Azerbaijan: Towards Green Growth

Issues Note

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Acknowledgments

This Country Environmental Assessment Note was produced by a core team led by Saša Eichberger (Senior Environmental Specialist, Task Team Leader), Gulana Enar Hajiyeva (Senior Environmental Specialist, co-Task Team Leader), Wei-Jen Leow (Senior Financial Specialist, co-Task Team Leader), Adriana Jordanova Damianova (Policy and Operations Advisor, Consultant), Elena Strukova Golub (Senior Environmental Economist), Kristina Govorukha (Consultant), Devika Singh (Consultant), Fuad Humbatov (Consultant), and Fuad Bagirov (Consultant).

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Acronyms and Abbreviations

ADB	Asian Development Bank
ALMP	Active Labor Market Policy
AQUASTAT	FAO's Global Information System on Water and Agriculture
AUM	Assets Under Management
BE	Blue Economy
BIG-E	Batumi Initiative on Green Economy
CBAM	Carbon Border Adjustment Mechanism
CBT	Climate Budget Tagging
CCDR	Country Climate and Development Report
CDC	Colonial Development Corporation
CO_2	Carbon Dioxide
CoED	Cost of Environmental Degradation
CWON	Changing Wealth of Nations
DAC	Development Assistance Committee
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia
EFI	Equitable Growth, Finance and Institutions Global Practice
EFTA	European Free Trade Association
EGD	European Green Deal
ENVISAGE	Environmental Impact and Sustainability Applied General Equilibrium
ESG	Environmental, social and governance
ETS	Emissions Trading System
EU	European Union
FAO	Food and Agriculture Organization
G20	Group of Twenty
GBD	Global Burden of Disease
GDP	Gross domestic product
GFDRR	Global Facility for Disaster Reduction and Recovery
GGSF	Green Growth Strategic Framework
GHG	Greenhouse gas
GRID	Green, Resilient, Inclusive Development
GTAP	Global Trade Analysis Project
IEA	International Energy Agency
IMF	International Monetary Fund
LCH	Low Carbon Hydrogen

LT-LEDS	Long-Term Low Emission Development Strategy
ug/m^3	Microgram per cubic meter
MENR	Ministry of Ecology and Natural Resources
MoE	Ministry of Economy
MoF	Ministry of Finance
MTEF	Medium Term Expenditure Framework
NAP	National Adaptation Plan
NDC	Nationally Determined Contributions
NGO	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
PM	Particulate Matter
PMI	Partnership for Market Implementation Program
R&D	Research and development
SDG	Sustainable Development Goals
SECO	Swiss Economic Cooperation Organization
SME	Small and Medium Enterprise
SOE	State-Owned Enterprise
SOCAR	State Oil Company of Azerbaijan Republic
SOFAZ	State Oil Fund of Azerbaijan
SOFI	State-owned Financial Institutions
SSC	State Statistical Committee of the Republic of Azerbaijan
t	Metric Tons
TSA	Targeted Social Assistance Program
UK	United Kingdom of Great Britain and Northern Ireland
UKEF	United Kingdom Export Finance
UN	United Nations
UNDP	United Nations Development Programme
UMI	Upper-Middle Income
U.S.	United States
USEPA	United States Environmental Protection Agency
VA	Value Added
WHO	World Health Organization
£	British pound
$	United States dollar

Abstract

The welfare and economic growth of Azerbaijan's development trajectory based on fossil fuel extraction has come at the expense of the environment, other non-oil industries, and human capital growth. Due to its lack of economic diversification, the country is highly vulnerable to transition risks, volatility of fossil fuel markets, and climate change. This note, produced in support of Azerbaijan's ambition for green growth, identifies how increased climate action and greening of a number of sectors have the potential to spur diversification of Azerbaijan's economy, contribute to addressing sector- and country-specific environmental challenges and goals, reduce greenhouse (GHG) emissions, address the identified physical and transitional climate risks and vulnerabilities, and strengthen long-term climate resilience of the country. Investments in resource efficiency, sustainable intensification of agriculture, better land use and urban planning, water and waste management, switching to cost-effective renewable energy, and research on low-carbon hydrogen and Caspian maritime space are the green measures that can have an immediate positive impact on Azerbaijan's economy and the environment.

The first stage in identifying areas for wealth development will be a comprehensive green growth and asset diversification strategy, informed by detailed sectoral analysis and supported by capable institutions. Once mobilized by public sector interventions through policies to enable and incentivize green investments and green finance instruments, private enterprises will take the lead in relocating capital to green supply chains, creating jobs and building human capital while increasing the focus on innovation and efficiency. Cutting system leak emissions in the oil and gas industry could contribute significantly to reducing GHG emissions at lower costs. Enhancing the environmental performance of enterprises will be made possible by promoting eco-efficient policies and investments in cleaner production and technologies. Beginning now and leveraging this transition to green growth and diversification through the use of public resources and revenues from fossil fuel exports, Azerbaijan can mitigate certain short-term difficulties and promote long-term sustainable growth to ensuring a cleaner environment and economic prosperity.

Executive Summary

Azerbaijan is striving toward a greener growth model, but faces many challenges.

Azerbaijan has joined the global pursuit for sustainable development by making a strategic choice to invest in a clean environment and reduce its greenhouse gas (GHG) emissions. The country is charting new directions to overcome the current limits of its fossil fuel-driven economy. Azerbaijan's new macro-economic policy framework includes a change in the economy's medium- and long-term 'driving forces' toward sustainability and diversification. Public finance is adapting to the changing conditions, underscoring the central importance financial institutions have in low-carbon development. The Central Bank of Azerbaijan (CBA) has developed an action plan focused on embedding sustainability and climate risk into public and private financing mechanisms. The macroeconomic framework will also support the implementation of emerging priorities[1] for meeting the national commitments to the United Nations' 2030 Agenda for Sustainable Development, as well as the ambitious targets of the Nationally Determined Contributions to the Paris Agreement. Azerbaijan's most recent strategic development plans take the global low-carbon development trends into consideration as well as long-term challenges for oil economies.

Azerbaijan's transition away from a high dependence on fossil fuels needs a plan for a gradual phaseout. While the share of exports and GDP from extractives industry (crude and refined oil, gas, and other petroleum-derivative products) was rising, in the timeframe from the late 1990s to the 2000s, agriculture as a share of GDP fell from 25% to 6.5%, the share of manufacturing was halved, and services dropped from 50% to less than 33% of total GDP. In 2018, the oil and gas sector accounted for over 50% of the country's exports and 30% of its GDP (World Bank, 2021). This established form of economic growth could be drastically affected when oil reserves eventually run out. The International Energy Agency (IEA) estimates that the country's oil reserves will last another 25 years, while production from onshore fields (the oldest fields in the Absheron Peninsula) will slow down to just 3% of the total current output (IEA 2021). Meanwhile, the country's renewable natural resources have yet to be fully developed. The share of renewable natural capital, including forests and cropland, has not increased substantially over time, although the renewable natural capital could potentially provide greater ecosystem services and rent capture. Another untapped opportunity that can be leveraged to help offset some of the transitional green growth constraints is the offshore marine renewable energy in the Caspian Sea.

The combined effects of the global economic slowdown from the pandemic and the war in Ukraine call for a realistic estimation of the challenges and a transition timeline while charting Azerbaijan's green path. The decarbonization pathways supported by low-carbon policies, financing, and near-term targets adopted by Azerbaijan's main trading partners like China, the EU, Georgia, India, Israel, and Türkiye will affect the structural transformation of Azerbaijan's

[1] President of the Republic of Azerbaijan 2021 and *Republic of Azerbaijan 2022-2026 Socio-Economic Development Strategy*.

economy. The EU's ambition is to reduce fossil fuel consumption in all member countries, and the EU countries account for over 45% of Azerbaijan's oil and gas exports,[2] followed by Türkiye with 18.8%. Due to the large share of fossil fuel exports and resource rents in its GDP, Azerbaijan is highly exposed[3] to transition risks and market volatility, while at the same time, the country's resilience[4] to such changes is low due to the lack of economic diversification and weak preparedness overall, including human capital. As an oil-dependent and carbon-intensive economy, the key question for Azerbaijan is what adaptive strategy the country will pursue for its industries and sectors that will bear the brunt of these challenges. Moreover, the confluence of recent economic and geopolitical challenges indicates the need for Azerbaijan to strategically address the risk of transition shocks and determine the new, green growth poles — sectors with the potential to attract and significantly boost sustainable green growth, contribute to decarbonization and climate resilience, and create jobs.

While the war in Ukraine has led to a short-term increase in demand for oil and gas, the long-term global ambition, however, continues to be a significant reduction of the dependence on fossil fuels and cutting GHG emissions. These developments mean that, while in the immediate future Azerbaijan will certainly gain from its untapped gas resources, as the global energy mix shifts from fossil fuels to renewables and new technologies emerge, kick-starting a green development trajectory in a timely manner will be a winning proposition. Taking early action to untie Azerbaijan's revenue dependence from oil and gas will reduce the uncertainties and related risks, including associated future costs.

