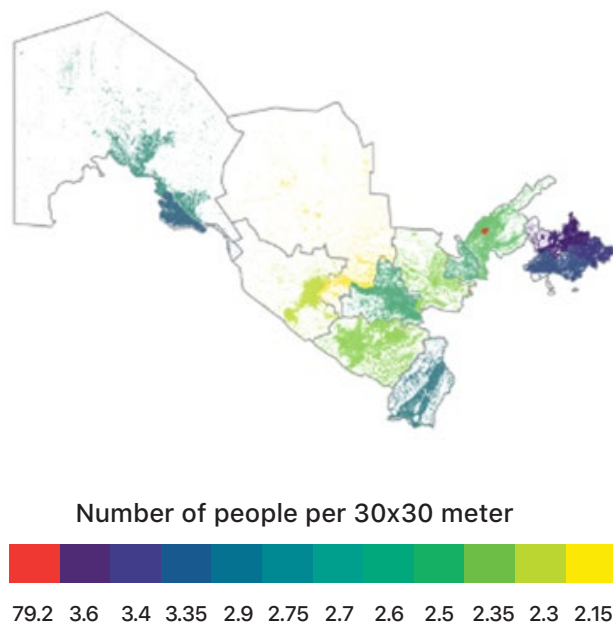
³⁵ Estimated from BP Statistical Review of World Energy. <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>.

Figure 3.5 PM_{2.5} concentrations in Uzbekistan, 2018 annual average



Source: Hammer et al. 2020.

Figure 3.6 Population density in Uzbekistan

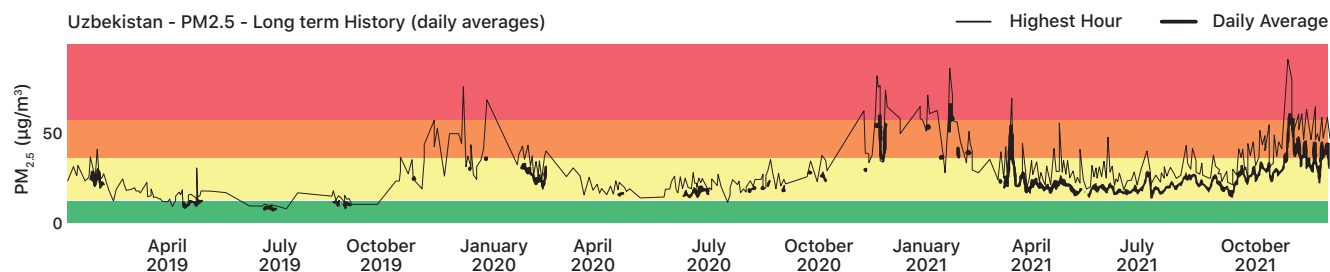


Source: Center for International Earth Science Information Network, Columbia University 2016.

Ambient air pollution affects nearly the entire population of Uzbekistan, with PM_{2.5} being the major contributor. PM_{2.5} air pollution is still detected in the most densely populated Ferghana Valley and in Tashkent (see Figures 3.5 and 3.6). The population weighted annual average PM_{2.5} concentration in Uzbekistan is $32.5 \mu\text{g}/\text{m}^3$ which is above the Central Asia average of $27.5 \mu\text{g}/\text{m}^3$ (Figure 3.5). Seasonal meteorological variations are observed in the short-term (24-hour) air pollution monitoring data. In Uzbekistan, the daily exposure limit of $15 \mu\text{g}/\text{m}^3$ is considerably exceeded over the year, especially in colder seasons (Figure 3.7).³⁶ Notably, the annual average PM_{2.5} standard recently adopted by the WHO is $5 \mu\text{g}/\text{m}^3$, which is considerably lower than the annual average PM_{2.5} concentration in Uzbekistan. Together with low winter temperatures and seasonal inversions, ambient air concentration of PM_{2.5} contributes to increased levels of cardiovascular, respiratory, and other diseases and mortality and reduced labor productivity. In 2019, total mortality from ambient air pollution (PM_{2.5}) contributed to as much as 13–20 percent of all non-accidental mortality of all health risks. This mortality range corresponds to the lower and upper bound of losses in economic welfare due to pollution in the range of 2–11 percent of GDP (US\$57.7 billion) in 2019.

³⁶ Berkeley Earth data. <http://berkeleyearth.org/air-pollution-overview/>.

Figure 3.7 Seasonal PM_{2.5} concentration in Uzbekistan



Source: Hammer et al. 2020.

The slight reduction in carbon intensity of past years has not been sufficient to maintain air quality.

Uzbekistan is at a stage where further action on air pollution will help avoid the public health cost as well as further reduce carbon emissions (this synergy is also explored from the low-carbon transition perspective in Chapter 5). The country shifted to more efficient gas power generation, reduced energy losses in the system, and saw a contraction of energy demand in the industry sector as factories closed.³⁷ From 2000 to 2018, this helped carbon intensity decline by a remarkable 72 percent, taking the country closer to the average of the Commonwealth of Independent States by the end of the period. But importantly, the country's energy use per unit of GDP is still high—about three times higher than the average for the ECA region, two times that of neighboring Kazakhstan, and six times that of Germany (Izvorski et al. 2021). Although natural gas has begun substituting oil combustion over the years, reducing some emissions, more can be done to improve air quality in densely populated areas that are affected by combustion of solid fuel for heating and cooking, agricultural burning, and soil and dust storms in the areas affected by desertification. There is material impact on public health, as PM_{2.5} air pollution is still detected in the most densely populated Ferghana Valley and Tashkent (see Figures 3.5 and 3.6).

Further analysis of the sources of PM_{2.5} pollution can guide mitigation strategies to prioritize the most affected regions and target major pollution sources within each airshed. This is especially important if resources for taking action are limited. In the urban areas, industry, transport, and waste burning are the dominant sources. Reducing the PM_{2.5} disease burden requires analysis of dominant sources and requires integrated pollution management systems. The total mass and distribution of PM_{2.5} in the air depend on local environmental conditions, dominant sources of pollution, and the magnitude of those source-specific emissions. The airshed approach suggests that integrated air pollution management system should be made a priority for the Ferghana Valley, where pollution is the highest. The valley has a bowl-shaped landscape between mountain ranges, and atmospheric inversion processes contribute to accumulation of particulates in the air.

Solid fuel burning in the rural areas for heating and cooking, together with agricultural waste burning and dust storms from soil erosion, affects air quality in many parts of Uzbekistan. At the national level, the largest disease burden among emission sectors is attributable to windblown dust (47 percent), followed by energy (12 percent) and waste and residential sectors (see Annex 2 on sources of ambient air pollution). The relative importance of different sources of air pollution varies according to localities, but this report is able to analyze air pollution sources only at the national level due to limited

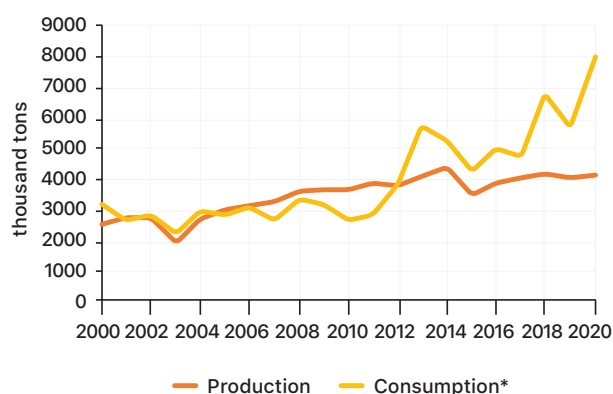
³⁷ IEA 2016.

data availability. Potential health benefits from eliminating arid conditions and soil erosion will have the largest positive impact on the attributable disease burden in some areas. WHO (2021) points out that dust from bare dry soils is usually lifted by strong winds to greater heights and penetrates into buildings and areas over long distances, contributing to substantial increases in measured concentrations of both PM_{10} and $PM_{2.5}$. Dust mixed with industrial pollutants and microorganisms may enhance the toxicity of aerosols in urban environments as well.

This underlines the importance of integrated measures in Uzbekistan's context, where particulate pollution can be more effectively addressed by reducing soil erosion, agricultural waste burning, and urban and industrial sources. With anthropogenic dust as a major contributor, a combination of soil rehabilitation, landscape restoration, and improved agricultural and land use practices, together with development of renewable sources, should be considered to combat air pollution in rural areas. Potential health benefits from eliminating combustible fuels add up to another 20 percent of total $PM_{2.5}$ deaths that could be avoided (coal 10 percent, oil and gas 10 percent). Reducing biofuel combustion, primarily in residential heating and cooking, could avoid another 9 percent of the total deaths related to $PM_{2.5}$.

The impact of coal burning and other solid fuels for heating in poor households is not fully reflected in the national data. Air pollution from the industry (coal mining) and energy sector together accounts for 19 percent of $PM_{2.5}$. Nearly 4,000 tons of coal was produced in Uzbekistan in 2020, and an additional 4,000 tons was imported. Figure 3.8 shows that since 2012, domestic industries and households consumed all the produced coal as well as imports, which by 2020 equaled domestic production. Nearly 40 percent of coal is used by the residential sector (Figure 3.9). Households typically use coal for heating, together with other domestic fuels—side products of agricultural practices (see Table 3.3 for heating fuels used by households). This suggests a local air pollution issue that is not fully understood or addressed, as it is not detected by satellite data (shown in Figure 3.5). Localized pollution from coal use in households is nevertheless real. This is corroborated by the consistent exceedance of safe air quality standards mostly during the winter season, as shown in Figure 3.7. In 2019, total mortality from household air pollution ($PM_{2.5}$) contributed to as much as 1 to 4 percent of all non-accidental mortality of all health risks.³⁸ This mortality range corresponds to the lower and upper bound of losses in economic welfare due to pollution in the range of 0.2–2 percent of GDP in 2019.

Figure 3.8 Production and consumption of coal



Source: The State Committee of Republic of Uzbekistan on Statistics.
Note: *including imports and inventory changes.

³⁸ GBD 2019 data.

Figure 3.9 Coal final consumption by sector



Source: IEA data and statistics.

With increasing urbanization, infrastructure planning and investments need to keep up with delivering public services and alleviate health and air quality issues from household coal burning. Urban development plans and measures to increase central heating coverage should account for coal burning in poor households, an issue that has not been fully registered. The level of central heating is low in some regions where there is a sizeable population, such as Kashkadarya (Table 3.3). Alongside increasing the coverage of central heating, new buildings should be designed for higher energy efficiency as this may be a more viable option for reducing pollution.

Table 3.3 Coverage of heating services and main sources of heating fuels in Uzbekistan regions (L2CU)

	Fuel bought by single households per heating period (2018) ^a								Population (2018) 16,124,000 ^b (%)
	% of apartments with heating*	Black coal (%)	Fire-wood (%)	Guza - paya (%)	Liquid gas in vessels (%)	Brush-wood, bush (%)	Dung (pcs.) (%)	Saw-dust (%)	
Uzbekistan	47.5	40	49	2		1	4	2	100
Karakalpakstan	80.5	11	83	1		1	4		6
Andijan	24.3	69	31		1				9
Bukhara	18.8	3	80	6		9	2		6
Jizzakh	22.1	26	48	5		5	17		4
Kashkadarya	17.4	12	65	9	1		12		10
Navoi	36.4	13	69				18		3
Namangan	38.4	50	36	3		1	4	6	8
Samarkand	31.6	43	56		1				11
Surkhandarya	22.5	47	36	2	1	3	12		8
Syrdarya	62.5	27	68	2				2	2
Tashkent	74.8	56	44						9
Ferghana	38.7	53	39		1		1	6	11
Khorezm	94.7	55	43	2					6
Tashkent city	100.0								8

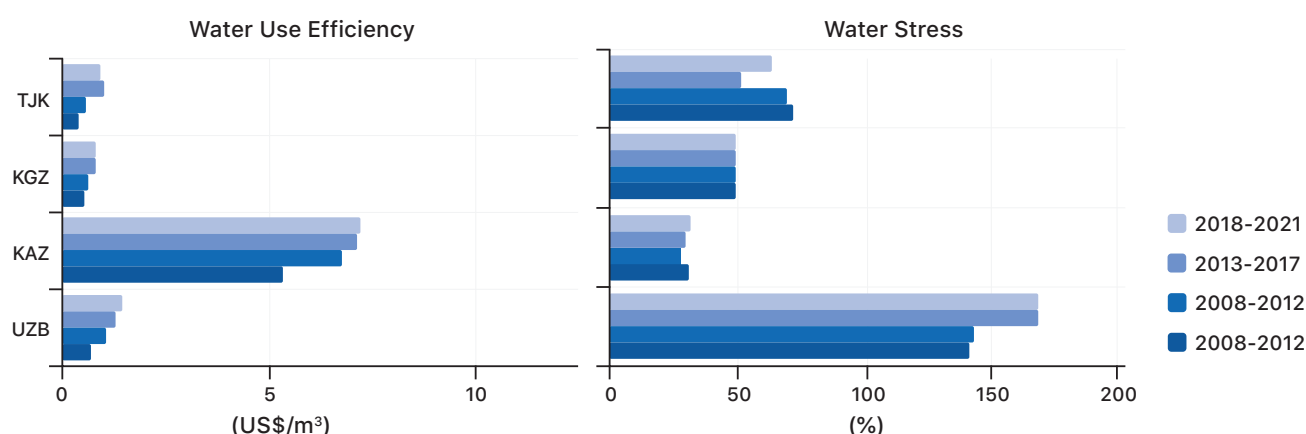
Source: a. Own estimates based on the L2CU household survey.
b. Data of the State Committee of the Republic of Uzbekistan.

3.4 Water Supply and Quality

There are public health impacts from poor access to water and degraded water quality. Based on GBD 2019, this amounted to 0.1 percent of GDP in loss of economic welfare in 2019. Poor access to clean water is related to how water resources are allocated in Uzbekistan and the aggravating factor of inefficient water use. This section also explores how water resource allocation has an economic cost other than the public health cost.

Water plays a key role in the economy of Uzbekistan and is well documented in previous assessments, such as regional studies on upstream water withdrawal for hydropower in Central Asia (the Kyrgyz Republic and Tajikistan) and downstream water demand for irrigation (Kazakhstan and Uzbekistan).³⁹ Figure 3.10 compares water stress levels across Central Asia countries. Water stress is shown by how much freshwater is being withdrawn by all economic activities, compared to the total renewable freshwater resources available, minus environmental flow requirements. Water resources in Uzbekistan are highly stressed from excessive water withdrawal, mainly for irrigation, and are plagued by problems of aging infrastructure. 'Water use efficiency' tracks the value added in US dollars per volume of water withdrawn in cubic meters. This considers water use by all economic activities, with a focus on agriculture, industry, and the service sector, assessing to what extent economic growth depends on the use of water resources.

Figure 3.10 Water use efficiency and water stress (SDG6)



Source: FAO AQUASTAT 2021.

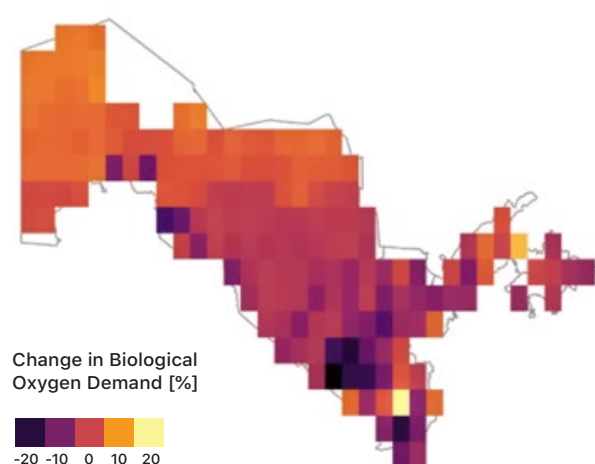
Better resource allocation and more efficient water use can potentially recapture the lost productive value of water. Current average annual water withdrawal rates are more than 50 percent higher than environmentally sustainable, and the water has not been well used. Data show the gap in the economic value of water withdrawn. The country's water efficiency is estimated at just US\$1.4 per m³, significantly lower than in Kazakhstan (Figure 3.10). Excessive withdrawal has led to high water stress (Figure 3.10). Improved water use efficiency in the agricultural sector can significantly ease water stress, which is the highest in Central Asia. Approximately 80 percent of the country's agricultural production depends on inefficient pumped irrigation systems, which suffer from high water losses due to aging and poorly maintained and operated infrastructure. This leads to suboptimal performance of the agricultural sector—the lower TFP for Uzbekistan compared to other Central Asian countries as shown in Figure 3.4. Inefficiency compounds the burden on natural water resources, including renewable water resources, by extending the hydrological cycle and worsening agricultural water productivity (measured as an amount of agricultural product yielded per unit of water spent on irrigation and agriculture).

³⁹ Saidmamatov et al. 2020; Siegfried et al. 2012; World Bank Group 2019b.

Tangible economic benefits can be captured through more efficient water use and better allocation in general. Low water productivity is among several probable causes of low TFP in agriculture compared to other Central Asian countries. Agriculture is a major water user but also draws on other scarce resources. Cotton and wheat cover 37 percent of arable land (Table 3.2) but consume 90 percent of water in agriculture and command more than 90 percent of agricultural public expenditures, totaling 2.1 percent of GDP in 2016.⁴⁰ There are other economic links. Hydropower accounts for 10–15 percent of electricity generation, with the rest being thermal/fossil-based generation. Uzbekistan is part of inter-regional electricity trade with the Kyrgyz Republic and Tajikistan, and a World Bank study has estimated that ‘non-efficient’ inter-regional trade (based on modeled results for 2010–2014) amounted to US\$600 million of costs annually for Uzbekistan (World Bank 2016a) that could be recaptured. Overall water resource availability for hydropower depends on extraction by other sectors and could be a factor in the frequency of non-efficient electricity purchases from the region.

Water quality issues are concentrated around Uzbekistan’s highly populated areas of south-east. These regions have a high density of agricultural lands and experienced the largest decrease in quality of water between 1992 and 2010 (Figure 3.11).⁴¹ The high levels of oxidized nitrogen found in the central and southern parts of the country (Figure 3.12) are linked to extensive fertilizer use. While mortality associated with inadequate access to water supply, sanitation, and toxic pollution is reducing in Uzbekistan, it is still significant. As shown in Figure 3.13, about 600 people died annually from risks associated with inadequate water supply and sanitation based on GBD 2019 estimates. This mortality range corresponds to the losses in economic welfare at about 0.1 percent of GDP in 2019. Some additional risks could be associated with lead pollution, but heavy metal pollution should be explored more to better understand complex pathways of lead exposure in Uzbekistan.