In addition to the transition risks, Azerbaijan's economy is exposed to the physical impact of climate change.[5] Addressing the related risks on time and in a strategic manner will bring multiple benefits. The diversification efforts towards greener growth need to consider the anticipated impacts of climate change on different sectors and aspects of life, notably the risks as well as the potential opportunities they bring. As this study indicates, in the context of Azerbaijan, green growth and climate action in several sectors has the potential to (i) bring mitigation and adaptation benefits; (ii) contribute to addressing sector- and country-specific environmental challenges and goals; and (iii) address the identified climate risks and vulnerabilities and strengthen climate resilience. Such sectors include integrated approaches in water management, agriculture, land use and forestry, as well as a broader context of developing blue economy and coastal areas of the Caspian Sea,

Addressing existing and future challenges, and opportunities for going green in a timely manner is key for sustaining growth

To support the Government in pursuing the national priority of a clean environment and green growth, this study has used several innovative diagnostic tools to assess the priority areas and opportunities for action. These include the Green, Resilient and Inclusive Development (GRID) diagnostic tool to identify opportunities to improve growth and economic development; a natural capital accounting to estimate the contribution natural resources have on the nation's wealth; the Global Trade Analysis Project 10 (GTAP 10) database to quantify the impacts of green investments; and the Environmental Impact and Sustainability Applied General Equilibrium (ENVISAGE) model, focused on a Carbon Border Adjustment Mechanism (CBAM) simulation to estimate the impacts that the CBAM instrument will have on Azerbaijan's exports to the EU. The main findings and recommendations of these analyses have been developed with inputs from several rounds of stakeholder consultations and are summarized below.

A timely start of the transition to green growth in the face of a near-term increase in the global demand for oil and gas will help Azerbaijan make incremental progress on its future low-carbon outlook. The EU, one of Azerbaijan's largest trading partners, has mobilized enormous support to reduce the oil and gas dependency of its member states. The EU has proposed CBAM along with its ambitious policy package to accelerate the green transition before 2030. Simulations of the impact of CBAM's introduction indicate a decreasing demand for oil, which could potentially impact Azerbaijan's exports by $2.5 billion by 2035 under the baseline scenario.[6] The planned pace and structure of the EU CBAM implementation

[2] OEC 2020 https://oec.world/en/visualize/tree_map/hs92/export/aze/all/show/2020/.
[3] Index composed of four indicators: (1) Carbon intensity of manufacturing exports, (2) Committed power emissions as a proportion of current annual power generation, (3) Fossil fuel export as a proportion of GDP, and (4) Expected resource rents as a proportion of GDP. Source: Pesżko et al. 2020. Also adopted as the Transition Risk Indicator by IMF https://climatedata.imf.org/pages/fi-indicators.
[4] Index composed of 11 indicators, including position on global oil supply cost curve and 10 indicators of economic resilience to external shocks. Source: Pesżko et al. 2020. Also adopted as the Transition Risk Indicator by IMF https://climatedata.imf.org/pages/fi-indicators.
[5] Detailed overview of physical climate change risks is provided in Annex 4.
[6] Detailed analysis of CBAM simulation is provided in Annex 2.

over the next 10 years calls for Azerbaijan to strategically adjust its hydrocarbon-intensive economy and diversify investments into green and blue sectors. If Azerbaijan acts to decarbonize the economy and achieve its Nationally Determined Contributions (NDC) targets, it could potentially secure higher revenues from oil exports to the EU to over $200 million per year from the late 2020s, while also potentially increasing non-oil exports and creating further potential for development.

Economic diversification through greening and adopting low-carbon and climate change policies can support Azerbaijan in meeting its international commitments and national development goals. At the COP26 meeting in Glasgow, Azerbaijan announced the target of 35% to 40% reductions of GHG emissions by 2050 compared to 1990 levels, and the country is working on an NDC update and developing a long-term Low Emission Development Strategy (LEDS). To address the physical risks of climate change the country is currently drafting a national adaptation plan that envisions nature-based resilience measures in agriculture and improved management of coastal areas and water resources. As this study shows, in addition to energy, there is a strong mitigation potential in Azerbaijan's largest sectors beyond oil & gas – mining, trade, construction, and agriculture. Greening the economy will be needed to meet the NDC targets and to strengthen climate resilience, and a greener Azerbaijan would also be consistent with the national socio-economic goals and the regional development vision which promotes more economic cooperation with its neighbors. Importantly, adopting low-carbon policies can cushion some near-term effects of low-carbon policies in other countries and major markets.

Compared to other upper-middle-income countries, Azerbaijan suffers environmental losses, lower material and land productivity, water scarcity, and a higher intensity of emissions. The GRID assessment points out the country's insufficient progress in reducing environmental pressures and protecting the value of natural capital. In Azerbaijan, ambient air pollution from fine particulate matter (PM2.5), mainly caused by windblown dust and fossil-fuel sources, contributes 10% to 18% to the non-accident mortality. This is above the average in the Eastern and Central Europe region, and according to Global Burden of Disease[7] estimates, the welfare loss corresponding to this mortality range is equivalent to 3% to 12% of GDP. Water scarcity is severe for the whole country, and soil erosion - affecting 42% of its territory – is the likely cause of lower land productivity (by 1.2%) and consequent losses in GDP. Material productivity is lower than in peer countries, and energy and emissions intensity is higher across most energy use sectors. Climate change will likely negatively impact the vitality of the natural assets, and yet Azerbaijan's environmental expenditures are 20 times lower than those in EU countries. This includes expenditures related to water resource use and protection, air protection, land recultivation, and waste disposal, which are also areas critical for adaptation to climate change. There are major challenges yet to be resolved, but as a first step, investing in systemic changes, adaptation measures to strengthen climate resilience and environmental improvements, protection of natural capital, asset diversification, and decarbonization will help Azerbaijan sustain its natural resource base.

Azerbaijan can gain multiple benefits from improved land management, particularly regarding forest, grassland, and arable land. These benefits translate into improved biodiversity protection without a reduction in monetary returns and include lowering overall GHG emissions through carbon storage, contributing to the efforts to meet NDC targets and environmental goals. Azerbaijan currently achieves around 69% of the full GHG sequestration potential that is possible to gain on the same surface without any loss of agricultural revenues. Despite being a small share of the economy, agriculture accounts for 57.6% of land use, more than half of which is permanent pastureland. However, land degradation from soil erosion affects 42% of Azerbaijan's territory. This is partially due to heavy precipitation and flooding, but also from overgrazing by livestock (SSC 2021). Based on the World Bank's assessment of land use and land change transitions from current to Pareto max production value, Azerbaijan could maximize its carbon sequestration by an additional 116 million tons of CO_2-eq, the equivalent of about 1.5 years of the country's emissions (at 2018 levels). These gains could be achieved by reallocating approximately 85% of grazing land, with a majority of it returned to natural land and the rest split between irrigated and rain-fed cropland.

Employment creation will be driven by asset diversification and a higher demand for skilled jobs in several new sectors with the potential for greening. Human capital development is an acknowledged priority

[7] Global Burden of Disease 2019. Air Pollution Exposure Estimates http://ghdx.healthdata.org/gbd-2019.

of Azerbaijan. Market-led changes and smart policies across entire value chains, switching to new energy sources, more renewable energy, low carbon-intensive production, and introducing material circularity will facilitate the green transition. There is a potential for job creation in less carbon-intensive sectors of Azerbaijan's economy: mostly in service sectors, health, and education. The analyses indicate that while investments in reducing GHG emissions in Azerbaijan's industry sector can create jobs, investments in low-GHG sectors hold even greater potential for value-added and low carbon jobs creation per $1 million of investment. Moreover, they will help address multiple objectives simultaneously: decarbonization, greening of the economy, developing human capital, and improving the quality of life.

A comprehensive green growth and asset diversification strategy, followed by policy interventions, is key to fostering Azerbaijan's sustainable future, cleaner environment, and green growth. Targeted public sector interventions may provide incentives and help create a reliable policy and regulatory environment for steering the economy towards a greener path. Investments in human capital development for the emerging green sectors would stimulate private investments in green and less polluting technologies. The Central Bank of Azerbaijan (CBA) has already developed an action plan for a sustainable finance roadmap, a key step in supporting the green growth agenda. While a full analysis of green finance instruments for Azerbaijan is yet to be conducted, it is likely that asset diversification could also produce welfare gains.

Now is the time to act on the most promising development and decarbonization goals

Azerbaijan is navigating a development phase marked by post-pandemic, post-conflict impacts and an evolving geopolitical landscape. Acknowledging these global trends and challenges, the Government of Azerbaijan has set the country's long-term development on the path to socio-economic and environmentally sustainable development based on five pillars that correspond to its national priorities for 2021-2030. Aligned with Azerbaijan's commitments under the 2030 Agenda, these priorities include: (i) a steady and growing competitive economy; (ii) a society based on inclusiveness and social justice; (iii) competitive human capital and space for modern innovations; (iv) great return to the liberated territories; and (v) clean environment and the country's green growth. Azerbaijan aims to create new economic opportunities in the liberated territories not only for itself but also for the region. In this regard, rehabilitation, reconstruction, and reintegration of the liberated and conflict-affected areas in a sustainable manner will be one of the country's main development priorities in the coming years.

Technology and innovation are the preconditions for a shift towards a low-carbon economy. While this is an implicit priority in the vision for national sustainable development, Azerbaijan's economy remains highly dependent on oil. Making systemic changes towards creating a sustainable and green economy begins by assessing the risks of price volatility, cost competitiveness, and testing the market's appetite for transitioning technologies. For example, Low Carbon Hydrogen (LCH) can play an important role in the future international competitiveness of Azerbaijan's exports as the world markets increasingly seek energy resources with low carbon intensity. Given the significant renewable resources (e.g. offshore wind), natural gas availability, Carbon Capture and Storage (CCS) potential, well-developed infrastructure, and proximity to key markets, Azerbaijan could develop a LCH economy and become an important producer of LCH and its derivatives. Furthermore, the simulations indicate Azerbaijan can tap into a wide range of environmental and public health benefits by boosting investments with the potential to create a new wave of green, high-skilled, well-paid jobs. By doing so, Azerbaijan could deliver on its NDC commitments and most importantly, avoid recreating the oil-driven growth path while moving towards greener economic diversification.

The medium-term outlook of Azerbaijan is bound to follow the traditional supply/demand fluctuations of oil and gas markets and regional geopolitics. In the long run, however, a strategic orientation towards green economic diversification will steer the development of the non-oil sector. The Government of Azerbaijan acknowledges that action on climate change should be based on the introduction of clean technologies, encouraging the use of clean energy sources, remediating contaminated areas, and reducing waste. In this regard, selected priorities include the creation or development of a high-quality ecological environment, spaces for green energy, and building smart cities and villages based on national development strategies and priorities and SDG 11.[8]

[8] National Coordination Council on Sustainable Development of the Republic of Azerbaijan 2021.

Green economic development as a central theme of this Issues Note emphasizes economic and social gains for the entire economy as well as specific sectors.

While some potential 'greening' measures may be easier to implement and bring quick results and local benefits, others target long-term results and require complex development and long implementation. For example, in the context of Azerbaijan, investments in resource efficiency (e.g. energy demand management, energy efficiency) and in sustainable intensification of agriculture, better land-use and urban planning, and water and waste management are green measures that deliver immediate benefits. Also, fostering the switch to competitive renewable energy choices such as solar and wind can bring immediate economic and environmental benefits, including through mobilizing private investments. On the other hand, carbon pricing, fuel and electricity subsidy reforms are designed to shift consumer/investor choices in favor of green and renewable options that derive fiscal merits. These measures take time to work, and their net benefits are limited by other costs. Conversely, erosion control and reversing the degradation of forests and natural ecosystems may not produce large short-term benefits, but they are essential for sustaining a resilient green economy over the long term, and there can be distributional gains if local communities derive jobs and incomes as part of restoration programs. The World Bank has developed a Sustainability Checklist[9] that can guide a stakeholder-driven process to prioritize the sectors and green measures most likely to deliver economic benefits and that are deemed appropriate for the country. Future consultations with stakeholders on country-specific aspects of green growth, as well as targeted research in cross-cutting topics and deep dives into sectors, will inform the development of a prioritization matrix for Azerbaijan. While deeper analyses are forthcoming, the highlighted areas and priorities below, if implemented, can kick-start greener growth while also addressing country-specific development challenges.

Addressing the Bottom Line: Policy Development and Institutional Capacity for Green Growth

Azerbaijan can demonstrate the ability to deliver on its priorities by introducing public policies that are informed by research and adequate pricing of environmental and climate externalities (e.g., green taxation, green financial instruments). A comprehensive green growth framework backed by sectoral analyses and supported by competent institutions, regulations, incentives, and public finance will be the first step in identifying sectors for wealth generation, unlocking their potential, and creating opportunities for spearheading the transition towards greener growth. Moreover, there is a need for consistent and credible climate policies in support of both mitigation and adaptation. An important element of the framework will be mainstreaming NDC targets and adaptation climate actions in sector development strategies. Implementation of the strategies will require knowledge and institutional capacity to formulate actions for mitigating transition shocks (e.g., improving the population's living conditions, training, and skills development to facilitate the delivery of green jobs) all of which, in the long term, would help develop the human capital necessary for green growth.

Stepping up Private Sector-led Green Growth

If low carbon policies are in place, businesses will lead the way in relocating capital to green supply chains. New green products and markets will emerge. Incentivizing the private sector to invest in green businesses will bring multiple benefits and a stronger focus on innovation and efficiency. The public sector's role in leveraging private sector financing in green growth includes, among others, low carbon policies and green financing instruments. Following this route will potentially create jobs, increase private spending, and bring economic spillovers to other industries from private green investments, while also bringing innovation and efficiency through private sector engagement. Such an approach could result in scaling up private green investments that, over time, surpass public spending in green growth. In addition to low carbon policies, Azerbaijan can build on its academic and scientific potential in the extraction industry, which provides a comparative advantage for venturing into green innovations, including carbon capture and storage, renewables, and hydrogen technologies.

Supporting Decarbonization Solutions through Green Financing

Public support for green investments could change the framework conditions and bring stability to the capital markets and financial institutions. In the short term, public finance will be critical when confronting key social and environmental challenges. It could also play a powerful market-shaping role as it does not face

[9] The methodological note is available https://thedocs.worldbank.org/en/doc/223671586803837686-0020022020/original/SustainabilityChecklistforAssessingEconomicRecoveryInvestmentsApril2020.pdf. The use of the checklist is described https://blogs.worldbank.org/climatechange/planning-economic-recovery-covid-19-coronavirus-sustainability-checklist-policymakers.

pressure to deliver short-term returns. The Central Bank of Azerbaijan (CBA) has already launched the Azerbaijan Sustainable Finance Action Plan (2022-2025) which sets ambitious actions, including (i) skill and capacity development in sustainable finance within the CBA and other industry associations; (ii) climate and ESG risk assessments, disclosure, and reporting within economic and financial sectors; (iii) developing a sustainable finance taxonomy; (iv) creating climate and ESG risk management, and internal control systems; (v) devising incentive mechanisms to enhance public-private mechanisms and sustainable finance products, stimulate local investors, and mobilize donor financing. All of these actions are steps in the right direction towards minimizing market uncertainties around greening the growth while also reducing transition costs. Introducing Climate Budget Tagging (CBT) and expenditure tracking in public financial management can be another important milestone in addressing Azerbaijan's climate-related policy ambitions and goals.[10]

Creating Green Job Opportunities and Building the Necessary Human Capital

Employment creation during the transition towards greener growth will be driven by higher demand for skilled jobs in several new sectors. Investments in increasing renewable energy production and switching to new energy sources (e.g. LCH), developing low carbon-intensive production and introducing material circularity may create numerous opportunities for expanding the job market. Innovation and new technologies in the Blue Economy (BE) sectors (new and established sectors) may also create more employment opportunities. Areas for further research on opportunities for BE to contribute to job creation include Azerbaijan's potential as a transport hub, the cleaning, rehabilitation, and green development of coastal areas, and reducing sea pollution from offshore drilling. The importance of human capital aspects of green growth calls for a comprehensive analysis of this topic, including skills development, impacts on labor markets, health and education, etc.

Acting on Low-hanging fruits and Greening the Economic Sectors

Cutting emissions from system leaks in the oil and gas sector could contribute significantly to reducing GHG emissions at lower costs and will support Azerbaijan's NDC commitments. On a per unit of GDP basis, Azerbaijan is among the largest producers of fugitive emissions from natural gas production in the world. Priority measures include phasing out the gas-powered controls used to manage oil-field valves and pressure and flow systems (which regularly release methane) and introducing new controls and new technologies (e.g., using compressed air instead of gas). Additional measures to stop leaks at production and transport facilities may include mounting leak-detection equipment on planes and using satellites and drones. Old/abandoned wells in oil and gas fields can leak methane and other pollutants that contribute to climate change and poor air quality, and heighten health and environmental risks. In countries with similar problems, regulators are looking at emission reduction opportunities using the most up-to-date information and technologies to address leakages with added benefits such as restoring surface locations (e.g. oil-lakes, contaminated lands), and revitalizing land in areas with high economic potential. The Absheron Peninsula is such an area with high demand for land development. A government-sponsored program that integrates plugging abandoned wells as part of the revitalization of coastal areas under a national BE development program could provide multiple socio-economic benefits, including employment. A dedicated program with funding (green finance instruments included) could alleviate the responsibility of oil and gas companies for their decades-old production equipment.

Realizing the opportunities to build a cleaner, resilient and future-fit economy and healthy living conditions requires a stronger focus on sustainable consumption and production. Promoting policies for eco-efficiency and investments in cleaner production and technologies will help enhance the environmental performance of enterprises and prevent pollution and the associated degradation. This involves reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing conservation techniques, and reusing materials rather than putting them into the waste stream. Investments in sustainable consumption and production will provide an added value by accelerating the clean energy transition and the pace for meeting climate action goals.

Sustainable use of renewable natural capital, including land and water for agriculture and forestry, is a pathway to advancing economic efficiency, climate resilience, and environmental sustainability. Land use and land management focused on safeguarding land productivity and the value of

[10] World Bank 2021a.

natural capital and ecosystem services will provide the population with multiple economic and social benefits. Leveraging the new technologies can contribute to proper valuation of biodiversity, ecosystems, and their economic and health impacts. There is an opportunity to enhance the productivity and job creation in Azerbaijan's agriculture and forestry. Advancing land regeneration and productivity, land use management, chemical pollution prevention, and technologies to decarbonize agricultural processes will increase not only green development potential, but also their climate adaptation potential.

The Caspian Sea offers multiple opportunities and newer pathways for green solutions in the blue space, but this will take time and effort. Azerbaijan's Caspian maritime space could provide more value-added to the economy by sustainably expanding the established sectors such as tourism and aquaculture, and boosting new green sectors such as offshore renewable energy. Opportunities that could be explored in new BE sectors include blue biotechnology and blue bioeconomy for plant-based alternatives to plastics and other petrochemical applications; marine renewable energy, including floating offshore wind, wave and tidal energy and floating solar photovoltaic energy; and maritime security and surveillance focusing on digitalization and technological innovation. An integrated approach based on the value and potential of the Caspian marine and coastal capital and tailored to deliver new economic and social infrastructure, ecosystem regeneration, and optimized performance of existing assets could serve multiple purposes. This includes cleaning and regenerating polluted coastal land, reducing untreated effluents into the marine environment, and opening new opportunities for growth where sea meets the land. However, determining what, where, and how Azerbaijan's BE potential can grow will need further assessment. A transition to BE that is clean, green, sustainable, and inclusive will require significant investments and policy changes over time. While 'Green' investing is becoming the new normal in a decarbonizing world, Azerbaijan could fast track the policies that facilitate green/blue investments to reinforce sustainable opportunities in BE and market-led low carbon development in the blue space.