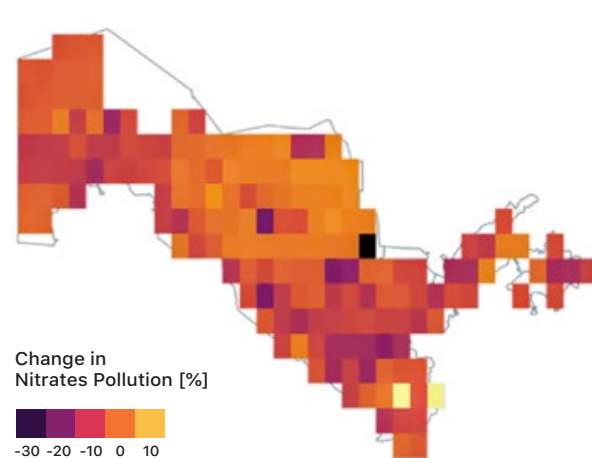
Figure 3.11 Change in BOD (1992–2010)



Source: Damania et al. 2019.

Note: BOD is the amount of oxygen that bacteria will consume in decomposing organic matter. It is measured in terms of milligrams per liter of water.

Figure 3.12 Change in nitrates (1992–2010)



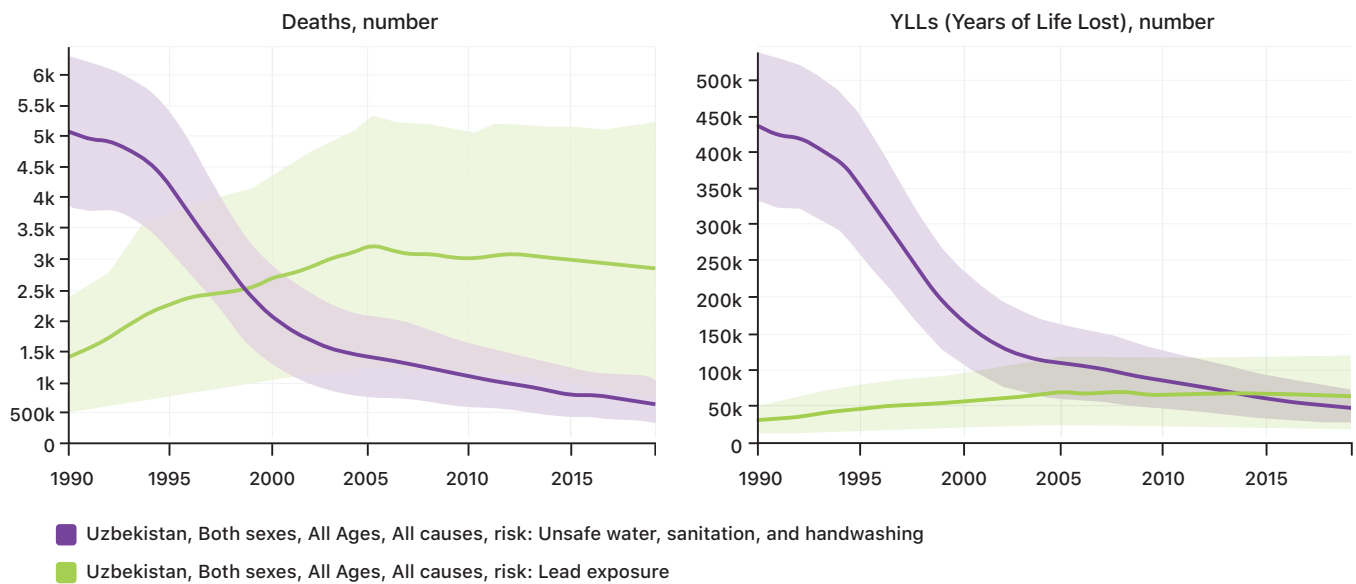
Source: Damania et al. 2019.

Note: Nitrogen captures the concentration of oxidized nitrogen in water. It is measured in terms of milligrams per liter of water.

⁴⁰ Cotton Taxation in Uzbekistan: Recent Developments and Reform Agenda (2018); Uzbekistan Agricultural Public Expenditure Review (2019); Reforming the Wheat Sector in Uzbekistan (2019), World Bank.

⁴¹ Biological oxygen demand (BOD) is a measure of the amount of oxygen that bacteria will consume in decomposing organic matter. It is a widely used umbrella proxy for water quality.

Figure 3.13 Mortality from unsafe water, sanitation and handwashing, and lead pollution



Source: <http://ghdx.healthdata.org/gbd-results-tool>.



CHAPTER 4
NEW RISKS AND VULNERABILITIES:
CLIMATE CHANGE
AND THE GLOBAL RESPONSE



CHAPTER 4.

NEW RISKS AND VULNERABILITIES: CLIMATE CHANGE AND THE GLOBAL RESPONSE

Climate change is a threat multiplier. Its projected impact on natural resources and the environment will add to the effects of excessive resource use and weak environmental management and further diminish the potential of natural resources. Poor communities stand to lose most from degradation of nature and the environment due to climate change and have the least means to protect themselves against it. Meanwhile, global action to the climate threat has gained momentum, with more countries adopting low-carbon policies. This poses risks to carbon-intensive economic sectors, including employment, in countries where domestic climate action may be lagging. This chapter discusses some of these risks and their economic impacts.

4.1 Climate Change Risks

Uzbekistan is currently ranked 111 out of 191 countries by the 2022 INFORM Risk Index in terms of natural hazard risks, including flood and drought risks as the main weather hazards. Institutional strengths to combat increased risks are relatively low. Under climate change, the exposure component of risk increases, and in Uzbekistan's case (Table 4.1) severe weather events are expected to increase in frequency. The lack of coping capacity, ranked 3.9 out of 10, indicates a modest ability of the government to cope with natural hazards in terms of formal, organized activities, as well as low preparedness of the existing infrastructure.

Table 4.1 Flood and drought risk indicators, 0–10 (INFORM)⁴²

Country	Inform risk	Hazards and exposure	Flood	Drought	Vulnerability	Lack of coping capacity
Kazakhstan	1.8	2.3	6.0	5.0	0.7	3.6
Kyrgyz Republic	3.3	3.7	5.6	6.0	2.3	4.3
Tajikistan	4.4	5.0	5.4	7.6	3.4	5.0
Uzbekistan	3.1	3.9	6.3	6.6	2.0	3.9

Source: European Commission 2022.

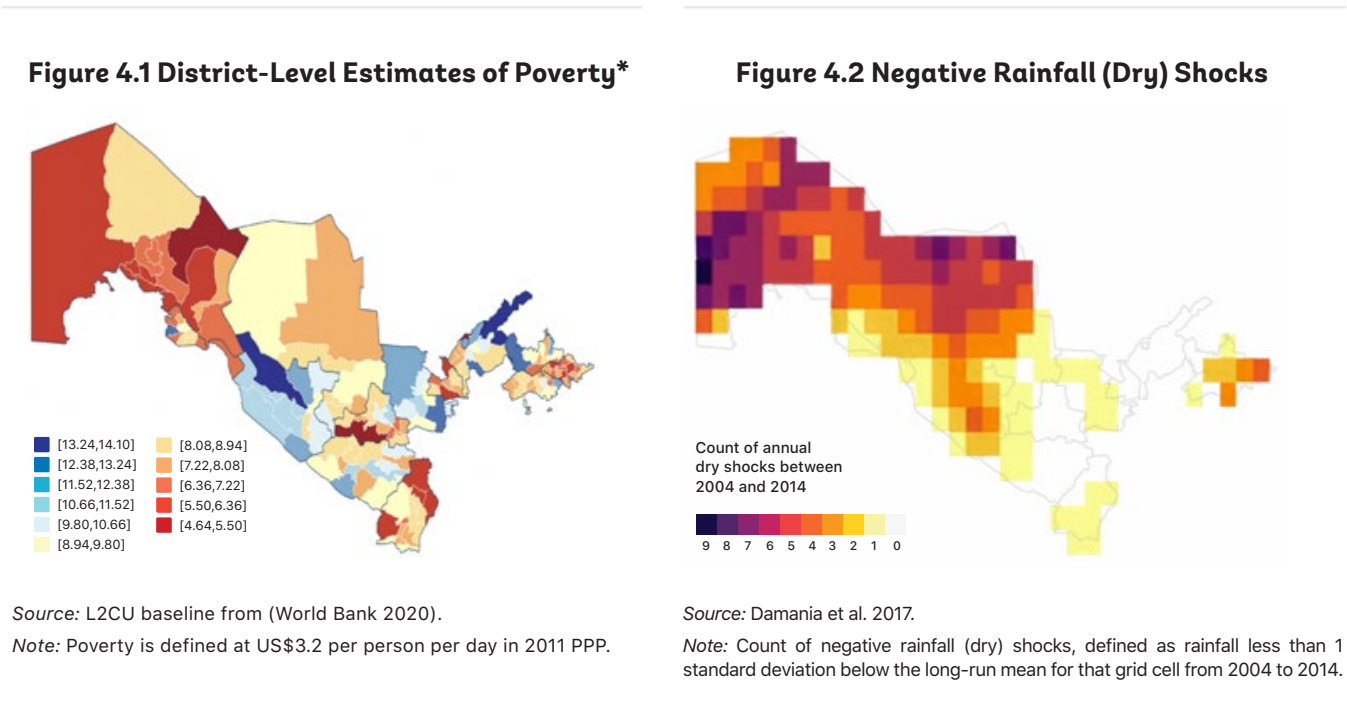
Uzbekistan has witnessed a temperature rise of 0.9°C between the mid-1970s and 2010.⁴³ While annual average precipitation changed very little over that period, there has been an increase in the frequency of droughts. There has also been an increase in the number of extremely hot days (over 40°C), especially around the Aral Sea. For the coming decades, climatic changes will depend in part on the

⁴² An alternate measure of disaster risk that is sometimes used is the ND-GAIN index which calculates a country's vulnerability to climate change and other global challenges as well as their readiness to improve resilience, where Uzbekistan ranks 80 out of 182 countries. The most at-risk country is ranked last.

⁴³ WBG Climate Change Knowledge Portal (CCKP 2021). Climate Data: Historical.
<https://climateknowledgeportal.worldbank.org/country/uzbekistan/climate-data-historical>

global evolution of GHG emissions. The different pathways for emissions are tracked through scenarios called Representative Concentration Pathways (RCPs).⁴⁴ Three paths are commonly reported: (a) a path that stabilizes the increase from preindustrial levels at 2°C and is called RCP4.5, (b) a path that stabilizes the increase from preindustrial levels at 1.5°C (called RCP2.6), and (c) a path that undertakes no further measures to stabilize temperatures beyond those already committed (called RCP8.5). Over the period to 2030, the climate models project an increase in temperature of between 1.04°C (RCP2.6) and 1.11°C (RCP8.5); over the period to 2050, they project an increase in temperature of between 1.40°C (RCP2.6) and 2.32°C (RCP8.5). Thus, policies to control emissions do not make much difference until 2050 but start to do so after that. By 2090 the differences are huge: 1.56°C with RCP2.6 and 5.35°C with RCP8.5. For precipitation, all the RCPs project a small increase with small differences between them.

Climate change will worsen the impact on already vulnerable areas. Underlying risk factors (Table 4.1) heighten impact and exposure of population and infrastructure to severe weather events. The country ranks in the top 20 in the world in terms of its exposure to drought (World Bank and ADB 2021). Dry shocks (Figure 4.1) — defined as a deviation (decrease) from normal rainfall levels — describe occurrence of long-term droughts. The country is more susceptible to drought in low-income regions that are more natural resource dependent (compare Figures 4.1 and 4.2).



The frequency of dry shocks is higher in the north-east part of Uzbekistan, affecting regions—the largest being Karakalpakstan—with poverty rates at above 15 percent (World Bank 2020). In this region, agriculture occupies the largest place in the structure of the economy, and water withdrawal for irrigation was the direct cause of the Aral Sea drying out. This was accelerated later by a feedback loop between evaporation, increase in sea surface temperature, and salinization.⁴⁵ Risk to employment in this region is ranked first among all potential social risks identified within the socioeconomic survey by UNDP (2018). In this area, agricultural lands interspersed with regions of sparse grass vegetation (Figure 4.3) are

⁴⁴ van Vuuren et al. 2011.
⁴⁵ The Aral Sea crisis. <http://www.columbia.edu/~tmt2120/environmental%20impacts.htm>

subject to wind erosion and contribute salt and dust to the atmosphere. Currently, decreasing precipitation levels and increasing occurrence of dry shocks are exacerbating the excessive water withdrawal that has led to the desertification of the Aral Sea region in Karakalpakstan (UNDP 2021a and Box 4.1).

Box 4.1 Aral Sea area desertification

The Aral Sea is one of the biggest environmental challenges for the region, in Karakalpakstan. The area of the Aral Sea is exposed to negative rainfall (dry) shocks (Figure 4.2). In addition, overexploitation of its resources for the cultivation of water-intensive crops such as cotton and rice has led to the near disappearance of the Aral Sea. A huge salt desert of more than 5.5 million ha has formed as a result, with 2.7 million ha located inside Uzbekistan (UNDP 2021a), and the effect has been spreading.

Climate change is affecting the water balance and is linked to the desertification of the Aral Sea. The Aral Sea plays an important regulatory function—making the winters milder and the summers cooler—but these functions have been impaired by desertification. The region now experiences shorter and hotter summers and longer and colder winters compounded by a decrease in precipitation. The population is exposed to other risks from a severely deteriorated environment linked to salt and dust storms from the dried bottom of the Aral Sea, solid waste, pesticides, and emissions from large enterprises (World Bank 2021e).

Timely supply of hydrological, weather, and climate information is a foundation for assessing and mitigating climate risks, and this is acutely needed in the case of the Aral Sea. Surface water flows are more crucial in setting the level of the Aral Sea than underground flow (UNDP 2021a). A comprehensive greening program is needed and should include a landscapes approach to address soil degradation and reduce the intensity of soil blowout and aeolian saline dust transfer. Other measures to strengthen regional water and environmental planning to manage surface inflows, introduce water management, and promote green development and support rural livelihoods will also be needed.

Figure 4.3 Changes in the Aral Sea between 2000 and 2020



Source: UNDP 2021a.

Box 4.2 Climate projections⁴⁶ and extreme weather events

Uzbekistan is projected to see average temperatures rise significantly above global averages by the end of this century. Average temperatures could rise by as much as 4.8°C above the 1986–2005 baseline by the 2090s for RCP8.5 (Figure 4.4). The increase in average temperatures by the 2090s is expected to be strongest in the Ferghana Valley. Average summer temperatures will rise even more—as high as 6°C—with daily temperatures regularly exceeding the 35°C heat index threshold (RCP8.5). As summer temperatures reach hazardous levels, they are likely to have severe socioeconomic impact on the country with significant risks to human health, hydrological resources, and ecosystems.

Figure 4.4 Historical and projected average annual temperature under RCP2.6 and RCP8.5

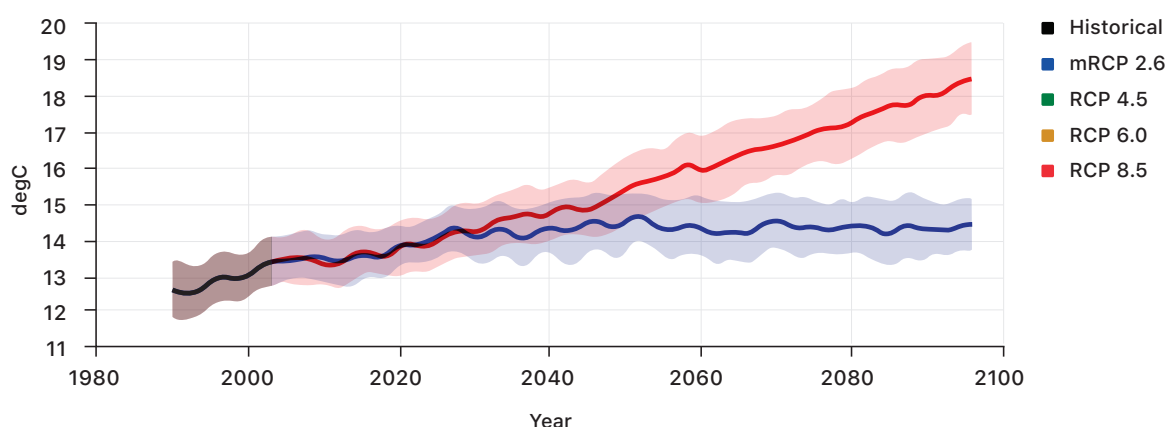


Figure 4.5 Projected annual average precipitation for Uzbekistan in 2080–2099

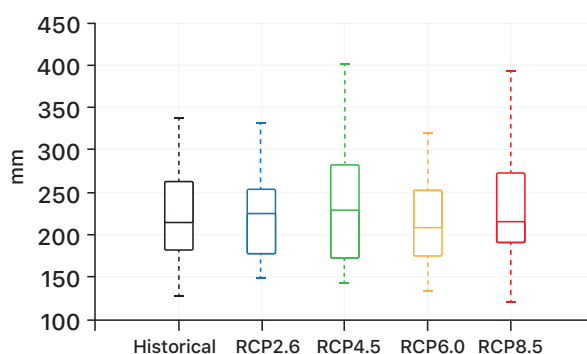
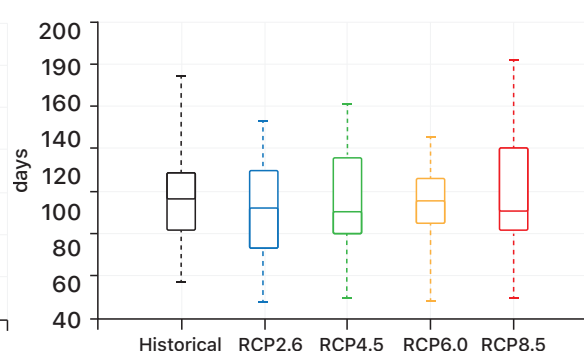


Figure 4.6 Maximum number of consecutive dry days in Uzbekistan in 2080–2099



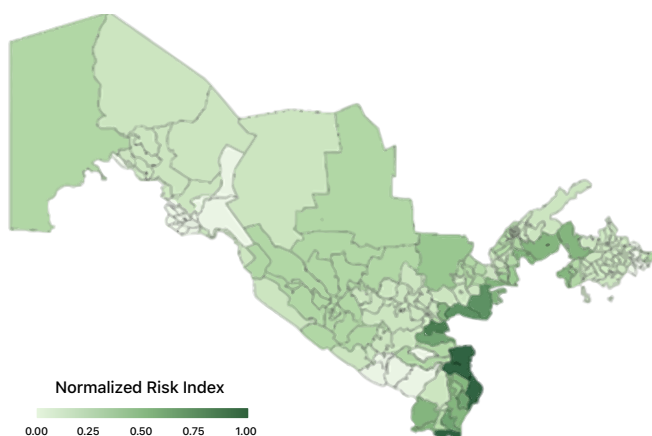
⁴⁶ Data from World Bank and ADB (2021).