Azerbaijan's rich natural endowment can support a timely transition to a low carbon economy, cleaner environment, and green growth. In the face of imminent challenges, kick-starting the transition towards green growth sooner rather than later, will reduce multiple uncertainties and costly measures in the future. Creating new, greener sources of growth that can substitute dependence on oil and gas (rather than simply adding them on the margin) will be a long and challenging process, requiring political will, significant investments, including into institutional and human capital development, and reforms. Utilizing public resources and revenues from fossil fuels exports to leverage this geostrategic shift towards decarbonization and diversification can offset some of the near-term challenges and enable future sustainable growth.

Introduction

During the last two decades, Azerbaijan's economic growth has been driven by physical capital accumulation financed from oil and gas export rents. The oil and gas sector contributed to more than 90% of export revenues. This growth model, however, led to the depletion of non-renewable resources and the proliferation of environmental stresses on land, water, air, and ecosystems, thus posing serious risks to future wealth formation and people's well-being. The substantial contribution of the oil and gas sector extends far more widely. It has altered Azerbaijan's structure of the economy creating long-term challenges. Stagnating human capital development has translated to the shortage of skilled labor faced by the private sector. Azerbaijan's main challenges going forward are to utilize its oil revenue for a greater public good and for future sustainable growth, including tackling pollution and protecting the value of its natural capital.

The 21st century marks a global change in search of solutions to reduce the dependency on fossil fuels bearing serious environmental consequences. Oil-rich economies are coming under pressure to reduce the ecological footprint of the oil and gas industry on natural resources and human health. Azerbaijan has responded to these global developments in its most recent strategic development plans and goals. In support of these endeavors, this Issues Note is highlighting some of the important considerations and possible areas of intervention as a prelude to the Country Climate and Development Report (CCDR), which will take an in-depth look at current carbon emissions and will model a potential low-carbon emissions path across the entire economy.

Azerbaijan joined the global pursuit of mitigating climate change by ratifying the Paris Climate Agreement in 2017 and committing to Nationally Determined Contributions (NDC) to that international agenda. In addition, Azerbaijan made a voluntary commitment to green economy actions in the Batumi Initiative on Green Economy (BIG-E) Actions by Azerbaijan till 2030 aiming to contribute to sustainable development. Nonetheless, Azerbaijan's greenhouse gas (GHG) emissions have risen by 19% since 2010 and have already exceeded the 2030 Nationally Determined Commitment target.[11] Azerbaijan is not on track to meet its near-term emission goals.[12] As of 2019, carbon dioxide (CO_2) accounts for over 70% of the GHG emissions in Azerbaijan.[13] Fugitive emissions, like unintentionally released methane from the oil and gas industry, are estimated at 13.8% of the total GHG emissions. Azerbaijan's energy intensity fell from 6.93kWh in 1995 to 0.91kWh in 2010 and averaged 1.13kWh from 2010 to 2018.[14] CO_2 productivity increased more than threefold in 2000–2010 and has since stabilized at this level. This is largely due to a slower increase in CO_2 emissions compared to the increase in GDP.

The government policies recognize that continued dependence on oil and gas is a serious transition risk, in addition to the impacts of the EU carbon

[11] EU 2021.
[12] The country has voluntarily pledged (NDCs) to reduce GHG emissions by 35% in 2030 compared to its 1990 level. But since 2010, energy demand has risen rapidly, partly because urbanization increased and energy demand from the transport sector tripled.
[13] Ritchie et al. 2020.
[14] Ibid.

border adjustment mechanism (CBAM).[15] The new macro-economic policy framework toward macro-economic stability includes a change in the medium and long-term 'driving forces' of the economy toward sustainability and diversification. The framework will support the implementation of emerging priorities[16] of particular importance for meeting the national commitments to the United Nations' 2030 Agenda for Sustainable Development centered around: (i) sustainably growing a competitive economy; (ii) society based on dynamic, inclusive and social justice; (iii) competitive human capital and modern innovations space; (iv) great return to territories liberated from occupation; and (v) clean environment and the country's 'green growth.'

The recent global and regional dynamics call for a realistic estimation of the scale of challenges and a timeline for charting Azerbaijan's green development path. The impacts of deep decarbonization and structural transformation of Azerbaijan's economy will depend on how and when its main trading partners will decarbonize. In the medium term, trading partners, like the EU, Japan, and the U.S., may start addressing carbon leakages and/or limit access to their technologies, finance, and trade for countries that do not follow a decarbonization path. The key question for Azerbaijan, as an oil-dependent country with high carbon intensity, is what adaptive strategy the country will pursue for industries that will be affected. This could entail developing new sources of green energy, advancing research and development to tap new market niches in the emerging green global economy. In the long term, timely provisioning for the uncertainties regarding how and when the green transition will reach a tipping point would help Azerbaijan to position itself in relation to its main trading counterparts. As the pandemic fades out, the situation with fossil fuel markets has turned fluid given the recent geopolitical developments. On the one hand, high demand may ramp up oil and gas production; on the other hand, high energy prices may catalyze the global efforts to decarbonize and meet global climate goals. Azerbaijan will benefit from the swing in oil and gas prices due to geopolitical challenges. However, recognizing that in the medium-term, higher prices will push up the global investments in clean energy and then rethinking how to accelerate Azerbaijan's green transformation would be a winning proposition for the country in the long run.

Azerbaijan's primary goal is asset diversification. The forthcoming Azerbaijan Systemic Country Diagnostics (SCD) states that regional and international experience highlight the importance of diversifying a country's asset base to sustain growth in the long run and diversify the economy away from fossil fuel resources. In resource-rich countries, successful diversification in terms of production and exports takes time. A focus on the diversification of assets could be feasible and effective in the shorter term — international experience associates higher labor productivity and lower output volatility with a balanced mix of capital assets (World Bank, 2022b).

Greening Azerbaijan's economy would take a series of steps. An important step would be to understand the specific challenges in the complex environment where increasing volatility is the only consistent characteristic of the oil/gas price trajectory. Along the way, decarbonization actions would be accompanied by subsequent/overlapping demand and supply shocks and market adjustments, often causing fossil fuel prices to vary between historical highs and lows. Maintaining a decarbonization trajectory in such a volatile market environment will require different policy tools that take the uncertainty of green transition into account while estimating the benefits of green growth and diversification.

A complete emissions inventory for the oil and gas industry is essential for establishing a clear emissions baseline across the vast value chains (e.g., sources, concentrations, and magnitude of emissions). This will help determine and monitor the actual emissions intensity across the productive assets, which can vary greatly due to technical and operational characteristics. Another important challenge is to develop a clear understanding of the range of decarbonization solutions, and their maturity and economics, to assess their feasibility across the economic sectors.

This Issues Note examines Azerbaijan's economic development and natural resources context, aiming to support the Government in pursuing the national priority of a clean environment and green growth. It discusses important considerations and possible areas of interventions related to green diversification, and indicates topics that call for further analytical deep dives and separate targeted research. The Issues Note identifies sectors with potential for diversification, decarbonization, and loosening the grip of oil and gas

[15] Financial penalties under CBAM will begin in 2026 for direct emissions from the production of certain industrial products imported into the bloc. The second phase of CBAM will cover indirect emissions in electricity used in production, which will heighten the financial impact on exporters of covered products.
[16] President of the Republic of Azerbaijan 2021 and *Republic of Azerbaijan 2022-2026 Socio-Economic Development Strategy*.

dependence, and it indicates possible policy avenues. However, it does not engage in deep analyses of these sectors and the cost of green diversifying, nor their risks and effects on the sector competitiveness. Such analytical work may fall under the purview of the upcoming CCDR, which will use the findings of this Issues Note to inform potential priority sectors.

Findings and recommendations provided in this Issues Note are informed by stakeholder consultations with the Government of Azerbaijan and by multiple diagnostic tools. The paper uses the Green, Resilient and Inclusive Development (GRID) diagnostic tool to identify opportunities to improve growth and economic development; natural capital accounting to estimate the contribution of natural resources to the wealth of the nation; the Global Trade Analysis Project 10 (GTAP 10) database to quantify the impacts of green investments; and the Environmental Impact and Sustainability Applied General Equilibrium (ENVISAGE) model, focused on the Carbon Border Adjustment Mechanism (CBAM) simulation to estimate impacts on Azerbaijan's oil exports in trading with the EU, based on different transition scenarios. More information on the methodology can be found in Annex 1.

The objective of the Issues Note is threefold: first, to assess the potential impacts of the global green transition on Azerbaijan's oil-dependent economy and the effects of the specific decarbonization efforts of its main trading partners; **second**, to look at the country-specific sustainable development co-benefits of a chosen path towards a more resilient growth model; and **third**, to identify diversification opportunities supported by accumulated financial resources and potential benefits in specific sectors. This analytical approach could be extended in further studies, primarily CCDR but also other targeted research. **The overarching objective of the Issues Note is to inform the dialogue with the Government of Azerbaijan on areas and opportunities for facilitating green growth.**

Chapter 1: The Context for Greening Future Economic Growth

The global transition towards greener economies creates new opportunities for Azerbaijan to overcome the limits of a fossil fuel-dependent growth model and build long-term prosperity in a sustainable and inclusive way. A global shift toward low-emissions economies is underway, driven by changes in market preferences and supported by policies involving incentives and penalties. As historical events have shown and the analyses of future scenarios indicate,[17] without more economic diversification and with the hydrocarbon sector continuing to dominate the economy, Azerbaijan will be in a vulnerable position – more so than other oil exporters with more diversified economies. The country will face challenges with future job losses, economic contraction, and stranded assets that come along with the global low-carbon transition. As a signal of change, the European Union (EU) — an important trade partner of Azerbaijan — has embarked on ambitious and long-term plans and policies for green transition embodied in the European Green Deal, including introducing border tariffs on imports of carbon-intensive products (CBAM).

In the face of this global green transition, Azerbaijan could build its resilience by using the opportunity to diversify its economy. While the hydrocarbons sector has been a pole of growth, some segments of the economy remain less developed where the benefits of growth have not been realized. Azerbaijan can reinvigorate the non-oil sector, including its non-oil natural resources. There are opportunities to rebalance the development towards a 'greener' and more inclusive economy and to improve livability at the same time. Greening is also in line with the country's actions on climate change, yet potentially generating additional economic benefits. By pursuing economic diversification guided by 'greening,' the country would advance the national socio-economic development strategy[18] and pave the way to becoming a high-income country in the future.

Globally, post COVID-19 pandemic economic recovery has been stalled by the war in Ukraine. While in the short run the impact on oil and gas markets will depend on the response by consumers, businesses, and governments, in the medium run the dynamics will be determined by the governments' actions to reduce the pressure on their economies and consumers. It is hard to predict which way the situation will go, but it is likely that energy security and affordability in Europe will take center stage. Such uncertainties may slow down the global green transition but will give a new impetus to the EU Green Deal in support of investments in climate-neutral technologies, low-carbon hydrogen industry, biochemicals, or decarbonized materials. In the face of these developments, Azerbaijan can benefit from putting efforts into creating a full set of options to boost the capacity of its economy to grow greener and build buffers to counter the long-term headwinds of global oil and gas market dynamics.

1.1. Economic achievements to date came at a cost

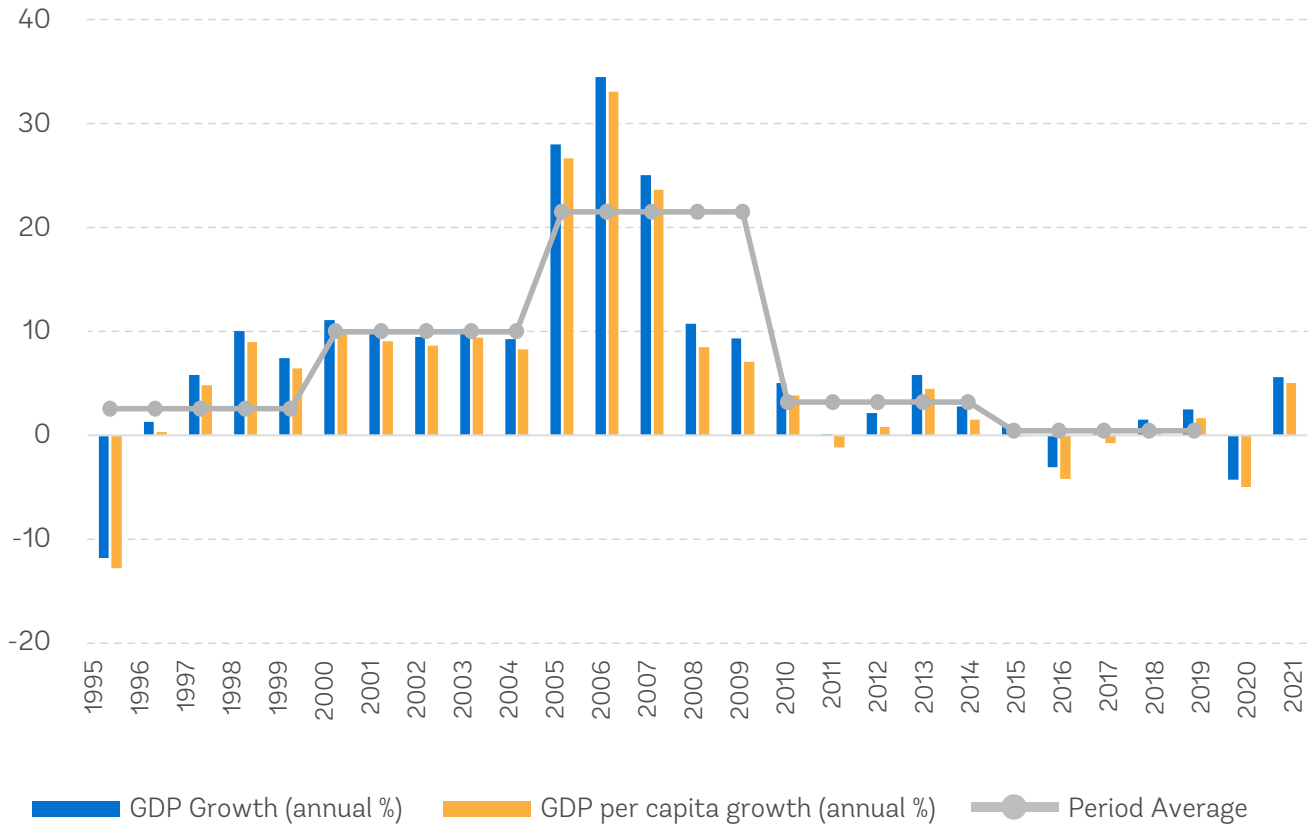
Azerbaijan's economic development has been tied to oil and gas exploration and its associated export revenue. During the last two decades, Azerbaijan has

[17] Drops in oil prices in 2014–2016 caused economic contraction in Azerbaijan. Analyses of the impacts of global decarbonization and instruments (carbon border adjustments in major markets) indicate a decreased demand for oil.
[18] President of the Republic of Azerbaijan 2021 and *Republic of Azerbaijan 2022-2026 Socio-Economic Development Strategy.*

invested heavily in the exploration and production of oil and natural gas (Figure 1 and Figure 2). A strong surge in oil price from $19 per barrel (2001) to $130 per barrel (2008) delivered an unprecedented economic growth of 24% per annum during the 2005-2008 period. Economic growth has increased substantially, with per capita GDP increasing from $209 in 1993 to $7,891 in 2014.[19] The slump in global energy demand in the subsequent 2010-2014 period impacted Azerbaijan's major export market in OECD countries, causing growth to drop to 3.2% per year on average. Since then, income has fallen to $4,221, largely following declining energy prices.[20] The oil prices completed this cycle by collapsing in 2014, thus triggering an economic contraction of 4.2% in 2016 — a dip sharp enough to qualify as an economic recession. Even with the return of favorable terms of trade in 2017, the economy only managed to sustain an average growth of 0.4% per year between 2015 and 2019.

The country has weathered the economic storms with relative success. During the last two decades, Azerbaijan has managed to sustain oil production and develop an emerging gas sector, which boosted a modest acceleration in domestic demand. Azerbaijan's economy grew by 2.2% in 2019, its best performance since 2014, before the COVID-19 pandemic and oil price decline caused another economic contraction of 4.3% in 2020.[21] Since then, recovery has been slow. Oil price is a constant factor in Azerbaijan's economic performance, and will continue to weigh on the pace of recovery.

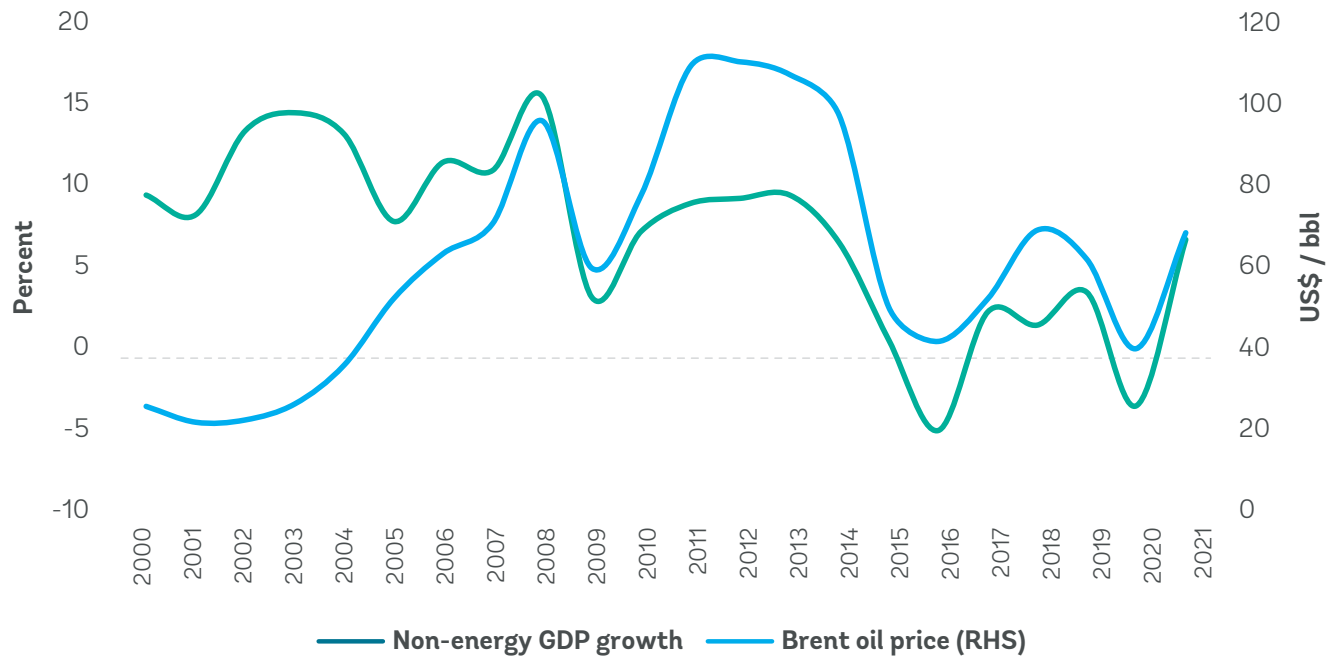
Figure 1: Azerbaijan's Real GDP and GDP per Capita Growth, 1995-2021



Source: Original calculations for this publication based on World Bank data.