Changes in average annual precipitation are associated with high uncertainty and strong spatial differences across all four emission pathways and at different time horizons (Figure 4.5). The projected annual averages do not show a consistent trend, with a potential 30 percent reduction in annual precipitation and up to 20 percent increase depending on the emission pathways. However, there is certainty in the intensity of sub-daily extreme rainfall events with increasing temperature, increasing the propensity of Uzbekistan for above-average levels of flood hazards.

Impacts from climate change increase the country's vulnerability to droughts, high temperatures, heat waves, heavy precipitation, mudflows, floods, and avalanches. Droughts have already triggered cascading effects and caused declining agricultural yield. Droughts in 2000 and 2001 resulted in severe economic and social consequences. Agricultural yields fell by 14–17 percent for cereals and 45–75 percent for other crops (CIA 2020), while the losses in agricultural GDP were estimated to be between US\$38 million and US\$130 million⁴⁷. As annual average temperatures are increasing, the weather is becoming less predictable with the annual probability of severe drought reflecting the consecutive number of dry days in Figure 4.6, intensified by the river runoff decrease, specifically from the Amu Darya and Syr Darya Rivers. Without support to adapt, Uzbekistan's poor and marginalized communities are likely to be affected most by climate change.

Increased drought risks under climate change. Uzbekistan's arid climate and regular high temperatures make drought an increasingly regular occurrence in the future. The duration and magnitude of drought in Central Asia will increase by the end of the twenty-first century under global warming levels of 1.5°C, 2.0°C, and 3.0°C, with intensive (so-called 100-year) droughts becoming 4 to 10 times more common (Naumann et al. 2018). Most water is sourced outside of Uzbekistan and drought within the country can be triggered by climate change impacts in upstream countries.

Figure 4.7 Flood risk (normalized), 1985–2020



Source: Flood Observatory <https://floodobservatory.colorado.edu/>

Climate change increases **flood risks** through a combination of more extreme precipitation events, glacier melt, and slope destabilization through permafrost melt. In addition, peak river flows due to snowmelt are expected to shift up to one month earlier in the year, which could increase the likelihood of extreme rainfall events coinciding with high soil moisture and base flows in rivers. This further increases the risk of flood, mudflow, and landslides. Uzbekistan is already at risk of both river and flash flooding, annually affecting 61,000 people with an expected annual impact on GDP estimated at US\$181 million (World Bank and ADB 2021).

Climate change is likely to increase the annually affected population by 130,000 people and GDP impact by US\$143 million under the RCP8.5 emission pathway (AQUEDUCT Scenario B) (WRI 2018).

⁴⁷ WBG Climate Change Knowledge Portal.

<https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=UZB&period=2080-2099>.

Flood risk is highest in the more densely populated parts of the country, such as the Ferghana Valley. Many public buildings and assets are also in flood hazard zones, affecting approximately 34 percent of Tashkent's major roads, 18 percent of schools, and 23 percent of hospitals. Severe floods in urban areas would likely affect about 5 percent of GDP, with losses intensified due to aging infrastructure, lack of drainage systems, poorly maintained drains, and loss of greenery and pervious surface. High-risk areas include unplanned urban areas and the urban slum population (Figure 4.7), which at 52 percent is higher than the LMIC average.

Climate change will exacerbate the vulnerability of infrastructure to disaster risks, with eastern Uzbekistan more exposed to higher flood risk. The Syr Darya and Amu Darya Rivers upstream and the mountainous regions face the risk of flash floods, debris flows, glacial lake outburst floods (GLOFs), landslides, and avalanches. It is currently estimated that about 22 percent of the population live in zones with high flash flood and mudflow risks, and climate change may increase the frequency of such events. Meanwhile, higher temperatures will accelerate glacial melt, likely leading to higher risks of GLOFs. Water infrastructure already in place should lessen the flood risk in the flat arid plains of western and central Uzbekistan. However, there remains a high residual risk given the presence of communities in the vicinity, as demonstrated by the 2020 failure of the Sardoba dam. After several days of intense rainfall, the Sardoba dam wall collapsed and flooded 35,000 ha of land in Uzbekistan and Kazakhstan, forcing the evacuation of over 100,000 people.

4.2 Initial Economic Assessment of Climate Change Impacts

This report did not have access to data and macroeconomic models to analyze the overall economic impact of climate change, but a limited assessment has been conducted by looking at physical changes resulting from climate change, as outlined in Section 4.1, and how they affect the ecosystem. These estimates (DARA 2012; IFPRI 2019) are summarized in Table 4.2. They are divided into three broad categories: habitat change, health, and industry and economy. Historical data of the economic losses of severe weather events are added to give a more complete picture.

The effects of climate change can be quantified as a loss of economic output of around 1 percent of GDP by 2030. This is the excess damage caused by climate change, in addition to the estimated cost of inaction presented in Chapter 3.

- Habitat change covers loss of property resulting from extreme events, loss of ecosystem services, desertification, impacts of sea level rise, and changes in the costs of obtaining freshwater. Damages are estimated from increased frequency and intensity of extreme events caused by rising temperatures.
- Health effects cover mortality effects of heatwaves, diarrheal infections, and increased incidence of meningitis. Epidemiological studies conducted by various research groups have established links between increases in temperature and precipitation and these health effects.
- Industry and economy costs arising from climate change include higher costs of cooling but lower costs of heating, reduced productivity of labor due to working in higher temperatures (especially outdoors), changes in yields of crops and productivity of livestock, and productivity of fisheries and hydropower systems.

Table 4.2 Incremental costs due to climate impacts in Uzbekistan (US\$ millions - 2020 prices)

Category	Item	Costs US\$2020 Mln.		Mortality (Deaths, Numbers)	
		2010	2030	2010	2030
Disasters	Environmental Disasters	1.3		10	15
Habitat Loss	Biodiversity Loss	26.9	228.4		
	Water	10.7			
Health	Diarrheal Infections			55	35
	Extreme Heat			200	300
	Meningitis			90	150
Industry and Economy	Agriculture	53.7	403.0		
	Heating and Cooling	-10.7	-40.3		
	Fisheries	0.3	2.7		
Industry and Economy	Hydro Energy	-40	-242		
	Labor Productivity Loss	6.7	40.3		
Total		84.9	698.8	355	500
As % of GDP		0.2%	0.9%		

Sources: DARA 2012 and IFPRI 2019.

Note: The estimates in Table 4.2 are incremental costs due to climate change, approximately those for RCP4.5, which are similar to other RCPs up to 2030. The costs in the table are additional costs resulting from climate change. The estimated costs of environmental disasters in Table 4.2 are based on the excess damage due to climate change in that year. This is different from the total value of assets at risk from natural disasters provided in Table 3.1 which includes disasters not associated with climate change and is an expected total value.

About half the costs by 2030 are under habitat loss, on account of the cost of water and biodiversity loss (which in turn affects agriculture). The other half are in industry and economy, with losses in agriculture (60 percent of the total) and labor productivity (6 percent of the total, with a substantial part being in agriculture). There is expected to be a small additional net cost of around US\$40 million (0.05 percent of the projected GDP) as increased cooling needs are not fully offset by savings from less heating. Finally, additional mortality is expected to increase to around 500, mainly from extreme heat.⁴⁸ Thus, the impact of climate impact could increase mortality risk associated with extreme heat by 40 percent in Uzbekistan.

In Focus: Effect on Food Production and Rural Communities

The analysis of climate change shows that the largest impacts will be on agriculture, both through the direct effects of higher temperature and changes in precipitation on yields and because of lower productivity of workers and damages to ecosystems. A study by the International Food Policy Research Institute (IFPRI) accounted for climate change impacts by shifting production from one crop to another according to which crop is favored by the changes in temperature. Table 4.3 presents the

⁴⁸ It should be noted that these costs assume no special measures taken to adapt to climate change, other than those undertaken by farmers, households, and private enterprises acting individually.

expected changes.⁴⁹ Changes in output with and without climate change were estimated for different crop categories and livestock, for 2030 and 2050. The climate scenario taken was RCP8.5 (that is, the highest emissions and climate impacts scenario⁵⁰), and only mean changes are considered. The impact on yield varies across crops, and the overall impact can be mitigated if farmers adjust their crop selection. Compared to no climate change output, the yield for roots and tubers (such as potatoes and beet) declines the most and fruits and vegetables decline the least. Furthermore, the analysis also shows that, compared to 2010, overall production in 2030 and 2050 is higher, even with climate change.⁵¹ To these changes in output, one must add the effects of changes in prices. Given the expected increase in global demand and a relative decline in supply, prices are expected to increase. This will help offset the small declines in output and help maintain or even increase farmer incomes.

Clearly this is only a first assessment of the impact of climate change and is limited to only food production and rural communities. A more detailed assessment of this sector is merited and is recommended as a follow-up to this report. The effect of extreme events, especially droughts, has not been considered. While there are indications that poor households facing higher prices for staples like cereals will require support, a full distributional analysis would be needed to design support programs.

Table 4.3 Output by crop in Uzbekistan with and without climate change (millions of metric tons)

		No Climate Change		With Climate Change		% Loss	
Year	2010	2030	2050	2030	2050	2030	2050
Roots Tubers	1.10	1.33	1.33	1.25	1.22	-6%	-8%
Pulses	0.01	0.02	0.02	0.02	0.02	-4%	-8%
Oilseeds	1.02	1.12	1.17	1.09	1.12	-2%	-4%
Fruit & Veg	6.08	8.61	9.64	8.49	9.39	-1%	-3%
Meats	0.73	1.03	1.20	1.03	1.19	0%	0%
Cereals	7.21	9.22	10.30	8.96	9.53	-3%	-7%
Total	16.16	21.32	23.66	20.84	22.47	-2%	-5%
Growth %		32%	46%	29%	39%		
Loss %				-2%	-5%		

Source: Based on communication with the IFPRI team and its 2019 analysis.

Poor communities are most affected by climate change, but survey data find that they do not perceive many effective solutions to climate change impacts. The projected impacts on agricultural yields are likely to disproportionately affect the poorer and less well-informed farmers who do not adapt or are unable to cope with extreme events. Recent surveys by the MEDPR of rural communities

⁴⁹ Table 4.3 presents output effects in metric tons for selected crops only with adaptation. Table 4.2 refers to damages from the whole sector, including agro-industries, in monetary terms with no special adaptation. The two are thus not comparable.

⁵⁰ While long-term GHG emissions in the RCP8.5 are considered overly pessimistic, it provides useful (and not implausible) high-warming scenarios which would be consistent with continued GHG emissions and high climate change sensitivity or positive feedback from the carbon cycle.

⁵¹ The analysis does not consider the possibility of fertilizer supply shortages and the effect of higher fertilizer prices.

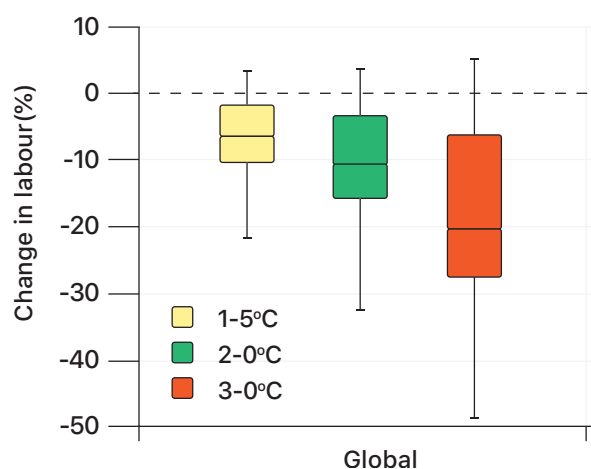
participating in the government's rural infrastructure development illustrate the challenge. Only 37 percent of respondents are somewhat or very concerned about climate change despite nearly 70 percent of communities stating that temperatures and drought frequency have been increasing over the past five years. Within communities, awareness among the lower educated is particularly low, as only 42 percent of respondents with vocational education or lower have heard what 'climate change' means from any source, and fewer respondents with lower education levels identify the various sources of climate change. Less than 10 percent of respondents say available resources and training are sufficient to help the village cope with the impacts of climate change. Respondents from the lowest income quintile feel that climate change has had a greater negative impact on their household's well-being than those in higher quintiles and see climate change adaptation measures as less effective than those in higher income quintiles.⁵² Climate change will also affect living standards for poor urban households who spend a relatively high proportion of their income on food, 47.3 percent in 2016,⁵³ leaving poorer groups relatively exposed to rising food prices.

Box 4.3 Climate change and productivity of workers

Rising temperatures, linked to human-caused climate change, damage economies beyond their immediate health impacts. Future climate change will cause up to 30 percentage point reduction in labor effectiveness in low-exposure sectors (indoors or outdoors in the shade) in Asia under the scenario of 1.5°C warming. In Uzbekistan, labor supply is projected to decrease by up to 2 percentage points in 1.5°C, 5 percentage points in 2.0°C, and 10 in 3.0°C scenario in 2100.

High temperatures affect both labor supply (a decrease in the number of hours worked) and productivity. Temperature increases result in a decrease in productivity of the workers and implies consequences for long-term economic growth and inequality. Both labor productivity and labor supply are affected by non-climate-related conditions such as clothing and the intensity of work being undertaken. Heat in the workplace has health impacts and increases the risk of accidents, while poor sleep makes heat-related illness (Kakamu et al. 2021) more likely and affects labor productivity. By 2030, the global cost of lower labor productivity due to heat is estimated to reach US\$2.5 trillion per year.

Figure 4.8 Population-weighted (SSP2) changes in global and regional effective labor compared with preindustrial levels, 1986–2005



Source: Dasgupta et al. 2021.

⁵² Estimates from World Bank (2022b).

⁵³ Uzbekistan, 2017, the State Committee of the Republic of Uzbekistan on Statistics. <https://www.stat.uz/en/>.

Outdoor workers in high-exposure (outdoor in the sun) sectors, those within the construction and agricultural industry, are the most affected by rising heat. The self-employed, informally employed, and those on zero-hour contracts may also feel they have no choice but to work all hours. Technical measures include engineering responses to cool workspaces, such as air conditioning or green roofs; regulatory and policy measures include building standards, green urban design; and behavioral responses are changing working hours, locations, or employment type. Optimizing work hours to avoid workers being out when the sun is at its hottest may have the greatest effect on employee health (Day et al. 2019). In warm countries like Spain and Greece, there is already a culture of resting during the hottest part of the day. India's National Disaster Management Authority has also advised avoiding strenuous work between 12.00 p.m. and 3.00 p.m. Individualized, wearable sensors could be a useful tool for determining likely heat strain. Wider take-up of wearable heat sensors by employees, employers, and health care providers would also help overcome gaps in heat awareness.

4.3 Global Green Transition Risks for Carbon-Intensive Sectors

Uzbekistan's transition to a low-carbon economy will take place in the context of other countries adopting low-carbon policies. The reduction in demand for fossil fuels resulting from global mitigation action would affect Uzbekistan's economy, but the negative impact on national economy can be mitigated if Uzbekistan harmonizes its domestic climate actions with global ones. The potential long-term impacts of worldwide climate policies on Uzbekistan's economy, its energy exports, welfare, and GDP are estimated using the Global Trade Analysis Project (GTAP) 10 database.⁵⁴ A set of mitigation scenarios for the period up to 2050 following Peszko et al.⁵⁵ are simulated using a global recursive dynamic model⁵⁶.

In addition to a reference scenario, the study explores four ambitious climate policy scenarios (Table 4.4). First, a standard global climate coalition scenario ('carbon price globally') is developed, which includes a uniform global carbon tax. In this scenario, all countries (including climate policy leaders [CPLs] and fossil fuel-dependent countries [FFDCs]) collaborate to achieve a 2°C consistent carbon budget by 2050. There are two climate mitigation scenarios each having the same global carbon budget as the 'carbon price globally' scenario but involve emission reduction actions by CPLs only. The 'carbon price by CPLs' scenario assumes that CPLs do not introduce border carbon adjustment tax (BCAT),⁵⁷ while 'carbon price and BCAT by CPLs' scenario assumes that CPLs implement BCAT on imports from FFDCs based on the carbon content of this imports.

⁵⁴ In the GTAP, Uzbekistan is estimated in a region that combines the country with Kazakhstan, Turkmenistan, and Azerbaijan.

⁵⁵ Peszko et al. 2021.

⁵⁶ The computable general equilibrium (CGE) model, Environmental Impact and Sustainability Applied General Equilibrium (ENVISAGE), is used.

⁵⁷ BCAT has the same goal as the EU Carbon Border Adjustment Mechanism (CBAM) to prevent carbon leakage but is defined much more broadly. BCATs are taxes on imports that account for difference in carbon pricing across different countries. In the model setting, they are applied to all sectors and cover Scope 1 (direct), Scope 2 (indirect), and Scope 3 (along the value chain) CO₂ emissions from fossil fuel combustion.

Table 4.4 Scenario structure

Scenario	Climate policies	Trade policies	Carbon budget, 2018–2050, GtCO ₂
Reference (NDC)	Reference with unconditional NDCs	No border carbon taxes	1,238
Carbon price globally	Cooperative carbon taxes introduced globally	No border carbon adjustment	862
Carbon price by CPLs	Carbon taxes introduced in CPLs	No border carbon adjustment	862
Carbon price and BCAT by CPLs		BCAT levied by CPLs on carbon content of imports from FFDCs)	862

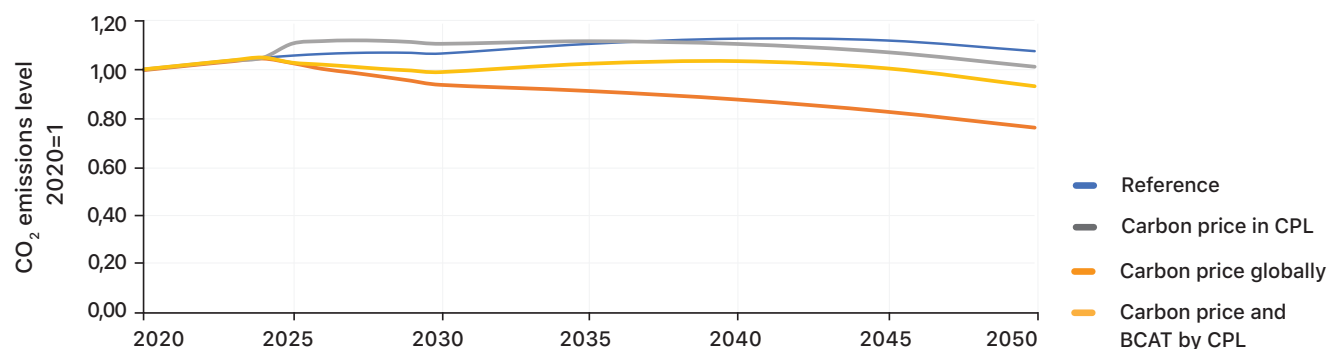
Source: Peszko et al. 2021.

Note: These scenarios cover a wide range of trade partners including the EU and is thus broader than the effect of the proposed EU CBAM that affects trade in a limited set of carbon-intensive products.