[19] World Bank 2022a (forthcoming).
[20] Ibid.
[21] Ibid.

Figure 2: Azerbaijan's Real Non-Oil/Gas GDP Growth and Oil Price, 2000-2021

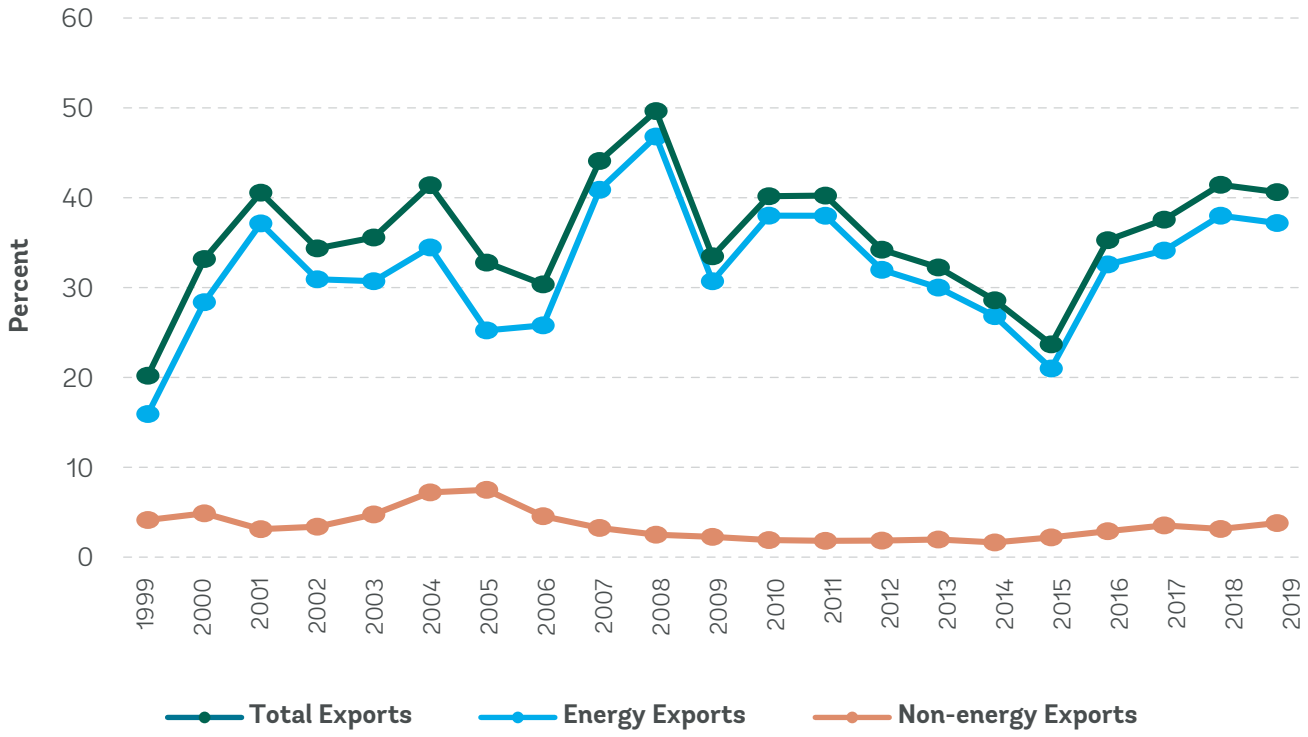


Source: World Bank 2022a (forthcoming). Azerbaijan Country Economic Memorandum.

Growth in the oil and gas sector has come at the expense of other sectors. Between 1995 and 2007, oil and gas production jumped from 10% to 54% (Figure 3) of GDP.[22] By the end of the energy super-cycle in 2008, energy exports accounted for almost half of GDP. The extractives industry (crude and refined oil, gas, and other petroleum-derivative products) was the dominant export category, rising from 50% of exports in the late 1990s to over 90% in the 2000s. In contrast, during the same timeframe, agriculture as a share of GDP fell from 25% to 6.5%, while the share of manufacturing was halved, and services dropped from 50% to less than 33% of total GDP.[23] Nonetheless, agriculture remains an important sector for poverty alleviation and inclusion, employing 36% of the total workforce and 42% of the female workforce.

[22] World Bank 2022a (forthcoming).
[23] Ibid.

Figure 3: Azerbaijan's Exports-to-GDP, 1999-2019

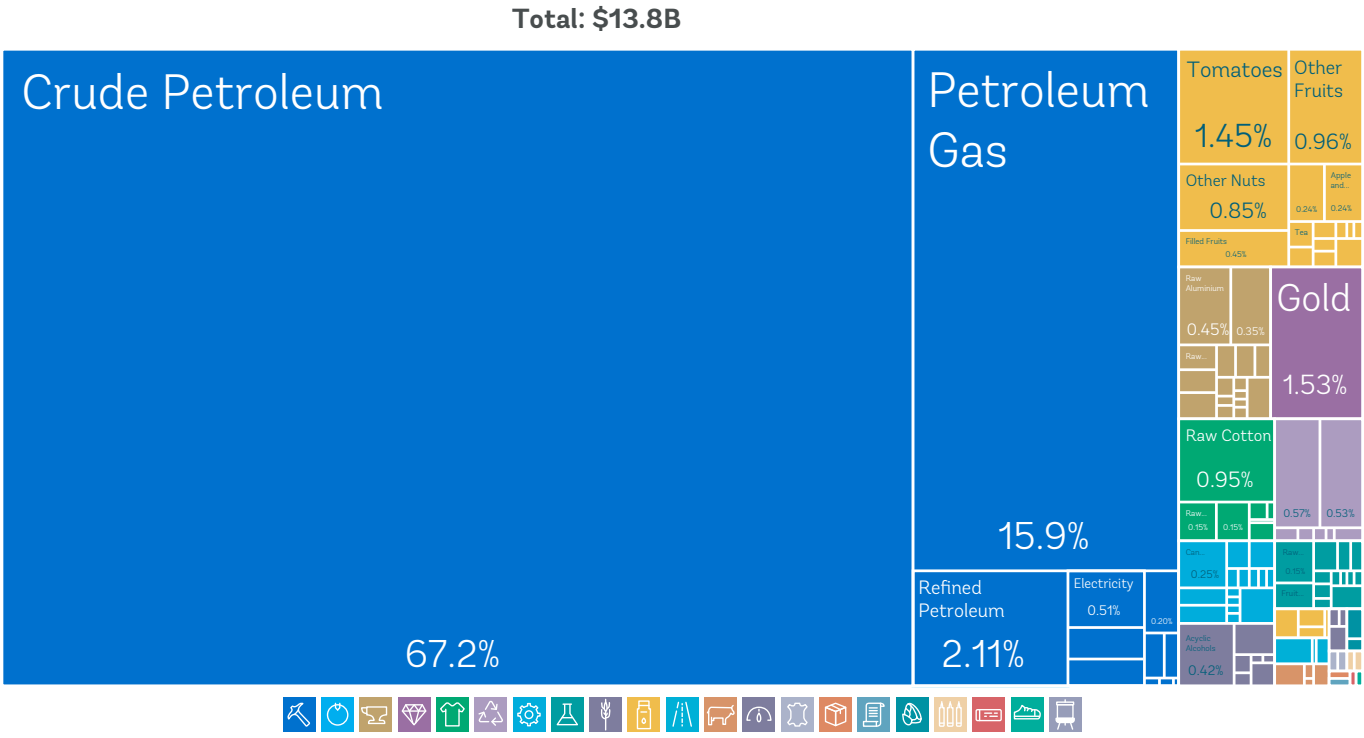


Source: Staff calculations based on UN Comtrade and World Bank WDI data.

Ninety-five percent of Azerbaijan's export revenues come from oil and natural gas, with EU countries accounting for over 45% of the total country's exports[24] (Figure 4 and Figure 5). Italy is the single largest importer of Azerbaijani exports, accounting for 42%, with over 99% of imports coming from mineral fuels, oils and distillation products amounting to $9.1 billion.[25] Türkiye and Russia are close seconds, and while 79% of Türkiye's Azerbaijani imports are from oil, Russia mostly imports agricultural produce and plastics, with oil imports accounting for only ~5% of the total.[26] In contrast, Azerbaijan's imports are primarily machinery, nuclear reactors, vehicles and equipment, pharmaceutical products and iron and steel and related products, cereals and plastics. China, Germany, Japan, Russia, Türkiye, Ukraine, and the U.S are the major trading partners for imports into Azerbaijan.