A BCAT could be introduced by CPLs to prevent carbon leakage and stimulate mitigation efforts in countries that have no incentives for active climate policies, especially FFDCs. Technically, BCAT is imposed in the form of an ad valorem equivalent tax on region- and commodity-specific carbon content of imports to the CPLs.⁵⁸ For every commodity, the total CO₂ emissions associated with fossil fuel combustion and embodied in trade flows from region to region are estimated.

A simulation of a possible application of BCATs by other countries has a significant impact on Uzbekistan's emissions. In the case of Uzbekistan, the reference scenario suggests an increase in emissions between 2020 and 2040 with further flattening of the emissions level post-2040 (Figure 4.9). Implementation of unilateral mitigation efforts by CPLs does not have any major impact on the emission trends from this region, as they do not differ much from the baseline path. Application of BCAT, on the other hand, has a substantial impact on CO₂ abatement in Uzbekistan, as emissions fall by around 14 percent in 2050 relative to the reference scenario level. Both cooperative scenarios result in major emission reductions of 30 percent in the region (under 'carbon price globally') relative to the 2050 baseline level.

Figure 4.9 Gross CO₂ emissions from fuel combustion in Uzbekistan under different scenarios

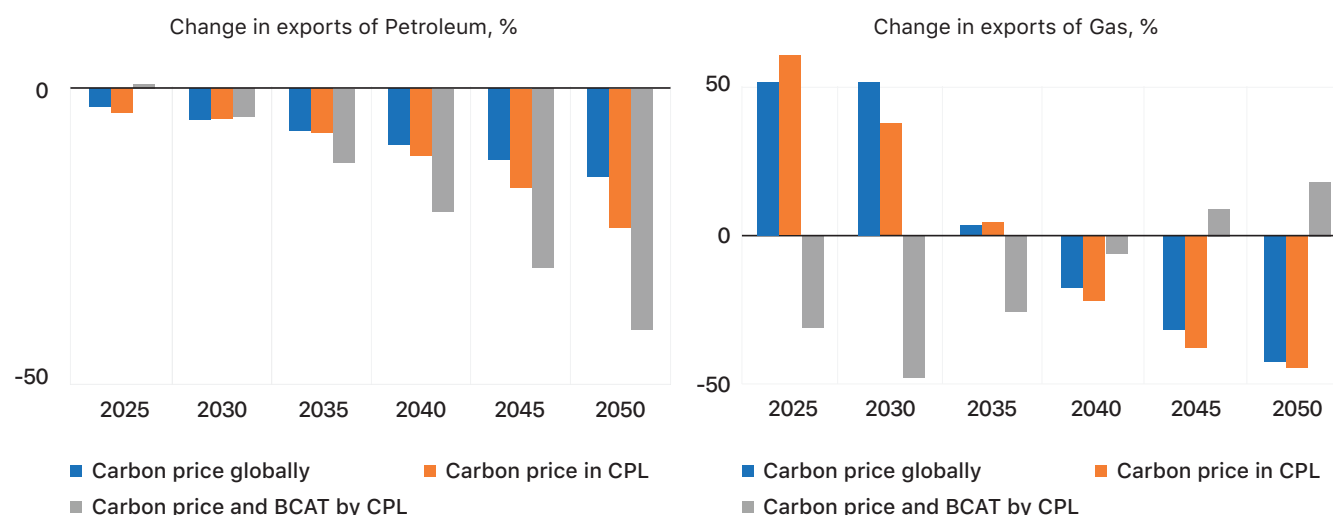


Source: Based on data from Peszko et al. (2021).

⁵⁸ In addition to gross CO₂ emissions from fossil fuel combustion, CO₂ emissions embodied in bilateral trade are estimated. The methodology used is given in Peters (2008). Country-specific CO₂ emissions per unit of output by sector are used to estimate emissions associated with bilateral trade flows.

Under a reduction in global fossil fuel demand and volatility of energy prices (reflected in the reference scenario), export of oil will decrease, but export of gas could initially increase under all scenarios except one with BCAT introduction by CPLs (Figure 4.10). This report extended the analysis into the effect of global cooperation on carbon pricing into oil- and gas-based trade, in which Uzbekistan is a participant. As oil is more carbon intensive than gas, its global demand falls sharply, which in turn depresses trade. In relative terms, BCAT ('carbon price and BCAT by CPLs') has a stronger impact on Uzbekistan exports than when trading partners adopt carbon prices but without border adjustment tax ('carbon price by CPLs'). The impact on natural gas export is heterogeneous across its trading partners in the region, as gas exports can be directed more toward countries that do not impose BCAT (non-CPL). In the model, gas has higher trade elasticity than oil as it is easier to switch between trade destinations and sources. The same price shock for oil and gas would result in much more trade switching for gas (than for oil). In a situation where its trading partners have constraints in carbon content, Uzbekistan could also substitute its export of natural gas with other carbon-intensive goods. Under the unilateral effort with BCAT, because global gas prices decline less significantly than domestic prices in Uzbekistan (where they also drop relative to the export price of gas), a shift from domestic to external markets takes place and gas exports increase in volume after 2040.⁵⁹ Other emissions-intensive trade-exposed (EITE) industries that could be affected by BCAT are metal production (ferrous and non-ferrous), refined petroleum products, cement, and fertilizer production subsectors, which currently make up 11 percent of Uzbekistan's total exports.⁶⁰

Figure 4.10 Change in aggregate exports of oil and gas by scenarios, % change relative to the reference scenario in Uzbekistan



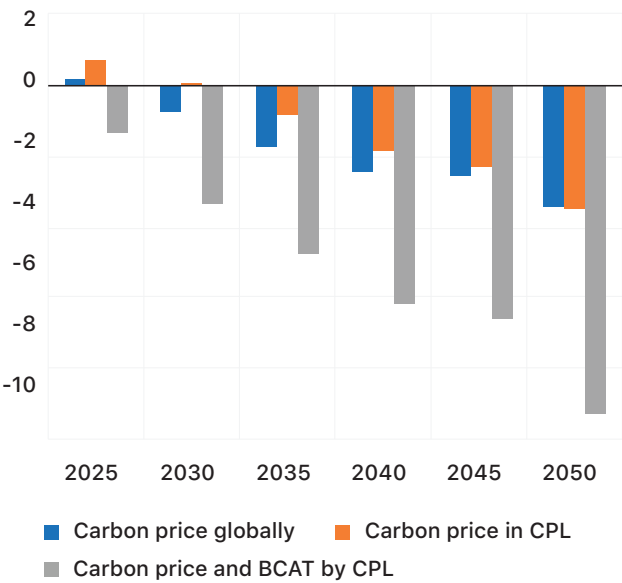
Source: Based on Peszko et al. (2021).

⁵⁹ The caveat for the analysis is that currently, Uzbekistan is less exposed to export of oil and gas than its peers from this region (In 2020, it was 16.5 percent for Uzbekistan, 67.1 percent for Kazakhstan, and 90.7 percent for Azerbaijan). However, natural gas, agricultural products, and non-ferrous metals together contributed about 35 percent of the total export from Uzbekistan in 2020 (<https://globaleledge.msu.edu/countries/uzbekistan/tradestats>). With more climate actions globally, all carbon-intensive exports from Uzbekistan could be affected by reducing demand or taxing of carbon leakages with border adjustments.

⁶⁰ Based on the Prototype Emissions Intensity and Trade Exposure Country Comparison Tool utilizing 2019 Comtrade export data.

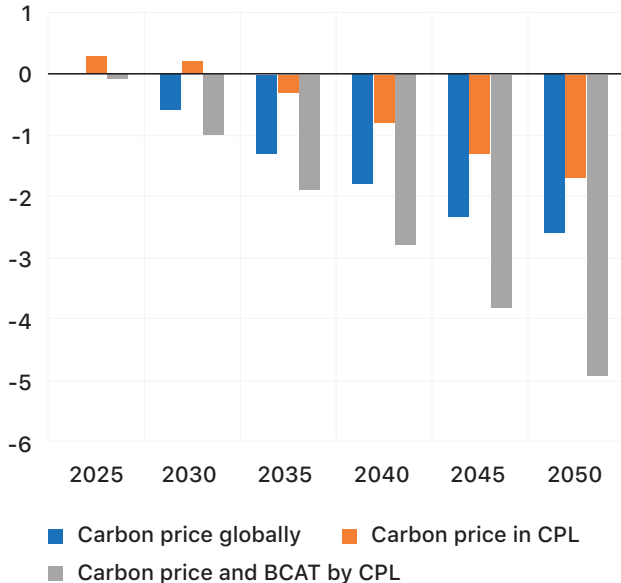
The volatility in prices and demand for fossil fuels and carbon-intensive goods globally, along with terms-of-trade impacts, could lead to a sizeable GDP and welfare reduction in Uzbekistan. If Uzbekistan acts and implements robust domestic climate mitigation policies and participates in global climate cooperation, the negative impact on the country’s economy could be reduced, compared to taking no action. With carbon pricing adopted more widely among its trading partners, the impact on Uzbekistan’s natural gas exports (Figure 4.10) could be as much as 40 percent by 2050. In terms of impact on welfare, the case of unilateral mitigation efforts without the BCAT implementation has the smallest impact on welfare (Figure 4.11). The implementation of BCAT by climate leaders has a much more significant negative impact on the welfare and GDP (Figures 4.11 and 4.12). Under the ‘carbon pricing globally’ scenario (shown in Figure 4.11 as blue bars), the impact on welfare would be less for Uzbekistan’s economy compared to the scenario where it faces BCAT under unilateral climate efforts (gray bars). When Uzbekistan participates in globally harmonized carbon pricing by setting a carbon price,⁶¹ welfare improves slightly (blue bar in Figures 4.11 for 2025). This is compared to the negative impact on welfare when it does not have carbon pricing and its exports are subject to BCAT (gray bar in Figure 4.11 for 2025). In the same year, the impact on GDP is negligible with a carbon price in Uzbekistan, compared to a negative impact when Uzbekistan is not part of global carbon pricing and exports are subject to BCAT.

Figure 4.11 Change in welfare by scenarios, % relative to baseline



Source: Based on data from Peszko et al. (2021).
 Note: Changes in welfare are measured using Hicksian equivalent variation measure.

Figure 4.12 Change in GDP by scenarios, % relative to baseline



Source: Based on data from Peszko et al. (2021).

⁶¹ Blue bars in Figure 4.11 are based on a US\$44 carbon price per tCO₂ in Uzbekistan starting 2025. Global carbon prices applied in the model are gradually increasing in 2025–2050, reaching US\$130 per tCO₂ in 2050.

Summary

Due to data limitations, the analysis presented here is an approximation of macroeconomic models built exclusively for Uzbekistan. The analysis finds that although global policies will influence the production of oil and gas significantly and will lower welfare, especially after 2030, additional opportunities could be created with an active participation of Uzbekistan in global efforts to reduce emissions. Uzbekistan could reduce the risk from the reduction of fossil fuel and carbon-intensive exports and accumulate carbon pricing revenues in the state budget. Uzbekistan can further prepare its economy to weather the anticipated drop in the global fossil fuel price and demand through structural transformation. Climate action from fossil fuel importers, including almost all OECD countries, China, and India, could lead to a decrease in exports of oil and natural gas and other carbon-intensive commodities especially after 2040 compared to the reference scenario. Welfare could be reduced by more than 3 percent. If fossil fuel and carbon-intensive commodities importers introduce BCAT along with their policies to reduce emissions, the effects on welfare may be 2.7 times larger by 2050. Carbon pricing introduction in Uzbekistan would reduce by half the negative impact on welfare, compared to the scenario with BCAT, and generate additional revenue for the state budget.



CHAPTER 5

TOOLS FOR IMPLEMENTING
THE GREEN TRANSITION AND
STRENGTHENING OF INSTITUTIONS



CHAPTER 5.

TOOLS FOR IMPLEMENTING THE GREEN TRANSITION AND STRENGTHENING OF INSTITUTIONS

This chapter discusses several specific strategies or tools for responding to the challenges discussed so far, implementing the green transition, and designing green programs. The forces of market transition, the changing global demand for fossil fuel-based products, and the effect of climate change on top of existing environmental degradation will all affect the Uzbekistan economy. A managed restructuring can lessen the socioeconomic impact of low-carbon policies, by anticipating and compensating displaced workers and nurturing new green growth opportunities to make up for losses in affected sectors. Implementing green growth is also a process of creating momentum for change and sustaining it and requires a change in incentives toward different investment and consumption choices. Depending on the tools used, they can also support the additional financing needed to ease the difficulty of transition for affected industries and provide early and demonstrable benefits. The strategies and tools analyzed in this chapter can create the incentive for change and ease the transition as just described. The strategies and tools are as follows:

- A low-carbon policy package that creates incentives for decarbonization through carbon pricing and aligning public finance as well as through a supportive financial infrastructure to leverage private investments for the green transition.
- Green employment policy. Analysis is provided to inform policies for developing the potential of current and new sectors and designing programs to support labor mobility and address skills gaps.
- Finally, green growth is facilitated by strengthening public institutions and supported by cross-cutting organizational, planning, and legislative arrangements. These institutions will allow policies to support innovations, create new jobs, and reskilling and improve labor mobility.

5.1 Low-Carbon Policy Package: Aligning Incentives for the Low-Carbon Transition

The low-carbon transition involves a shift to low-carbon activities and a reduction in carbon intensity by energy users.⁶² Uzbekistan has moved steadily along the path to a less carbon-intensive economy, but there is still some way to go. Uzbekistan's NDC sets a mitigation objective to decrease carbon intensity (emissions per unit of GDP) by 10 percent by 2030 from 2010 levels. The NDC recognizes that structural reforms are needed in the long run for the low-carbon transition. As discussed in Section 5.3, the shift to a low-carbon economy needs to be accompanied by investments and job creation in non-energy-intensive green sectors, such as education, health care, finance services, and forestry.⁶³

⁶² This section does not address natural carbon sinks from forests and landscapes which are also important elements of decarbonization. Those will be addressed in a follow-on 'deep dive' study.

⁶³ World Bank 2018a.

The transition to low carbon along the lines of the government's plans will need a range of instruments, including fiscal incentives to adopt cleaner low-carbon technologies. Fiscal instruments are a critical and necessary part of the policy package needed to reduce emissions. Green growth is like most types of policy reforms that advocate the acceptance of short-term adjustment costs in the expectation of long-term gains. Fiscal tools such as (a) energy subsidy⁶⁴ reform and price policies (for example, carbon taxation),⁶⁵ subsidies for mitigation action, and low-carbon investment; (b) spending and investment; and (c) public guarantees to secure private sector participation are critical. The analysis here relates to one of these instruments, the carbon tax, and its fiscal and emission reduction potential.

An important step to aligning fiscal policies with low-carbon development in Uzbekistan is to reduce energy subsidies, that is, various subsidies to SOEs in the energy sector. The Public Expenditure Review (Izvorski et al. 2019) estimates that quasi-fiscal deficits of SOEs in the energy sector amounted to over 4 percent of GDP in 2018. The estimated quasi-fiscal deficits cover under-recovery of costs, under-collection of revenues, and technical losses above international norms due to underinvestment. The state's continued subsidization of loss-making operations gives SOEs little reason to adopt more energy-efficient, and therefore low-carbon, practices and technologies. The scale of quasi-fiscal losses across the economy is likely to go beyond this for three reasons: (a) the estimates do not include interest costs on SOE debt or debt incurred on their behalf, (b) lack of adequate information even for the enterprises in the sample makes the estimates tentative, and (c) the sample does not include the railway company and other SOEs that have such deficits.

Table 5.1 Quasi-fiscal deficits of SOEs in the energy sector of Uzbekistan (% of GDP)

	Under-recovery of cost	Under-collection of revenue	Technical losses above norms	Total
Natural gas	1.90	0.40	1.20	3.50
Electricity	0.01	0.08	0.24	0.30
District heating (Tashkent)	0.20	0.10	0.10	0.40
Total				4.2

Source: Izvorski et al. 2019.

Note: Because of rounding, the total does equal the sum of components.

After addressing the issue of energy subsidies, further steps could be taken to introduce a carbon tax or equivalent pricing of fossil fuels. These are effective on carbon emissions, are attractive from the fiscal and environmental perspective, and can take various forms and packaging. As of now, 64 jurisdictions around the world, ranging from national to subnational governments (SNGs), have some form of carbon pricing such as a carbon tax or emissions trading schemes. Among them are China, Brazil, Colombia, and other developing and middle-income countries. All these jurisdictions have implemented

⁶⁴ Low-income households may be disproportionately affected if they no longer receive subsidies on energy and a distributional impact analysis is strongly recommended. There are plans under the World Bank CCDR to conduct such a study.

⁶⁵ Carbon taxes are charges on fossil fuels, with rates equal to the fuel's CO₂ emission factor multiplied by a CO₂ emissions price. They can be comprehensively applied and should cover imported but not exported fuels.

pricing through carbon taxes or emissions trading systems (ETs), though the global average CO₂ price is currently only US\$2 per ton. Although there is some concern that carbon pricing could lead to a reduction in the competitiveness of carbon-intensive industries or negatively affect low-income groups (Arlinghaus 2015), these potential downsides can be effectively managed through an appropriate design of the carbon pricing mechanism. Besides, the literature (de Gouvello, Finon, and Guigon 2019) suggests that countries have de facto multiple implicit carbon pricing already in place as a result of the multiple energy and fiscal policy instruments. These have been implemented to pursue development goals in the energy sector (energy security, access, affordability, development of domestic resources, competitiveness of energy-intensive industries, and inflation control). Decarbonization signal requires a tax rate proportionate to the fuel's carbon content. The impact of carbon pricing and overall mitigation efficiency depends on how the regulatory design accounts for the specifics of the particular economy where regulation is being introduced.

A variety of measures are available to reduce the impact on international competitiveness for firms that are particularly emissions intensive and trade exposed, such as free allocation under the ETS or rebates under carbon taxes (Haïtes 2018). Carbon pricing systems often ensure compensatory mechanisms for redistribution of revenue generated from carbon taxes or ETs. Stepanov and Makarov (2021) describe the cases of British Columbia, Canada, and Norway, where carbon revenues are recycled in whole or in part back to the economy. These revenues are recycled back either in the form of income and corporate tax cuts or as subsidies for vulnerable households.

Carbon pricing is an effective way of reducing GHG emissions but will affect fossil fuel and electricity prices. A US\$35 per tCO₂ tax would imply an increase of 111 percent in the price of coal, 25 percent for natural gas, 12 percent for electricity, and 9 percent for gasoline. This would effectively reduce GHGs by 11 percent relative to the business-as-usual scenario (IMF 2019). The price increases for natural gas and electricity are comparable to the proposed tariff increases to achieve cost recovery.⁶⁶ Carbon pricing is particularly effective if levied on combustion fuel and is less distortionary than taxes on labor and capital. In addition, carbon pricing can be placed in strategic regulations, making it difficult to evade.

While putting a price on carbon can have social impacts, the revenues raised can help mitigate them. A US\$35 per tCO₂ tax would yield tax revenue equal to 5.7 percent of GDP in 2030 or US\$7.3 billion. These revenues would permit the government to support households, companies, and regions that are disproportionately affected by the rise in energy prices. Some of the economic cost of carbon tax introduction is offset by a gain in health benefits of lower air pollution in 2030 due to reduced fossil fuel combustion (IMF 2019). This benefit could be particularly important in the highly polluted residential areas where a high proportion of households use solid fuel for heating (Table 3.3), which is associated with locally elevated cost of ambient and household air pollution and high mortality and morbidity.

Implementing a carbon price will have to be done through a broad strategy which includes specifics on how revenues are to be used, assistance to vulnerable households and firms, stakeholder consultation, and public communication.⁶⁷ The overall effect of a carbon tax, including the changes in prices of all products, will depend on how the revenues are used. In practice, they are often allocated to reduce the burden on enterprises that are highly energy intensive (for example, base metals and

⁶⁶ Izvorski et al. 2021.

⁶⁷ See Carolyn Fisher's analysis of carbon pricing with rebating for industry for details of how to combine such pricing with complementary measures related to industry.

gold), and in some European countries they have also been used to reduce other taxes, namely, the tax on employment, making it less costly for firms to hire workers. If these links, as well as benefits to public health from lower air pollution, were clearly communicated to the public, carbon pricing could even increase public acceptance of climate policy in general.

Overall, there is a compelling case for gradually eliminating energy subsidies and introducing a carbon price to meet the NDC targets and move the economy onto a path of green growth. The International Monetary Fund (IMF) analysis has shown that there can be important gains in the form of reducing GHGs and harmful air pollution. The additional revenue gives the government access to funds that can be used to mitigate negative social impacts supporting investment in cleaner technology. Moreover, as multiple studies note, other mitigation instruments (such as a road fuel tax or a coal or oil tax) are less effective at reducing CO₂. Finally, a carbon tax also offers the opportunity to mitigate GHGs from sources other than fossil fuels. For example, feebate (tax-subsidy) schemes might promote forest carbon storage in cases where property rights are well defined.⁶⁸

Domestic carbon price will also help reduce welfare losses from global climate policies by Uzbekistan trading partners, such as BCAT. As demonstrated in the analysis in Section 4.3, Uzbekistan will be better off by participating in global climate policy efforts than opting out—even with only a modest carbon price. Carbon border adjustment introduced by CPLs would eliminate a comparative advantage of emission-intensive industries and fuel exporters in Uzbekistan. A domestic carbon tax will allow Uzbekistan to keep tax revenue at home and use for economic and social priorities instead of those revenues being transferred abroad through BCAT. Besides, it will create incentives for the decarbonization of carbon-intensive sectors and innovations.

In addition to policies and price signals, there is a need for dedicated programs to support the sectoral transformation, such as improving energy efficiency and scaling up renewable energy. As seen in Chapter 2 (Table 2.1), Uzbekistan is more energy intensive than other countries, including fugitive emissions (the GHG, methane) from leakages and flaring. Thus, the NDC recognizes the importance of the energy sector itself and assigns a high priority to renewable energy and energy efficiency measures, among others, from both the economic and the climate mitigation viewpoint. The NDC contains key energy-related actions such as (a) upgrading power generation capacities with the introduction of efficient and low-carbon technologies, (b) deploying on a large scale renewable energy sources (solar, wind, small and micro hydro, biogas, and others), (c) making greater use of energy efficient technologies in energy-intensive sectors, civil construction, and buildings, (d) eliminating natural gas leakages and flaring in the oil and gas sector, and (e) reducing losses in transmission and distribution networks (Izvorski et al. 2021). In addition to a significant reduction in GHG emissions, these actions will also help improve air quality and reduce the deaths, illness, and economic costs of air pollution, which make the largest contribution to the overall ‘cost of environmental degradation’ analysis in Uzbekistan (Table 3.1).

⁶⁸ A potentially promising instrument is a nationwide feebate applying a sliding scale of fees/rebates to landowners who reduce/increase carbon storage relative to the baseline level. Feebates can cost-effectively promote all mitigation opportunities across all landowners, can be designed (through appropriate scaling of the baseline) to be revenue neutral in expected terms, and could be administered through finance ministries once a registry of landowners is established.

Box 5.1 Scaling up renewable energy

The government's carbon abatement target recognizes the country's renewable energy potential for diversifying the energy mix, emphasizing the clean energy transition. In April 2020, the government approved its 2020–2030 generation expansion plan, which calls for the development of about 15 GW of net generation capacity (at an estimated investment cost of US\$14.7 billion) by 2030, of which 5 GW and 3GW will be of solar and wind power, respectively. The government plan envisages the share of renewable energy (solar and wind) in the country's power generation capacity mix to increase from 0.2 percent in 2019 to 25 percent in 2030, the share of natural gas in generation capacity to decrease from 76 percent to 46 percent, and the share of coal to contract from 9 percent to 5 percent. The increase in solar and wind power together with the reduction in fossil fuels in the generation mix would result in the reduction of around 13 million tons of CO₂ over 2020–2030, compared with the 'business-as-usual' scenario. Steps have been taken to replace the existing obsolete and carbon-intensive generation gas fleets with modern generation units, which are up to 50 percent more energy efficient and emit over 50 percent less carbon.

The relative cost of various green options for electricity generation is influenced by domestic energy price and structure and regulations of electricity supply and other energy sector characteristics. Some of the relative cost issues can be seen in a study (UNDP 2021b) of shifting to more efficient use of gas for power generation (replacing old turbines with new combined cycle gas turbines (CCGTs) and the introduction of solar and wind turbines and other renewable sources. The capital costs of a switch to CCGT are estimated at around US\$4 billion, while the introduction of wind turbines enough to supply 20–30 percent of the 2017 installed capacity is estimated to cost US\$1.4 billion. At the level of generation in 2017, the CCGT option would reduce GHG emissions by 6,318 tCO₂, whereas the two wind turbine options would make a reduction of 1,368 and 2,056 tCO₂ respectively, representing a modest 0.6–27 percent of total emissions in that year. While the CCGT option is more attractive from the emissions perspective, cost considerations might change the outlook. When assuming the domestic price of gas in 2017 (around US\$50–60 per 1,000 m³), the study finds that utilities would find neither of the options financially attractive and the state generating company would not undertake any investment to replace the old turbines. If the cost of gas is at the then prevailing international price (US\$140–160 per 1,000 m³), generating companies would find CCGT most profitable, followed by wind turbines and conventional gas technology. The findings from this study need to be updated with new investment costs and more robust energy price assumptions including accounting for any short-term disruptions to regional supply and integration. Uzbekistan is not currently a net importer of energy and is less susceptible to international price fluctuations.

In terms of social effects, given that the country has regulated utilities, there is likely to be some cushion to end users, and the cost of green investments may not be fully passed on to customers in the form of higher tariffs. If the utilities eventually recover these costs in full without government support, the impact on consumers needs to be more closely studied. The UNDP study has estimated that the cost of additional investments implies an increase in tariff of 7.2 percent to cover amortization. The wind turbine investments involving a capital cost that is just under half that of CCGT imply a tariff that is correspondingly about 3.6 percent. These observations are only preliminary. Distributional implications for low-income energy users, especially those dependent on subsidies, should be fully explored as part of future work.

5.2 Low-Carbon Policy Package: Financing the Green Transition

Greening the economy, while fiscal policy is tightening, will require more effective public spending and revenue mobilization. In 2021, consolidated public revenues and expenditure stood at 27 and 30 percent of GDP, respectively, (IMF 2021). Reforms introduced in 2016 have given more room to market forces, although SOEs still account for half of the national output and state-owned banks account for over 80 percent of banking system assets. Notwithstanding, public finance is weakly aligned with the green objectives. Only 11 percent of state budget expenditures directly contribute toward the implementation of SDGs linked to the green economy (UNDP 2021c) and 5 percent of tax revenues have environmental relevance. Improvements to public financial management (PFM) practices can help allocate resources more effectively to green objectives as they complement environmental taxation and revenue mobilization.

For public spending, initial steps in this direction could take the form of green public procurement and classification of green public expenditures to support green budget preparation and execution. Introducing climate change and green criteria into Public Investment Management systems requires deeper reforms but will help ensure that public assets are climate resilient and public spending does not entrench the economy further in carbon-intensive practices. But the underlying issues with regard to increasing revenue collection by eliminating or reducing tax privileges and exemptions, among other sources, including subsidies to SOEs should be tackled first.

For revenue mobilization, it should be recognized that the financing needs for a green transformation are large. The public budget to finance green growth can come from several sources. General public budget allocations can provide flexibility for government allocation processes that are relatively simple to administer. Revenues from specific taxes, such as fuel and water taxes, will also contribute toward the pool of public resources for green investments in Uzbekistan. A proposal to set up an Uzbekistan Green Fund has been put forward by the MEDPR. This can be useful as a vehicle for organizing public and other resources (such as private funding and development assistance) and channeling them strategically to advance the government's green policies. Such funds can strengthen the green mandate by aligning it with the government's mechanism for green policy coordination. The IAWG was formed under the MEDPR (see Section 1.2.2) to consolidate and coordinate efforts among the various stakeholders involved in the development of green finance initiatives in Uzbekistan, including the federal executive bodies, the CBU, development institutions, businesses, and the professional communities.

The gradual introduction of instruments such as excise tax based on environmental standards, tax incentives for renewable energy deployment, or a limited carbon tax could be part of the solution to the revenue mobilization task for its energy transition. In revenue mobilization analysis for the country's SDG targets, an additional 8 percent of GDP in revenue was assessed as necessary (IMF 2021). This can be raised through a comprehensive green tax package in a more growth-friendly manner compared to increasing VAT or corporate income tax (IMF and OECD 2021). This means that Uzbekistan has the potential for aligning tax policies with environmental objectives while broadening its tax base. The tax-to-GDP ratio remains at 14.8 percent, which is two points higher than the average of middle-income countries. The revenue potential and emission reduction performance of a carbon tax are already discussed in Section 5.1. Currently, only about 5 percent of total tax revenues is tax with some environmental relevance—mostly in the form of excise and resource taxes. These revenue streams are not structured to support the green economy strategy by incentivizing renewable energy deployment

and energy efficiency, but a different model could be suggested. For example, the EU has green fiscal packages to support the EU's low-carbon transition consisting of carbon taxes, fuel subsidy reforms, and green public investments. In the context of an analysis for Bulgaria, Croatia, Poland, and Romania, such green fiscal packages were found to improve price incentives and provide for a tax system that is less distortionary than other tax changes while simultaneously ensuring that those who lose out are compensated and supported in the transition (World Bank 2022c). Experience from Sweden shows that a comprehensive, well-designed tax package signaling the long-term policy direction can set investment decisions in the private sector without compromising growth and competitiveness.

The Uzbekistan government successfully issued historic bonds in the London Stock Exchange in August 2021—the first in the country and the region—which were sovereign SDGs bonds. This is a breakthrough in the channeling of private funds to finance public SDG-oriented programs. The volume of international bonds and interest rates were in two tranches of US\$635 million and US\$235 million (denominated in Uzbek som), but more can be done to encourage the flow of green private capital. Currently, private financing to green investments is still insignificant in Uzbekistan because of (a) inadequate regulatory framework for green finance instruments and insufficient incentives in GHG regulation, (b) still limited number of green private sector projects due to modest carbon reduction goals, and (c) insufficient involvement of financial institutions and investors in the discussions of risks and return opportunities associated with green finance.

5.3 Policies Supporting Employment Opportunities from the Green Transition: An Analysis of Promising Sectors

This section analyzes how the green transition involves a shift in labor resources—across sectors and within sectors. This analysis aims to inform early thinking on policies needed to stimulate investments to support new jobs, policies to facilitate labor mobility, and skill programs. There may also be social and distributional implications that would require policies to give better access to opportunities.

A green economy can generate additional jobs, although these would be different types of jobs and in different sectors under the current growth model. Workers in the oil and gas sector are among the first to be affected by a low-carbon transition, and policies for income restoration and preferential access to new green jobs, along with reskilling, will be needed. A study on the fiscal and employment effects associated with a low-carbon transition was conducted by Agence Française de Développement (AFD). This focused on the 'sunset' industries—ones which could face a decline in demand and pressure to decarbonize and include mining and quarrying, petroleum, chemical and nonmetallic mineral products, and metal products. In Uzbekistan, the share of the wage bill and employment in these industries is small—less than 5 percent of the total. In terms of net revenues of foreign currency from these industries, Uzbekistan had the lowest exposure among the set of 40 countries that are engaged to any significant extent in these sectors. The study concludes that Uzbekistan is not a highly exposed country in macroeconomic terms, as it is not structurally dependent (directly and indirectly) on those sunset industries. However, further growth in these industries increase its vulnerability.

Box 5.2 Easing the impact on ‘brown’ industries

Experience in the coal industry points to critical needs that must be paid for: socioeconomic assessments; programs to reskill, compensate, or fund concessional access to opportunities for affected communities; regional economic stimulus and infrastructure investments; and direct costs such as closure or repurposing of coal mines. For European Community members, accessing the EU and Just Transition Mechanism requires, among others, a territorial just transition plan. Being able to carry out these in parallel, or ideally in advance, of phasing out certain industries is as important as investing in renewable energy or any other aspect of the decarbonization strategy (Climate Investment Fund 2020; World Bank 2018b).

Carbon pricing can align incentives for a green transition and will add to the state’s financial resources. Carbon revenue can be channeled to the central government revenue pool to finance tax reforms that spur economic growth, including fuel subsidy reform and other non-distortive enhancements like reducing the employment tax. It can be used to finance public debt or climate and environmental programs. Within a carbon tax design, carbon revenues can be used to address the potentially negative impacts of carbon pricing on competitiveness for the domestic industry. This can be done by providing tax discounts or exemptions to vulnerable sectors. Carbon revenues can also be used to help individuals, households, or businesses deal with the impacts of carbon pricing through direct transfers or other policies and programs. A major initiative of this nature in Germany involves a variety of supportive policies for phasing out coal production, including early retirement support, retraining programs, and support for economic development in affected areas (World Bank 2019).

The greening of the economy will also involve shifts within sectors, and socioeconomic outcomes need to be tracked carefully—including more subtle shifts that can have deep social implications.

A shift to value-added work in agriculture and natural resources would result in fewer cotton pickers, and this will disproportionately affect rural women (who made up 65 percent of cotton pickers in the 2020 harvest). In the transition from cotton production to higher-value cotton garment and textile manufacturing, more jobs would be created—including for women—but the location of these jobs and the skills required to do them will be different. The government will need to address this through further study and might consider supporting the preferential access of new employment positions for workers displaced from cotton growing and harvesting.

5.3.1 Identifying New Growth Sectors

This analysis⁶⁹ identifies the top four sectors with potential for green job creation in Uzbekistan: health care, education, finance, and forestry. All these sectors are closely associated with human

⁶⁹ The methodology for identifying sectors with green job potential is based on job creation potential per dollar invested, qualified by sectors where value added is high for every ton of GHG released. The methodology is executed by using data from the GTAP. This accounts for international trade patterns that link individual countries and regions and models internal links between sectors within each country using an input-output matrix of the economy (Taheripour et al. 2021). The data allow for analysis of multiplier effects on employment, value added, GHG emissions, and air pollution for every dollar invested in any sector. Job creation potential is based on supply-side investment in economic sectors defined in available input-output tables. This methodology assumes a given economic structure and does not consider the possibility of structural changes. This approach may understate the green job potential as it excludes the existence of new sectors with high innovation potential that might emerge from the green transition. Nevertheless, the model provides useful insight into where employment potential lies.

capital accumulation, building market infrastructure, as well as enhancing renewable natural capital through landscape restoration, expanding application of nature-based solutions, and supporting small and medium enterprises (SMEs) to implement conservation projects. Natural resource management and landscape restoration programs involve reforestation that has the potential for creating jobs and increasing social and economic outcomes in rural regions while producing the additional benefit of helping to mitigate climate risks related to land use and reduction of soil erosion.

The sector mapping in Figure 5.2 illustrates the green potential of these sectors by applying an additional criterion of carbon intensity of the investment as measured by GHG emissions per value added. If the analysis could be expanded to new sectors, one can possibly add climate-smart mining to the list of green sectors as well. Further work with in-depth analysis will be needed on where the strongest job growth can come from under the current economic structure and how to prioritize them. Beyond this list, sectors with normally low environmental impact that should be prioritized for the analysis include public administration, communication, and ecotourism. Education and health care have particularly strong green merits as sectors that support high female participation in the labor force without association with the environmental issues related to mining.

The analysis here does not yet consider more productive and green jobs from new technology and innovation sectors and subsectors that may emerge in a new green economy (for example, green hydrogen). While green innovation policies that generate employment are not discussed here, having such policies will help Uzbekistan tackle other challenges: (a) improving the competitive advantage of Uzbekistan through deeper penetration into the global value chain and encouraging foreign direct investment and (b) creating new and more vibrant economies based on clean leapfrogging technologies that attract private investments.