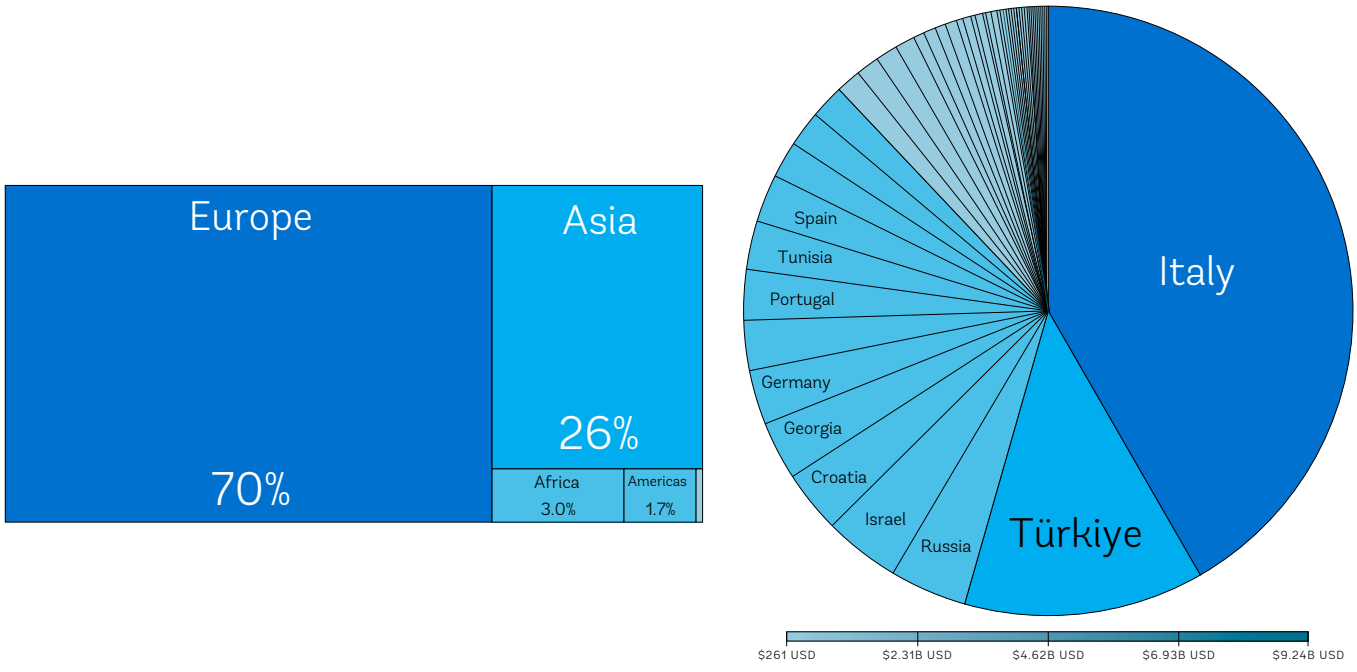
[24] Trading Economics. https://tradingeconomics.com/azerbaijan/exports-by-country.
[25] Trading Economics. https://tradingeconomics.com/azerbaijan/exports/italy.
[26] Trading Economics. https://tradingeconomics.com/azerbaijan/exports/russia.

Figure 4: Azerbaijan's Export Composition by Commodity (2020)



Source: OEC 2020. World Trade Data.

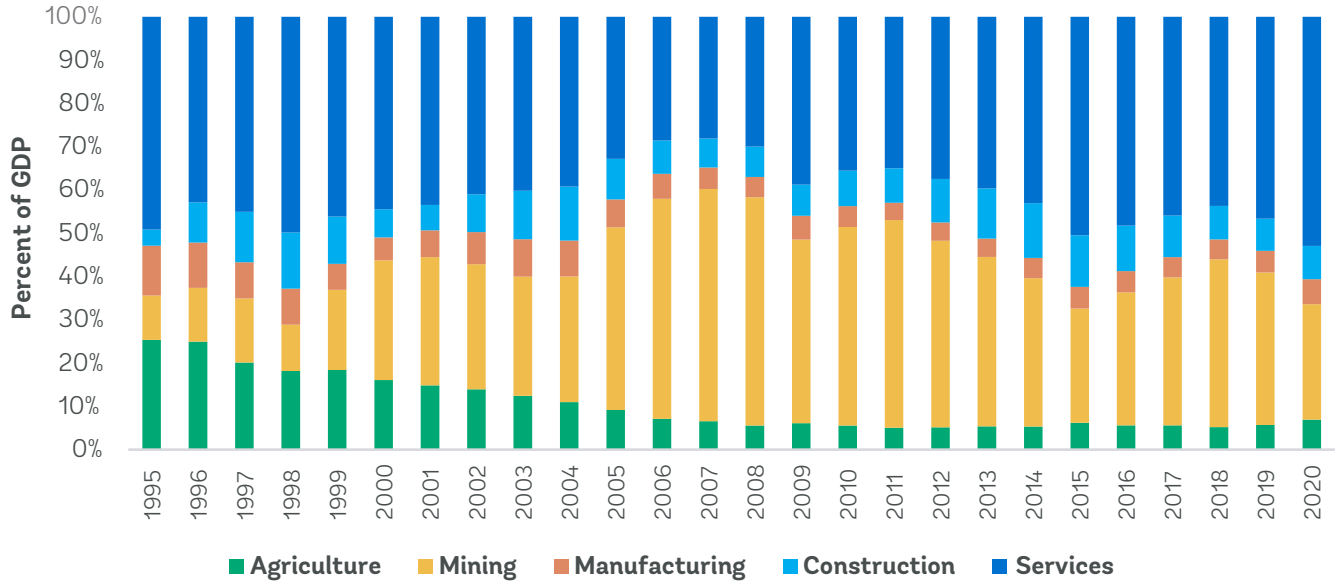
Figure 5: Azerbaijan's Export Composition by Country (2021)



Source: Trading Economics: Azerbaijan Exports. https://tradingeconomics.com/azerbaijan/exports.

The development of the non-oil and gas economy has been neglected and growth in the non-oil and gas sectors has not decoupled from energy prices, as shown in Figure 2. In the 2010s, the country invested heavily in natural gas exploration and extraction, opening up another source of export revenue in 2018 with the completion of the Southern Gas Corridor. Though this has reduced its exposure to oil, it did little to wean the country from dependency on hydrocarbons in general.

Figure 6: Azerbaijan's GDP Structure (Supply Side), 1995-2020



Source: Original calculations for this publication based on SSC data.

Note: Current prices.

Past decades of oil-based growth have come at the expense of the environment and other sustainability indicators. Beyond GDP and growth rates, a holistic snapshot of the country could be produced by examining other socio-economic indicators. The GRID (Green, Resilient and Inclusive Development) approach proves useful for this purpose. A summary of the GRID results for Azerbaijan is presented in Table 1 and highlights the areas needing improvement when compared to other Upper Middle-Income countries.

Water scarcity is severe in Azerbaijan, and soil erosion — affecting 42% of its territory — is the likely cause of lower land productivity (by 1.2%) and consequent losses in GDP. Material productivity is lower than in peer countries, and energy and emissions intensity is higher across most energy use sectors. Climate change will likely impact these indicators negatively. On the coping side, Azerbaijan's environmental expenditures are 20 times lower than in the EU countries.

Table 1: GRID/RISE Benchmarking for Azerbaijan

Indicator	Key sources and main issues		Benchmark	
		AZE	ECA / UMI	
Air pollution emissions				
PM2.5	PM2.5% pop exposed above WHO (25ug/m) Defined as the portion of a country's population living in places where mean annual concentrations of PM2.5 are greater than 25 micrograms per cubic meter.	95.3	56.6	UMI
	Mortality rate attributable to ambient and household air pollution (per 100,000), including acute respiratory infections (estimated for all ages); estimated above 25 years: cerebrovascular diseases in adults, ischemic heart diseases in adults, chronic obstructive pulmonary disease in adults, and lung cancer in adults.	76.5		UMI
Welfare cost of premature deaths from PM2.5	Total non-accidental mortality from ambient air pollution (% *GDP equivalent 2019)*	7	5	ECA
Municipal waste	Solid waste generation (tons per capita)	0.3	0.3	UMI
	Inadequately managed waste (% of total waste generated)	100.0	49.5	
Material productivity	Material productivity is expressed as the amount of economic output generated (in terms of GDP) per unit of materials consumed Total materials / Non-energy materials, US dollars/ kilogram, 2019	1.5	2.9	EU27
Land degradation and soil erosion	Estimated annual absolute land productivity losses (%) due to severe soil erosion	1.2	1.1	ECA
	% change in real GDP due to severe soil erosion	-0.024		ECA
	Agricultural land productivity ($ per hectare of ag land)	636	695	UMI
	Agriculture value added per worker ($ per worker)	2198	8353	UMI
Water scarcity and quality	Water quality, nutrients, salts, chemicals (SDG 6.3.2)	-2.7	-2.8	UMI
	Wastewater treatment capacity (% of wastewater produced)	3.8	13.5	UMI
	Productivity of water use ($ per m3 water withdrawals)	3.7	16.1	UMI
	Mortality rate attributable to inadequate water supply, sanitation and hygiene (per 100,000)	1.7	2.6	UMI
Total environmental expenditures (% GDP)	Expenditures mostly to water resource use/protection, air protection, waste disposal, land recultivation 0,1% of GDP in 2019 as reported by the SSC, 2020. The State Statistical Committee of the Republic of Azerbaijan. Environment in Azerbaijan, Statistical Yearbook. Baku. Table 13.5.	0.1%	2%	EU27
Natural hazards and disasters risks	Natural disaster risk to assets (% of GDP)	0.3		UMI
	Natural disaster risk to well-being (% of GDP)	0.4		UMI
	Population exposure from disasters (% of total population exposed)	0.1		UMI
CO_2 emissions per sector				
Energy	Energy: Building, Electricity, Heat, Transport, Fugitive (tons CO_2-eq. / million $ GDP)	664.0	258.0	ECA
	Energy sources: Oil (42%), Natural gas (40%), Electricity (15%)			
Electricity	CO_2 emissions in electricity (tons CO_2-eq. / million $ GDP)	303.0	114.0	ECA

Source: Original table for this publication.