Figure 5.1 Jobs per million dollars investment

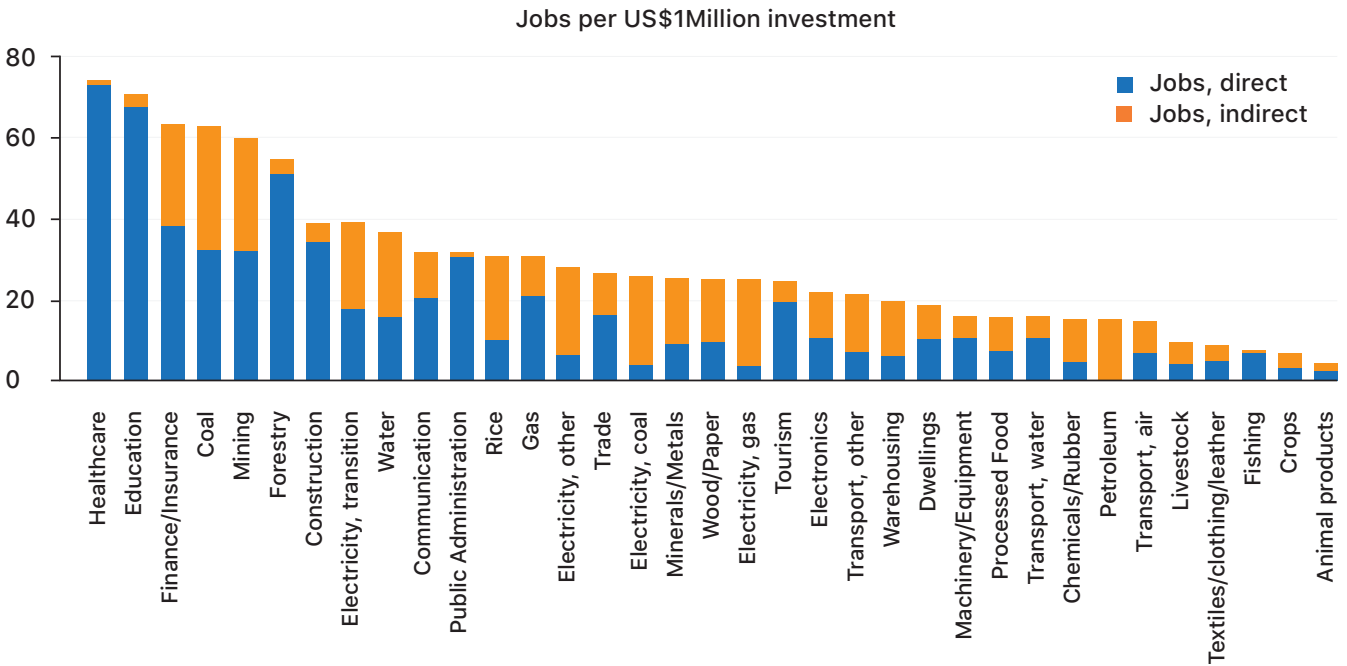
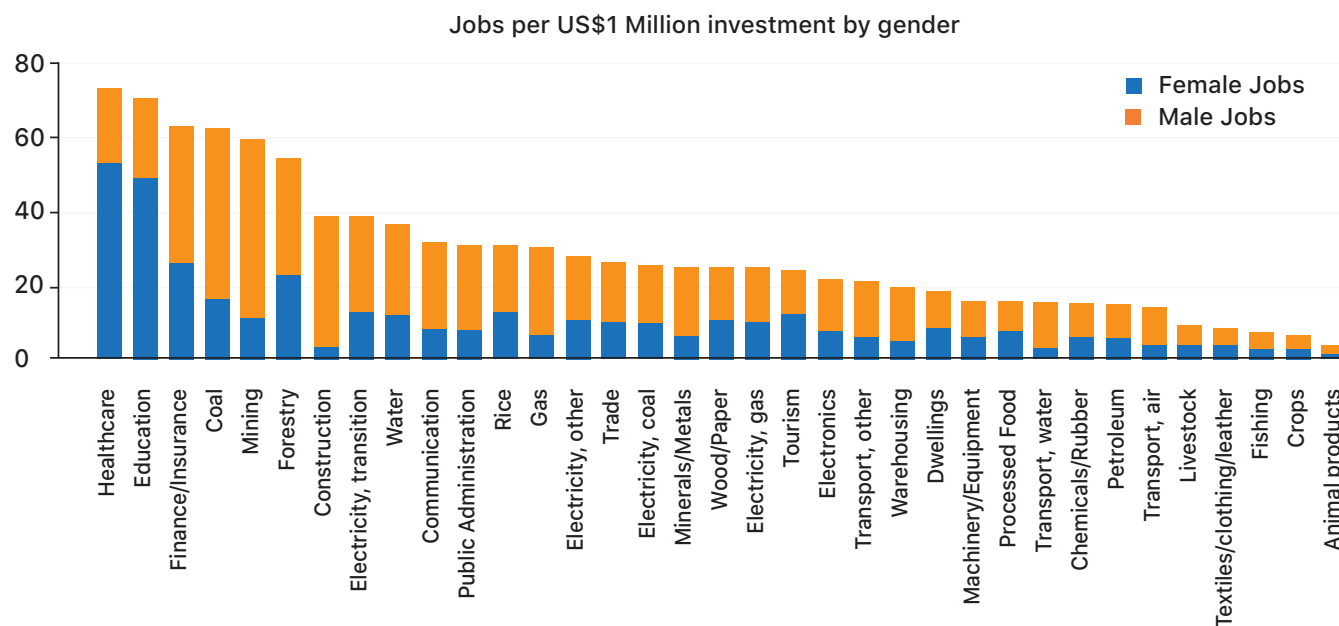
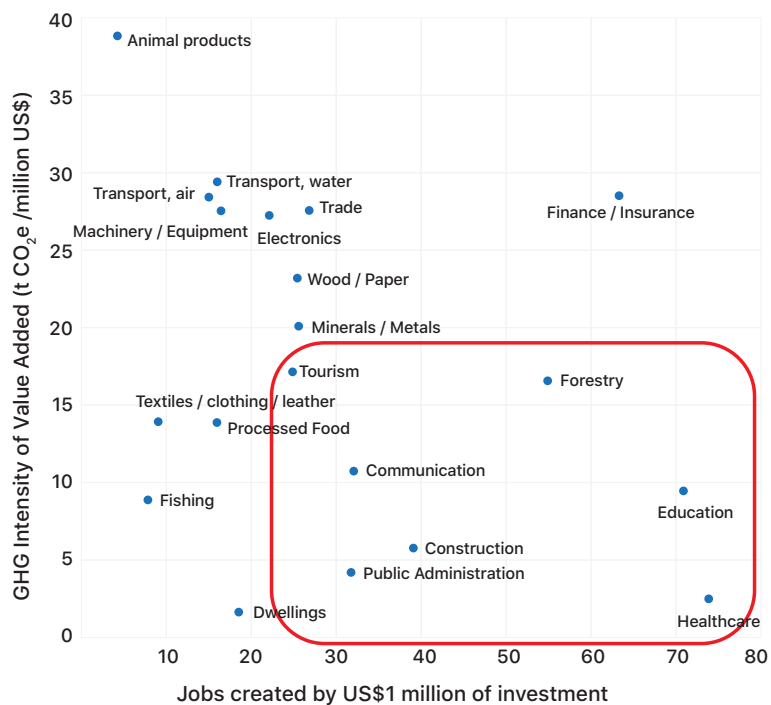


Figure 5.1



Source: Estimation based on Taheripour et al. (2021).

Figure 5.2 Carbon intensity of jobs created per million dollars of investment in the selected sectors with the lowest GHG intensity per value added



Source: Estimates based on Taheripour et al. (2021).

5.3.2 Green Shifts within Agriculture

Already the largest employment sector in the country, agriculture still has the potential to provide more and better jobs—with the support of a range of policies. It is not included in the priority sectors discussed above due to relatively high carbon intensity of value added in this sector. However, as stated above, specific high-productivity climate-smart subsectors of agriculture should be the focus of further analysis. Some examples of green shifts in agriculture are presented below. They should follow reforms to dismantle the state agricultural system for cotton and wheat that could effectively free up resources.⁷⁰ This allows labor resources to flow to other higher-value agricultural products and help the sector realize its green potential with higher productivity and value. Employment studies for the agri-food sector indicate there is potential to increase employment between 19 and 32 percentage points in 2030 compared to 2019, allowing annual creation of 0.7–1.3 million jobs, more than enough to absorb 600,000 young entrants into Uzbekistan’s labor market (World Bank 2020, 2022a). Many of these are in subsectors that are ‘green’ in the sense of a relatively low environmental impact.

- Horticulture is an industry with high productivity and job creation potential. It already generates 50 percent of the value of crop production and 40 percent of gross agricultural output from just 10 percent of total arable land.⁷¹ Job creation will be dispersed and available to women and youth not only in Tashkent and other large cities but also in rural areas and secondary towns. This offers important economic spillovers to regional and rural economies.
- The livestock sector currently generates a lot of emissions directly and indirectly through land use change. At the same time, it generates about 50 percent of agriculture GDP and is another source of jobs and livelihoods and is therefore a priority for greening. As livestock also serves as a social safety net, an estimated 27 percent of the agricultural labor force⁷² are also engaged in livestock production for an additional source of income. Greening of the livestock sector includes the use of sustainable feed, the introduction of silvopastoral systems, and the use of smart transportation routes to reduce environmental impacts. Biogas units (BGUs) for cattle manure disposal can be introduced and repaid by the energy and fertilizer generated in the process. BGUs also reduce GHG emissions. Environmental improvements like this will become more important for the country for meeting NDC goals as the agriculture sector continues to grow.

In Uzbekistan’s case, investments to improve resource efficiency — particularly for sustainable land and water management — do not lead to job losses and could even alleviate unemployment.

The agriculture sector is the most direct channel for addressing rural needs and reducing poverty rates, and all measures should be considered to maintain growth for the sector. The UNDP report argues that a decline in water availability implies a constraint on agricultural production if no action is taken. For a decline of 10–30 percent of water availability, total agricultural output could fall by 6–28 percent. Employment correspondingly declines by 55,000–250,000. Therefore drought-induced job losses can be significantly limited if climate-smart agriculture and sustainable land and water conservation measures and investments are taken. Policy makers faced with competing priorities will bear in mind this link between jobs and sustainable land and water conservation measures (drip and solar irrigation, strict

⁷⁰ In the employment analysis presented later, agriculture as a whole is not a sector with a high multiplier per million dollars invested. It is, however, a sector where the investment contributes significantly to reducing poverty. GDP growth originating in agriculture induces income growth among the 40 percent poorest, which is about three times larger than growth originating in the rest of the economy (de Janvry and Sadoulet 2009).

⁷¹ World Bank 2020, 2022a.

⁷² State Committee of the Republic of Uzbekistan on Statistics.

water consumption metering and accounting, soil erosion control, no tillage, and water harvesting). Moreover, drip technology saves both water and energy consumption, given the use of pumped irrigation in the country.

5.4 Strengthening Public Institutions

Green growth requires the institutional and governance setting to be well adapted to the wide-ranging needs of multisectoral policies. Climate change institutions is one example of how green growth can be served by better institutional arrangements, as it demands the same type of cross-cutting organizational, planning, and legislative arrangements. The institutional setup for climate change is similar in this respect but is often more developed than institutional arrangements for green growth or SDGs. This is partly because of national ratification of the Paris Agreement that sets off formal government processes.

As a first step, a **CCIA** is being carried out in Uzbekistan as part of the World Bank’s programmatic support on green growth. It covers the country’s system of laws, policies, organizations, systems, and processes for climate change and can be potentially extended to cover environmental institutions in a second phase (see Table 5.2). The full assessment report with an analysis of gaps and recommendations for improvement will be available at a later stage. Highlights of initial findings are shown in Annex 3.

Table 5.2 CCIA Methodology⁷³

The purpose of the CCIA is to allow countries to effectively understand the strengths and challenges of their institutional architecture and to develop laws, policies, organizations, processes, and programs to improve their cross-sectoral response to climate change. The CCIA comprises five pillars:

- **Organization.** Assesses the regulatory framework for climate change policy, the functional mandates of government agencies, coordination arrangements, and the technical capacity to support climate change policy
- **Planning.** Evaluates systems for climate change risk and vulnerability assessments, strategies, and plans and the regulatory framework for the climate change planning and policy process
- **Public finance.** Considers the integration of climate strategies, plans, and policies in fiscal and PFM practices and the mobilization of resources for climate action
- **SNGs and SOEs.** Examines the treatment of climate change in the intergovernmental system and in the management of SOEs, the capacity of SNGs, and incentives for climate action
- **Accountability.** Reviews transparency and engagement mechanisms for civil society, the private sector, and other stakeholders and the roles of expert advisory and oversight institutions.

⁷³ World Bank, 2021, ‘Climate Change Institutional Assessment’. This is a diagnostic tool that helps countries effectively recognize the strengths and challenges of their institutional architecture for cross-cutting issues such as climate change and green growth.



CHAPTER 6

A WAY FORWARD



CHAPTER 6.

A WAY FORWARD

COVID-19 and the war in Ukraine are putting significant stress on growth outlook and fiscal balances and limiting policy flexibility for reforms for many countries, including Uzbekistan.

Greening the economy remains highly relevant, as it increases overall economic resilience to external shocks. The Government of Uzbekistan has shown commitment to greening the economy by setting targets for efficient use of natural and energy resources that would minimize pollution, reduce climate and environmental impacts through decarbonization, and strengthen resilience to natural disasters and climate change. Recent regional and global developments show the importance of building food and energy resilience to exogenous shocks. The green transition would also position the country for the future by capturing the dynamics between transformative technology and natural capital, delivering growth, and creating jobs.

The analysis in this report has highlighted that Uzbekistan has scope to improve its environmental sustainability and address the high, albeit hidden, economic and social costs due to the excessive pressures on natural resources, including water, land, and air. Climate change exacerbates these impacts and costs. Meanwhile, the global trend of rising carbon emissions and a growing resolve to address this reinforce the importance for Uzbekistan to transition to a greener growth model. The analysis has also stressed the need for a comprehensive package of ‘green’ policies, including incentives, regulations, finance, and institutions and outlined possibilities for growing the ‘green’ sectors and jobs.

From the foregoing analysis, a set of recommendations is presented here—with supplemental additions from consultations at the Green Growth Policy Dialogue⁷⁴ hosted by the MEDPR and attended by the government and wider stakeholders. These serve to complement the government’s framework of actions and inform initial thinking on priorities and policy design. The government has set out a framework of actions on green growth and gathered policy ideas. The recommendations are organized according to the government’s green growth pillars: sustainable and efficient use of natural resources, strengthening response to climate change and disasters, green and low-carbon development of the economy, effective and green public and private expenditure, and leaving no one behind in the green transition process. The recommendations from this report under the government’s ‘sustainable and inclusive urban development’ pillar are limited to air quality and disaster risk. Therefore, the recommended priorities for this pillar have been incorporated into the first three pillars.

6.1 Sustainable Land Use: Agriculture, Water, and Landscapes

The data on the cost of land degradation (Section 3.2), analysis of climate change risks (Section 4.1), and country benchmarking (Section 2.2) point to the critical link between water efficiency, land productivity, and social vulnerability. This is the basis for prioritizing a steep increase in water use efficiency, through pricing and irrigation investments. But limits to water use will have to be part of the intervention, as analysis in Section 3.4 shows that withdrawal rates have greatly exceeded the level needed for environmental sustainability. The analysis finds a credible link between forested and protected lands with soil erosion and agriculture, with economic impacts that are hard to ignore (Section 4.2). The Natural Capital Accounts

⁷⁴ Website of the MEDPR. <https://mineconomy.uz/en/news/view/4330>.

(Section 2.3) highlight the situation of vital ecological functions being supported by a limited area of forested and protected lands. Landscape restoration and sustainable land and water management and climate-smart agriculture programs take on a special importance. The dominance of the agriculture sector as an employer, and its potential to generate even more green jobs, are analyzed in Section 5.3.2. Policies are also needed to encourage labor mobility, increase jobs access to the affected, and narrow the skills gap to realize this potential. The recommended priorities are summarized as follows:

Recommendations

Short term to midterm

- Prevent land degradation not only by curbing soil erosion but also by adopting reforestation and landscape restoration programs
- Adopt climate-smart agriculture practices and an integrated landscape approach
- Gradually adjust water prices for irrigation and water tariffs toward cost-reflective levels and remove water tariff exemptions
- Upgrade the aging water infrastructure to reduce technical losses and non-revenue water.

Midterm to long term

- Limit water withdrawals in line with environmental sustainability while taking regional cooperation into account
- Support water-efficient technologies and climate-smart agriculture by mitigating investment risks in new technologies, advancing land reform, and enabling public-private partnerships
- Enable the transition from agriculture to higher-value and better-paid sectors by facilitating reskilling of the labor force, especially the most vulnerable women and youth
- Promote natural resource management-based enterprises.

Further Studies and Considerations

a. Impact of water pricing reforms on low-income communities, including those that rely on irrigation water. This is important for informing policy decisions on the level of price increase. It may not be feasible for price increases to be set by the ‘true value of water,’ as that would usually be higher than the cost-of-service provision. Assessing the value of environmental services provided by healthy ecosystems (rivers, lakes, wetlands aquifers)⁷⁵ is technically difficult.

b. Policies to encourage more private investments in agriculture as the state retreats from some sectors. Water-saving technologies support efficiency but, as discussed in Section 5.3.2, minimize job losses in the agricultural sector. The experience of credit lines and private sector involvement in agriculture has been promising. Yet it is unclear if public-private partnerships can alone encourage sufficient investments, including the more general investments to improve irrigation infrastructure that will curb land salinization and erosion issues. Policies to encourage more private investments in agriculture as the state retreats are needed. This should include

⁷⁵ <https://seea.un.org/content/seea-water#:~:text=The%20System%20of%20Environmental%2DEconomic,into%20one%20coherent%20information%20system.>

actions to address disincentives that result from land tenure rules and the financing gap that is left when the state divests.

c. Strategies for targeting green opportunities toward transition-affected workers and other vulnerable communities. The effect of greater efficiency and sector diversification on agricultural workers is a complex subject, and it is not immediately clear how new green jobs can be preferentially filled by affected workers if they do not have the right skills or are not in the right location. A study would be needed to develop effective strategies. Also, landscape restoration programs can enhance critical ecosystems and provide income for local communities. A follow-up study (deep dive on land use) is already ongoing to analyze the interplay of landscape restoration and land productivity and the kinds of restoration programs that generate high returns. The study could be extended to optimize the effect of restoration programs on critical ecosystems as well as the most socially vulnerable communities living in areas prone to drought (Section 2.2), such as the Ferghana Valley.

6.2 Strengthening Resilience to Natural Disasters and Climate Change

Research and analysis in Section 4.1 highlight the distinctive feature of natural hazards and climate change in Uzbekistan, where the share of the vulnerable population (Section 2.2) may be small, but broader resilience measurements (Section 3.1) find extreme social vulnerability due to high income and consumption impacts. The analysis points to geographical concentrations of vulnerability in the east (Section 4.1) to floods and drought risk and its associated effects in the densely populated areas in the Ferghana Valley, requiring proactive and climate-informed urban planning and management of informal urban settlements. Section 2.2 also finds a low percentage of households with access to catastrophe insurance, pointing to the need for private alternatives to complement government support in the event of a major disaster. The high-level assessment of the physical impacts of climate change presented in Section 4.2 roughly mirrors the objectives of the government's draft adaptation plans. Detailed resilience and adaptation measures are yet to be developed and this should be informed by the analysis here and more precise models. The cost estimates presented in Table 4.2 could be an input to prioritizing the interventions of this plan. It will also be important to strengthen climate data systems and engage local groups to validate proposed adaptation actions to local needs and circumstances. The recommended priorities are summarized as follows:

Recommendations

Short term to midterm

- Operationalize resilience plans by preparing specific adaptation interventions, including cost assessment and sources of finance
- Adopt nature-based solutions, where possible, to lower costs and achieve long-term results, with a focus on desertification hot spots like the Aral Seabed
- Strengthen local institutions structures to inform and protect the most vulnerable, especially women and youth, from the effects of climate change.

Midterm to long term

- Build a robust system of climate data and risk analytics to support an adaptation strategy
- Develop post-disaster measures, including financial instruments to cope with contingent public liabilities
- Strengthen the insurance market as a core disaster risk financing mechanism, especially for drought risk.

Further Considerations and Studies

- a. Actions to improve climate data collection and analytics.** An ongoing CCIA has yielded initial recommendations to strengthen the capacity to collect and make available data on weather, climate, and water risks and vulnerability. There will be more conclusive results on this aspect involving the Center for Hydrometeorological Service of the Republic of Uzbekistan (UZHIDROMET) and other public institutional elements with the conclusion of the assessment. A roadmap for strengthening the government's hydrometeorological and early warning capability can follow from this.
- b. Adaptation strategy and planning.** The NDC has identified adaptation objectives that broadly correspond to the projected climate impacts on the economy laid out in Section 4.2: agriculture and water management, adaptation of the social sector, mitigation of the Aral Sea disaster, adaptation of ecosystems, and adaptation of strategic infrastructure and production facilities. But detailed adaptation planning needs to be informed by spatial patterns and regional characteristics, for both wet and dry shocks. Follow-up work could include adaptation strategy and planning (including costing) and can be informed by the World Bank's adaptation principles⁷⁶.
- c. Local engagement strategy.** Section 4.2 reported on the public perception of climate change adaptation as inadequate. Traditional community-based organizations such as mahallas are present in all communities throughout Uzbekistan⁷⁷ and could be an entry point for engaging and empowering communities to address this.

Box 6.1 Nature-based adaptation solutions

Nature-based systems can protect against hydrometeorological risks and are useful as an adaptation measure (Ruangpan et al. 2020). Integration of large-scale green and grey infrastructure can tackle sources of natural resource degradation upstream, increase resilience of infrastructure, and provide benefits to the downstream users. Green infrastructure can include slope stabilization, vegetation of degraded areas, and planting of grass and other species and support dams by curbing erosion in the upper catchment. Grey infrastructure can include strengthening of river embankments and construction of concrete infrastructure to reduce sedimentation and river flow and prevent flooding. These types of investments can restore ecosystem functions and services and increase resilience of infrastructure and communities to floods, mud slides, and gully erosion. Landscape restoration is a form of nature-based adaptation against drought and flood risk, by preventing soil erosion. Landscape restoration involving reforestation has other additional benefits.

⁷⁶ <https://www.worldbank.org/en/news/infographic/2020/11/17/the-adaptation-principles-at-a-glance>.

⁷⁷ Urinboyev 2011.

The NDC notes the need to restore mountain and piedmont forest areas. Uzbekistan has relatively low forest cover, with only about 8.6 percent of forest land in 2020, but it provides environmental benefits such as water regulation, carbon sequestration, and supports biodiversity. Almost all forests supply fuelwood for local communities in Uzbekistan, though often unsustainably. Restoring terrestrial resources and using them more sustainably can combat desertification and land degradation and improve livelihoods for at least 50 percent of the population.

6.3 Green and Low-Carbon Development of Industry and the Economy

The low-carbon transition will affect energy-intensive export sectors, but the cost can be minimized (Section 4.3). The low-carbon policy package analyzed in Section 5.1 includes tools for incentivizing a shift to low energy intensity and low carbon intensity, such as subsidy reform and carbon pricing. On a preliminary basis, these are found to be environmentally effective, but social impacts need to be mitigated. The country has huge renewable energy potential, but as the analysis in Box 5.1 shows, the case for replacing inefficient gas boilers with renewable energy is highly sensitive to the price of natural gas. Additional policy interventions to prioritize renewable energy options will be needed. Reducing carbon and energy intensity will also bring currently ‘hidden’ economic benefits such as reduced air pollution, with improved human health and productivity. Energy efficiency measures were not analyzed in detail in this report, but low-cost measures, such as reducing heat and gas losses, were raised during stakeholder consultations. These should also be prioritized. A robust Long-Term Decarbonization Strategy (LTS), already planned as part of the programmatic green growth support for Uzbekistan, will help lock in short- and medium-term actions to keep the transition on track. The recommended priorities are summarized as follows:

Recommendations

Short term

- Prepare a long-term decarbonization strategy to guide the process of reducing emissions and improve energy efficiency to achieve net-zero carbon emission goals while reducing local air pollution.
- Start implementing low-cost energy efficiency measures that do not require advanced technologies and training. These could include building insulation and upgrading of old structures and production lines.

Midterm

- Proceed with gradual reduction of quasi-deficit through explicit budget subsidies to SOEs and their eventual elimination
- Combine targeted support to the poor with subsidy elimination and eventual introduction of carbon pricing packages to speed up transition to low-emitting technologies
- Mobilize private investments in renewable energy by completing regulatory and tariff reforms, power purchase agreements, priority dispatch, and investor rights
- Promote the use of circular and waste reduction approaches to shift toward climate-smart industries.

Further Considerations and Studies

- a. Private sector analysis.** Besides subsidy reform and carbon pricing, there is a need to actively attract private investors in renewable energy and low-carbon technology. The role of the private sector was not fully analyzed in this report, and more analysis is recommended. Incorporating greening requirements into reforms of state enterprises is one area deserving further work (see Box 6.2).
- b. Long-term framework to inform medium-term actions.** Part of the World Bank's programmatic support includes assistance on a LTS, which will guide the multiyear effort of the low-carbon transition. This should begin as soon as possible to avoid further entrenchment of current practices. A typical whole-of-economy strategy covers deep decarbonization of the power sector, a combination of energy efficiency and electrification in end use sectors, and a change in current practices to maximize carbon sequestration from forest landscapes. New technology options should feature in the country's long-term decarbonization as well, and the World Bank is separately supporting a study on the market potential and investment needs of low-carbon hydrogen energy.
- c. Air pollution study.** One co-benefit from the low-carbon transition would be the improvement to air quality as fossil fuels are reduced. For comprehensive air quality management, additional work should be conducted based on urban air quality models, including to assess the contribution of windblown dust to pollution by particulate matter. Marginal cost analysis would be recommended since the measures to curb industrial and energy sources—which also contribute to particulate pollution—would be different from certain dust control measures, such as landscaping and greening. Coal burning for home heating is the cause of seasonal air pollution in areas not served by central heating (Section 3.3).

Box 6.2 Competition and a vibrant and green private sector

SOEs that benefit from monopoly powers or public subsidies are operating in sectors where private firms are trying to compete such as agriculture, manufacturing, and financial services. This inhibits the development of the private sector. The government has taken first steps to streamline the competition policy framework in Uzbekistan. The current draft of the Competition Act touches on a wide range of topics to create a sound regime: anticompetitive practices, merger control regime, and rules governing state aid, the participation of SOEs in markets, public procurement, and so on. There is scope to boost the act's effectiveness through legal amendments, development of implementation rules and guidelines, and actual implementation. Barriers to entry for new players should also be removed, particularly for sectors central to the low-carbon transition, such as transport and energy. There have been pro-market reforms in the electricity sector, and more can be done to attract private investment and align with carbon transition objectives. A pro-market regulatory framework for green enterprises should be overseen by a strong regulator, preferably separate from policy-making ministries. Some SOEs will hold a natural monopoly, and the approach should be for the state to require them to green their operations and business strategies. Regulations to control or at least disclose state aid to enterprises would also help.

6.4 Green Jobs and Support for the Vulnerable

The impact of the green transition on employment is discussed in Section 5.3. Broadly, two trends need to be managed. Displaced workers in ‘brown’ sectors, such as fossil fuel extraction sectors, will require some form of income restoration until they can be redeployed. Environmental taxation, including carbon pricing, could add to state finances to support these costs. Beyond this, preferential access to new green jobs and reskilling programs could be considered. The labor flow within the largest employment sector—agriculture—will be complex. One likely trend is a shift toward higher-value activities and more skilled jobs. In parallel, the green transition will create more sector diversification—toward services, innovation, and technology. Many of these jobs will require more technical and transversal skills. Sectors that have strong green credentials and generate more jobs per dollar invested have been identified (Figures 5.1 and 5.2)—these deserve priority attention in terms of policies to attract investments and entry of new firms. All this points to a comprehensive labor and skills study, in which new green skills and actions are identified to redeploy, retrain, and recruit for new green jobs. Finally at the local level, the design of programs to reskill and provide opportunity to the most vulnerable should be approached the same way as local adaptation and resilience actions discussed earlier. Engagement of local self-governing bodies, such as mahallas, will be important to raise awareness of climate change risks and adaptation measures and assist vulnerable groups within communities to access training and resources to support adaptation. Government rural infrastructure development programs, as well as mahalla-led development initiatives introduced as part of the 2022–2026 National Development Strategy, provide platforms through which to engage communities in the green transition. Landscape restoration programs have the benefit of strengthening ecosystems and stimulating natural resources-based businesses in rural areas. The recommended priorities are summarized as follows:

Recommendations

Short term

- In-depth analysis into changing composition of labor demand and supply during the green transition
- Preferential access to new employment positions for displaced workers, especially women and youth, and green reskilling, including entrepreneurship programs
- Enhance vocational education for training and reskilling to improve transferability across firms and sectors, prioritizing regions and communities most affected (short to midterm).

Short term to midterm

- Financial support and safety nets for individuals and businesses, which could be financed by environmental and carbon taxes
- Strengthen local governments’ and mahalla committees’ capacity to support communities in handling climate change risks and green transition challenges
- Engage mahalla committees in land and natural resource planning and management to ensure local ownership and sustainability and rural green infrastructure programs.

Further Consideration and Study

- a. Private sector partnership.** Priority for green employment should be given to displaced workers from the transition, particularly women. In practice, redeployment to new industries may be a limited solution due to a mismatch of geographical location and skills. Localized studies may be required to complement national studies. Further thinking is needed on how to partner with the private sector to prepare the labor force. The challenge would be to strike a balance between industry needs and giving priority to transition-affected sectors and vulnerable rural communities.
- b. Plan for supporting local capacity.** A detailed assessment of mahalla committees and other local institutions' capacities, resources, and mandates, drawing, for example, on the Landscapes Governance Assessment Tool that is being piloted in Uzbekistan, is needed to develop an action plan for operationalizing green transition programs targeting vulnerable communities and vulnerable groups within communities.

Box 6.3 Reskilling for green jobs, using existing employment programs in Uzbekistan

Flexible labor markets and flexible skills are important to build resilience against a variety of external shocks or policy changes. Existing programs following active labor market policies (ALMPs) are designed for that purpose, and these can be reshaped to cater to the labor shifts from the green transition. Consultation with industry groups will be key to ensuring the relevance of training programs toward green transition. Vocational training of transferable skills across green sectors (for example, engineering, construction, digital technology, energy auditing and environmental services, and forestry) could be useful, but these should be identified in close consultation with the private sector. Attracting firms that invest in green technology and apprenticeship programs could be more important than attracting other firms. Partnerships between the government and industry could also cover financing for reskilling. The 'digital Uzbekistan 2030' reform could accelerate digital reskilling in partnership with important donors like the EU.

6.5 Green Finance

The analysis suggests a scope for improvements to PFM practices and fiscal policy. On the revenue side, the alignment of taxation and GHG emissions can be strengthened with a carbon tax, eliminating energy subsidies and applying other environmental levies. On the expenditure side, conducting climate-budget tagging, public expenditure and investment reviews, climate-informed public procurement, and investment management could be recommended. The analysis also supports the case for green revenue mobilization, but underlying issues in public spending, especially in subsidies that lead to inefficient energy use, must be addressed. The recommended priorities are summarized as follows:

Recommendations

Short term

- Support early commercialization of green solutions through targeted public green procurement
- Explore the potential of Uzbekistan Green and/or Sovereign Fund for channeling public and private funding strategically to advance the government's green policies
- Strengthen the capacity of issuing green and climate bonds and better defining green investment projects through standard green taxonomies.

Midterm

- Align SOEs' investments and decisions with long-term green priorities
- Apply excise tax based on environmental standards and introduce tax incentives for renewable energy deployment
- Consider repurposing subsidies to support green sectors: differential VAT, tariffs, import duties, and excise
- Support the greening of the financial sector by setting standards for green finance following the global regulatory trends and removing barriers of financing to green investments.

Further Consideration and Study

- a. Green classification system.** The experience with SDG bonds can be extended to develop green and climate bonds in Uzbekistan. A starting point for doing this would involve defining what green investment projects are. A taxonomy of activities and investment projects that are aligned with financial and environmental regulations, known as a green taxonomy, will give clarity on what counts as green investment projects. This enhances market transparency and facilitates alignment of capital flows with environmentally sustainable economic activities.
- b. Green fund design study.** With this system, government incentives could be channeled, and appropriate financing instruments (such as green bonds) can target investments under this taxonomy. Experience from other national strategic funds can inform the design of the Uzbekistan green fund to better target its resources for impact and provide real value addition to other financing sources, particularly private capital.

Box 6.4 Initial considerations for designing the Uzbekistan green fund

Uzbekistan, like many other countries in the world, is considering the establishment of a 'green fund' to support investments that accelerate the adoption of green technologies. In Uzbekistan's case, the government is using the context of the ambitious economic transition under way to identify and implement greener growth and investment policies.

Green funds are relevant within a strong and robust green policy framework. To effectively support the green agenda, a good practice is to have the fund embedded into the climate or green policy framework of the country where it serves a clearly identified role (as a policy instrument) and adds value in relation to other existing institutions or financing. Uzbekistan is developing a

green growth strategy and the specific investments and policies that are needed to achieve this strategy. Finalizing these details would strengthen the design of the proposed green fund by ensuring that the most critical financing gaps and market failures have been identified for the fund to support through strategic investments. The proposed coverage areas of the green fund are vast, making it more difficult to set, implement, and track clear performance objectives. Initially, the fund could focus on a narrower set of issues and sectors as a pilot to test the hypotheses of specific market failures—for example, green projects that face credit market constraints, a perception of high investment risk, or the absence of proven technology.

Green funds are most successful with strong budget integration and transparency. Most green funds are capitalized with public funding. Before establishing such funds, potential constraints on the government's ability to allocate and reallocate resources through the budget process need to be well understood. Extra budgetary vehicles also create the risk of capture by vested interests, including through revenue earmarking and exemptions from public procurement, manpower, and financial management rules. Uzbekistan's public financial systems are still being strengthened. The effectiveness of the proposed fund could be affected by an underdeveloped public investment management system and a significant share of off-budget spending. These limit the ability of government to make more strategic budget allocation decisions and obtain value for money from public investments. Accelerating reforms to address these weaknesses should be a priority—ideally in advance of the fund's establishment but at the very least in parallel to the process. A climate/green public expenditure review could also help identify a clear role for the green fund that avoids duplication and complements other public sources.

Opportunities to leverage other public institutions also exist. For instance, it is common for countries with sovereign wealth funds, such as Uzbekistan, to review and enhance the objectives of these funds to align with green growth objectives. The Uzbekistan Fund for Reconstruction and Development (UFRD) already plays an important strategic investment role and could conceivably have its mandate extended to include the green transition. This could reduce duplication within the public financial system and strengthen the focus and outcomes of the proposed green fund on any gaps that the existing budgetary system and UFRD do not address.

With Uzbekistan's state-owned entities still dominant in the private sector, the green fund could be more successful in attracting private co-financing at the project level rather than at the level of the fund. While a vibrant private sector is still being developed, the green fund could prioritize certain sectors where regulatory reforms in Uzbekistan are already turning toward market liberalization, such as renewable energy generation. A green taxonomy of projects would help reduce uncertainty to co-investors on eligibility. In this regard, SDG bonds commit to a broader set of objectives than the green agenda. Narrowing down the green fund's target sectors and investment objective would be necessary.

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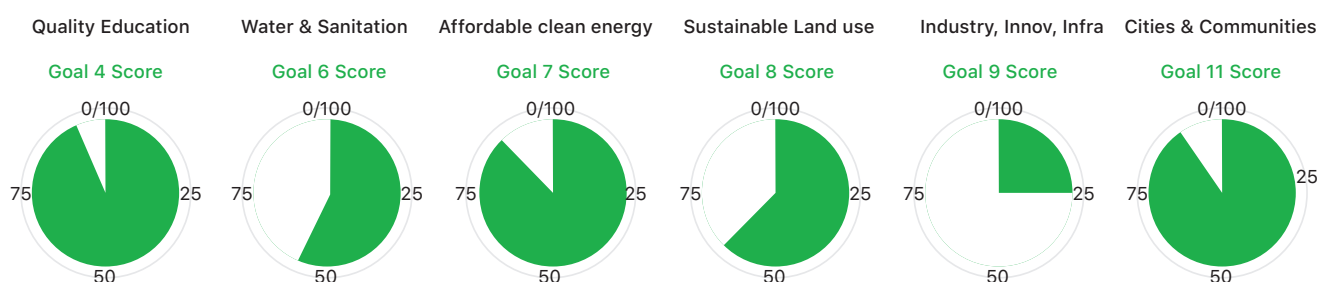


ANNEX 1:

PROGRESS TOWARD SUSTAINABLE DEVELOPMENT GOALS

The SDGs have been incorporated into Uzbekistan’s national development policy framework and can serve as a gauge for progress being made toward sustainable development. With the adoption of ‘Uzbekistan 2017–2021 National Action Strategy’ and ‘2030 Agenda for Sustainable Development’ in 2018, Uzbekistan reinforced its commitment to align SDGs to national strategies and programs. The agenda requires developing SDG baselines and target values that reflect national aspirations to 2030. It also assumes gradually integrating the SDG targets and indicators into central, sectoral, and regional strategies as well as into annual legal, budgetary, and reporting processes and indicators (Izvorski et al. 2021). An overview of the SDG indicators based on currently available data is presented here as an Uzbekistan’s percentile for each SDG score.⁷⁸ As information quality continues to improve in Uzbekistan, these SDG indicators serve as valuable tools for assessing the road that is remaining in implementing sustainable growth strategies.

Figure A1.1 Overview of SDG scores in Uzbekistan



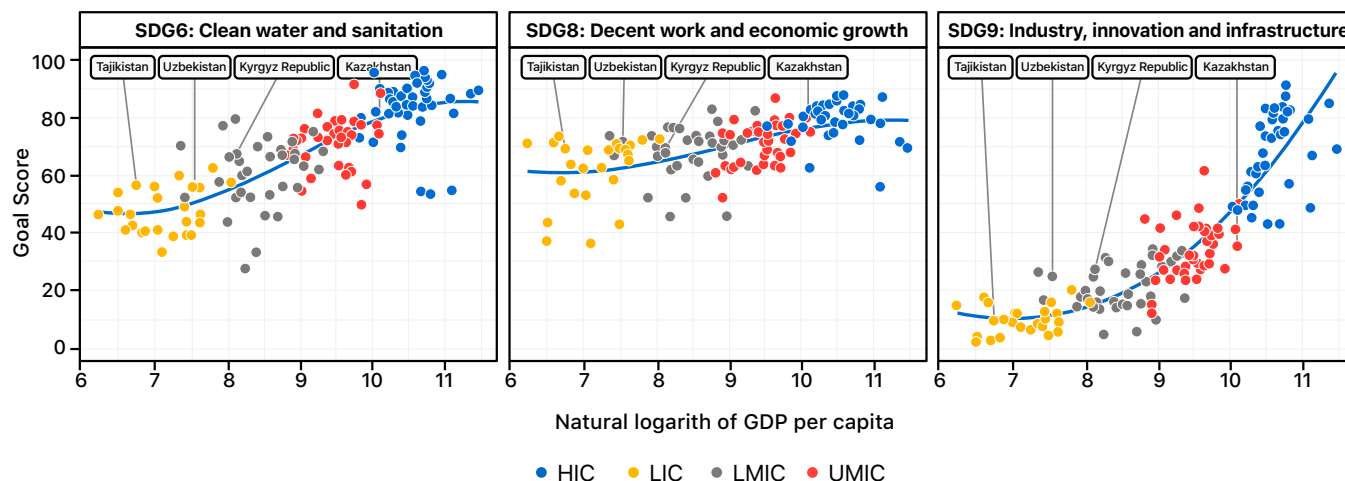
The SDGs cover different dimensions of sustainable development that are useful for tracking progress in the green transformation. Progress toward creating economic opportunities can be measured by the SDG for providing quality education (SDG4); delivering opportunities for decent work and economic growth (SDG8); and introducing sustainability measures in industry, innovation, and infrastructure (SDG9). Achieving environmental and resource productivity of the economy can be measured by progress in delivering affordable and clean energy (SDG7). The environmental dimension in quality of life is linked to the provision of clean water and sanitation (SDG6), building of sustainable cities and communities (SDG11), and sustainable land use (SDG15).

Efficient investments in human capital are necessary to enable Uzbekistan green growth and advance the productive, innovative, inclusive, and stable society. Within the green growth strategy, Uzbekistan has prioritized human development and enhancing of the quality of education. The country’s relatively high score for providing quality education (SDG4) (93) is based on the enrollment to primary and completion of secondary education (Sachs et al. 2019), which does not reflect the significantly lower enrollment in higher education, which is just 12.6 percent . Uzbekistan committed to increasing the enrolment rate to 50 percent by 2030 (Izvorski et al. 2021). These trends bode well for further

⁷⁸ For each SDG aggregate indicator, the SDG score rating is estimated as the average of the two variables on which a country performed worst. It highlights those SDGs that require particular attention in each country and should be prioritized for early action (Sachs et al. 2019).

development of human capital to support the green transition. Investments in human capital, as quality of education and training, can ensure employment opportunities in the period of transformation. This includes key economic sectors such as agriculture which employs about 27 percent of Uzbekistan's labor force (L2CU 2019).⁷⁹ Achieving decent work and economic growth (SDG8) will require improvements in the business climate, stimulation of entrepreneurship, and formal employment.

Figure A1.2 Uzbekistan benchmarking for selected SDGs



Source: Sachs et al. 2019.

Increasing efficiency in key economic sectors, such as water use in agriculture and energy, resource use in industry, and sustainable land use, is advancing Uzbekistan achievement of clean water and sanitation (SDG6) and affordable clean energy (SDG7). The score for SDG6 and SDG15 is significantly lower than comparators, also within the group of LMICs (see Box 2.1 and Figure 2.1). The critical importance of better managing water and land resources, both quantity and quality, and related services has also emerged as a priority by applying other analytical tools in this report (GRID and Cost of Environmental Degradation). Attracting investment and promoting innovation to these sectors are aligned with advancing the achievement of the SDG for industry, Innovation, and Infrastructure (SDG9), which scored slightly above the LMIC average. Improving an obsolete infrastructure can advance sustainable cities and communities (SDG11). In particular, the opportunity for improvement is most visible in the electricity sector, where electricity losses (more than 20 percent of net generation) and frequent power outages undermine economic activities and the well-being of citizens across the country (World Bank 2021a). With more than half of the urban population living in informal settlements, ensuring transformation of the energy sector and reducing carbon emissions and water and air pollution can advance its achievement of SDG11.

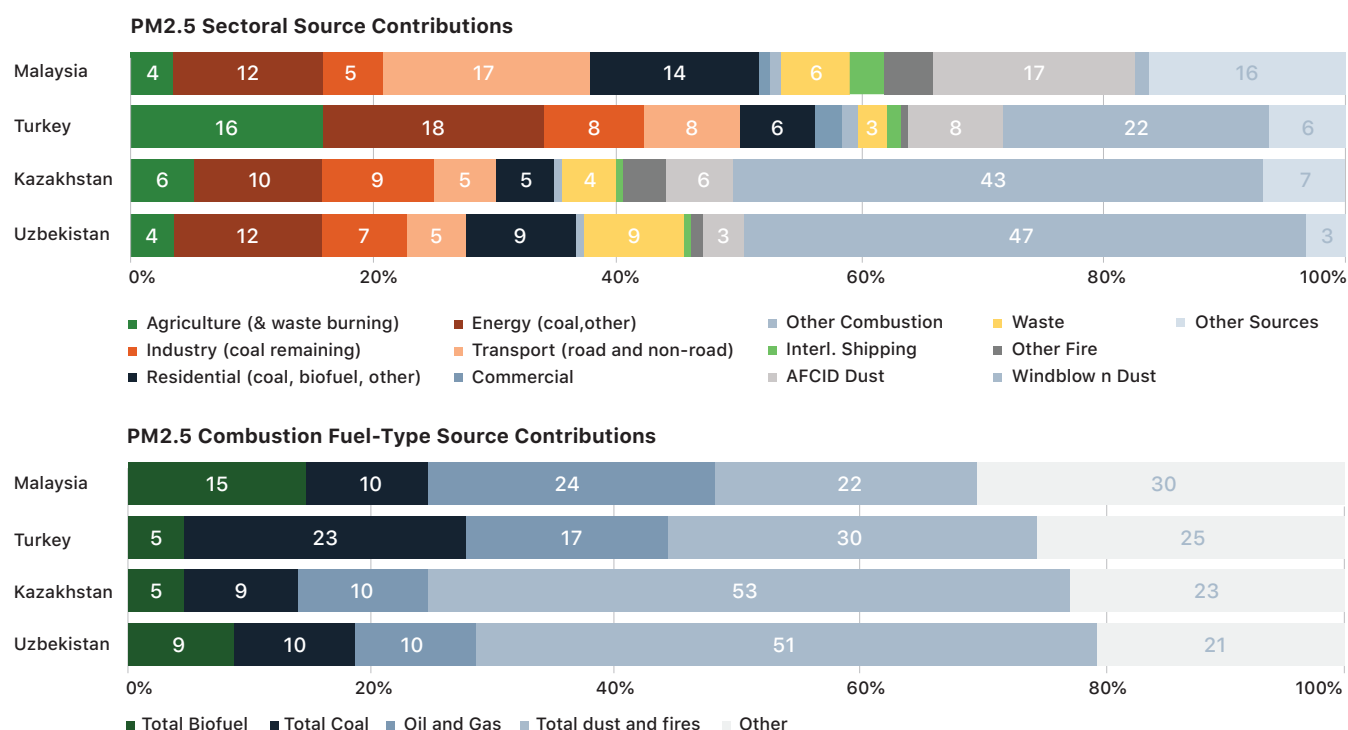
⁷⁹ L2CU. A collaborative effort led by the World Bank in cooperation with the authorities, nongovernmental organizations, United Nations Children's Fund, the EU, and the United States Agency for International Development (USAID). <https://www.worldbank.org/en/country/uzbekistan/brief/l2cu#2>.

ANNEX 2:

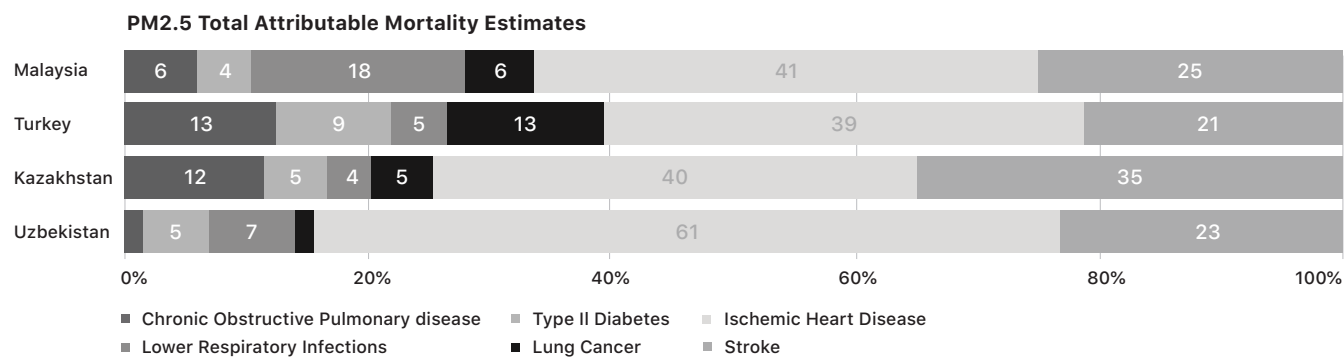
SOURCES OF AIR POLLUTION IN UZBEKISTAN

Priorities for air quality management can be informed by the relative contributions of various sources to annual PM_{2.5} exposure levels. This data are presented here by population age distribution and the relative baselines associated with each disease. Data suggest that priorities may be shifting from indoor to ambient air pollution. The characteristics in each country are different, and overall, there is a lower total attributable mortality in Uzbekistan compared to the Central Asia region. Attributable deaths were primarily caused by ischemic heart disease (61 percent) and stroke (23 percent). From 1990, estimated annual mortality (measured in number of deaths) and morbidity (measured in number of years lived with disability [YLDs], which is a component of disability-adjusted life years [DALYs]) caused by the PM_{2.5} ambient concentrations have significantly increased (by 2.5 and 3 times higher, respectively), and mortality and morbidity associated with household air pollution from using solid fuels for heating and cooking have decreased by -75 percent and -53 percent, respectively (see Figure A2.1). These estimates are developed in a harmonized way by the Institute for Metrics and Evaluation (IHME), which calculates health risk attributed to exposure to PM_{2.5}. This exposure is estimated using a combination of remote sensing and air pollution monitoring where available. The numbers are particularly notable for developing priorities to reduce health risks from poor air quality in polluted cities of Uzbekistan.

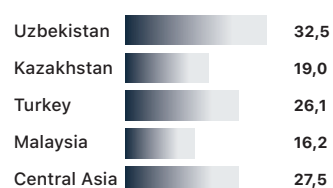
Figure A2.1 Analysis of causes of air pollution



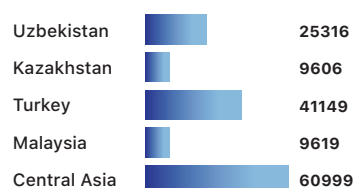
Source: Estimated from McDuffie et al. (2021)



Population Weighted Annual Average PM2.5 ($\mu\text{g m}^{-3}$)

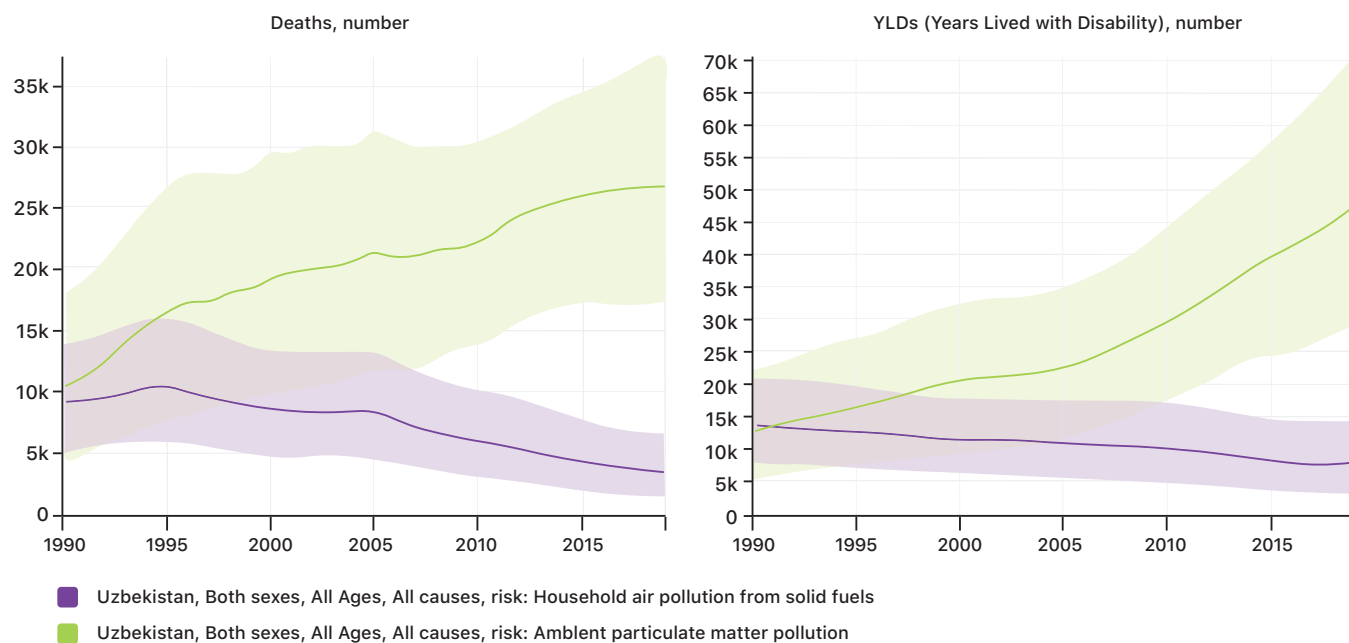


Total Attributable Mortality (Deaths)



Source: Estimated from McDuffie et al. (2021)

Figure A2.2 All-cause deaths and DALYs for 2019 with trends since 1990



Source: <http://ghdx.healthdata.org/gbd-results-too>.

ANNEX 3:

SUMMARY - INSTITUTIONAL STRENGTHS, CHALLENGES, AND REFORM OPTIONS

The following is a sample of results from the CCIA for Uzbekistan. Highlights of only the organization pillar are shown. The other pillars are planning, public finance, SNGs and SOEs, and accountability.

Institutional strengths and challenges	Reform options
1.1. Regulatory Framework	
<p>In the last 5 years, the Uzbekistan government has made strong and consistent efforts to improve its national policies and plans on climate change, but it does not have an integrated climate change policy framework. The conceptual documents adopted by the government in the last few years include the 'Concept of Environmental Protection until 2030' and the 'Strategy for the Transition of the Republic to a Green Economy for the period 2019–2030', and their primary purpose is to mitigate and adapt to climate change effects by reducing emissions and pollutions, promote rational use of water resources, introduce environmental-friendly technologies, boost renewable energy sources, increase collection and removal of waste services to the population, improve energy efficiency, and reduce the use of hydrocarbons.</p>	<p>Complete the development of a National Climate Change Law and Strategy to ensure that the country's regulatory framework</p> <ul style="list-style-type: none"> ▪ Institutes a lawfully binding long-term emission neutrality target, complemented by a strategy and policies based on medium-term quantitative targets; ▪ Clearly defines the institutional mandates, functional capabilities, and coordination mechanisms of all climate change actors and stakeholders; ▪ Promotes scientific and interdisciplinary processes for data-driven and evidence-based policy and action; ▪ Regularly monitors and evaluates the effectiveness of adopted legislation, strategies, plans, and policies; and ▪ Supports legislative oversight and judicial review of climate-related issues. <p>Lead(s): UZHYDROMET, State Committee on Ecology and Environmental Protection (SCEP)</p>
1.2 Functional Mandates	
<p>The state governing body authorized to coordinate the country's response to climate change is UZHYDROMET, which was appointed as the national coordinator for the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement under the management of the Cabinet of Ministers. Under a presidential resolution, an Inter-Agency Council,⁸⁰ made up of heads of government ministries and agencies (totaling 19 people) and led by the Minister of Economic Development and Poverty Reduction, will provide strategic guidance and serve as a decision-making authority for the advancement of green transformation in Uzbekistan, including the GGSF.</p>	<ul style="list-style-type: none"> ▪ Revise the charters of the key ministries based on international standards to improve effectiveness of key functional mandates of climate leadership and develop sectoral regulation as well as to avoid duplication ▪ Perform a functional and institutional assessment to evaluate the country's capacity to tackle climate change issues <p>Lead(s): Cabinet of Ministers, Inter-Agency Council</p>

⁸⁰ Chaired by Mr. J.A. Kuchkarov (Deputy Prime Minister for financial and economic issues and poverty reduction, and Minister of Economic Development and Poverty Reduction). The members of the Inter-Agency Council were appointed by the President of the Republic of Uzbekistan (see annex to the Resolution No PP-4477) and comprised representatives of 19 ministries, national agencies, and companies. For a detailed list, please see <https://lex.uz/ru/docs/4539506> (in Russian).

Institutional strengths and challenges	Reform options
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The Ministry of Finance develops financial mechanisms to support green transformation and assesses utilization of funds received as part of the climate projects and programs. The Intersectoral Energy Saving Fund under the Ministry of Energy was established to support state policy on energy efficiency.

1.3. Government Coordination

As mentioned above, UZHYDROMET is the designated agency to lead coordination on climate change issues, and an Inter-Agency Council made up of leadership from all relevant government ministries and agencies provides technical advice for setting sectoral targets, adaptation planning on climate change, and NDC preparation. More time, data, and information are needed to assess the effectiveness of the coordination body in practice, especially its ability to promote stakeholder engagement and mobilize technical expertise.

- Establish and strengthen specialized departments on climate actions in each state body involved in the coordination of Climate Change Strategy, policy, and implementation
- Regularly monitor and assess horizontal and vertical coordination of state agencies working on climate change
- Undertake cost-benefit analyses on climate actions to establish foundational evidence to implement climate change adaptation and mitigation measures

Lead(s): UZHYDROMET, SCEEP, Inter-Agency Council

1.4. Technical Capacity

In general, organizational structure and systems within key government agencies are properly and effectively aligned with national climate change commitments. Focal points for Nationally Determined Contributions, National Communications, and other climate commitments are in place, and at the same time there are special climate change departments. Roles and responsibilities of sectoral specialists are mainly focused on administrative management and climate blind. There is limited evidence of inclusion of climate change in the performance targets and other accountability processes of various government ministries and agencies listed above, but most of them focus on reducing GHG emissions in the energy and agriculture sectors.

- Mainstream climate change into recruitment process, roles, and responsibilities of employees of ministries and departments through revision of current charter and manuals
- Improve awareness and strengthen the capacity of key decision-makers and institutions on climate change mitigation, adaptation, and early warning of risks and climate hazards
- Create an enabling environment and build institutional capacity for effective adherence to the Paris Agreement
- Systematically introduce climate change in academic curriculums, with a specific program at each level—primary, secondary, university—and incorporated appropriately in different subjects

Lead(s): UZHYDROMET, SCEEP, Inter-Agency Council



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