GRID analysis confirms that economic achievements in Azerbaijan have come at a cost, while new challenges of global green transition are on the horizon. Azerbaijan has accumulated financial resources to start moving away from an oil-based economy and could use opportunities coming with the global demand for green innovations to address environmental challenges. The future sustainable development goals could be addressed together with social and economic objectives. The next sections unveil particular challenges, opportunities and policy needs in Azerbaijan that are closely linked to green growth and diversification priorities.

1.2. Upcoming challenges reinforce the need for sustainability

Azerbaijan's oil reserves will eventually run out. Meanwhile, its renewable natural resources and other alternative energy sources are yet to be fully developed. IEA has estimated that the country's oil reserve will last about another 25 years[27] (Table 2), with production from onshore fields (including the earliest production fields in the Absheron Peninsula) slowing down and accounting for just 3% of total output (IEA 2021). The oil and gas sector provides the major share of natural resource rents, which collectively accounted for 30% of GDP in 2018 (World Bank 2021). The share of renewable natural capital, including forests and cropland, has not increased substantially over time and has yet to command a larger share of natural wealth. A breakdown of natural capital components is shown in Figure 7 and Figure 8. Limitations to the potential of renewable natural capital are tied to the lack of a sustainable approach to natural resource management and to resource degradation due to weak environmental practices in the extractive industries.

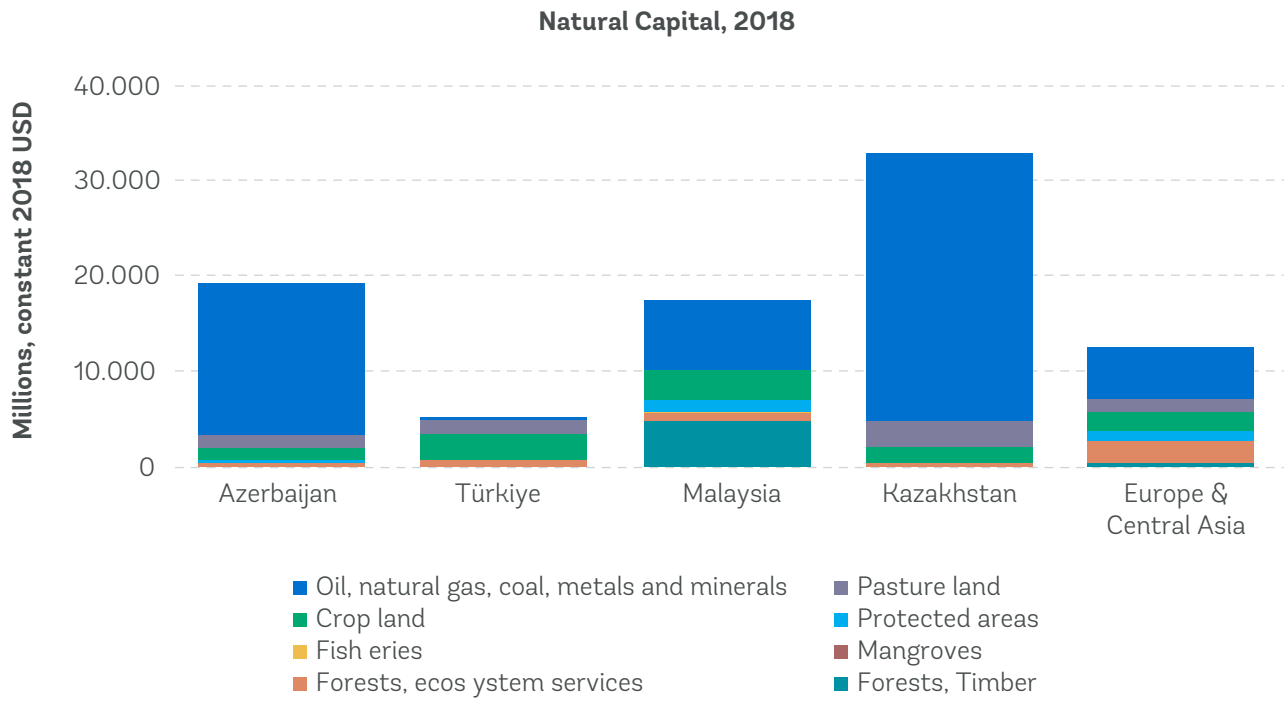
Table 2: Azerbaijan's Oil and Gas Reserves

According to IEA (2021), Azerbaijan's oil reserves will last another 25 years. (in million barrels of oil equivalent)			
		Liquids	**Gas**
Recoverable	Wood Mackenzie	18,025	8,525
	BP	21,520	24,045
Produced		14,520	4,095
Remaining reserves 2020	Wood Mackenzie	4,105	4,430
	BP	7,000	19,950
Production 2019 (SSC)		280	252
(in years)			
Reserve life	Wood Mackenzie	15	18
	BP	25	79

Source: IEA 2021.

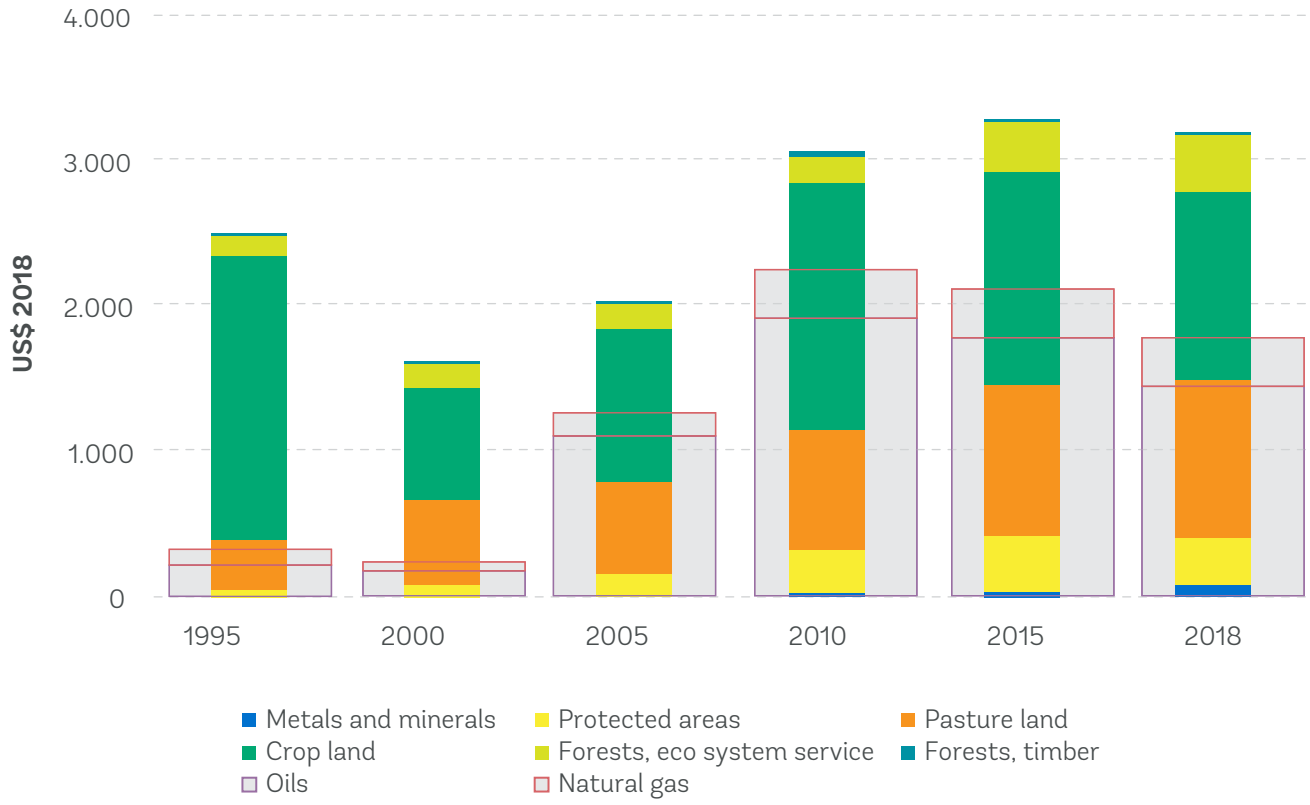
[27] According to bp *Statistical Review of World Energy 2021* (https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf0. Azerbaijan has proven oil reserves of 7,000 million barrels of crude oil (bbls), which corresponds to a reserves-over-production life (R/P) of 26.7 years. The proven gas reserves are 88.4 trillion cubic feet (tcf) or 14,737 barrels of oil equivalent (boe), corresponding to a reserves-over-production life (R/P) of 96.9 years.

Figure 7: Natural Capital per Capita



Source: World Bank 2021: CWON

Figure 8: Dynamics of Natural Capital per Capita, $ 2018

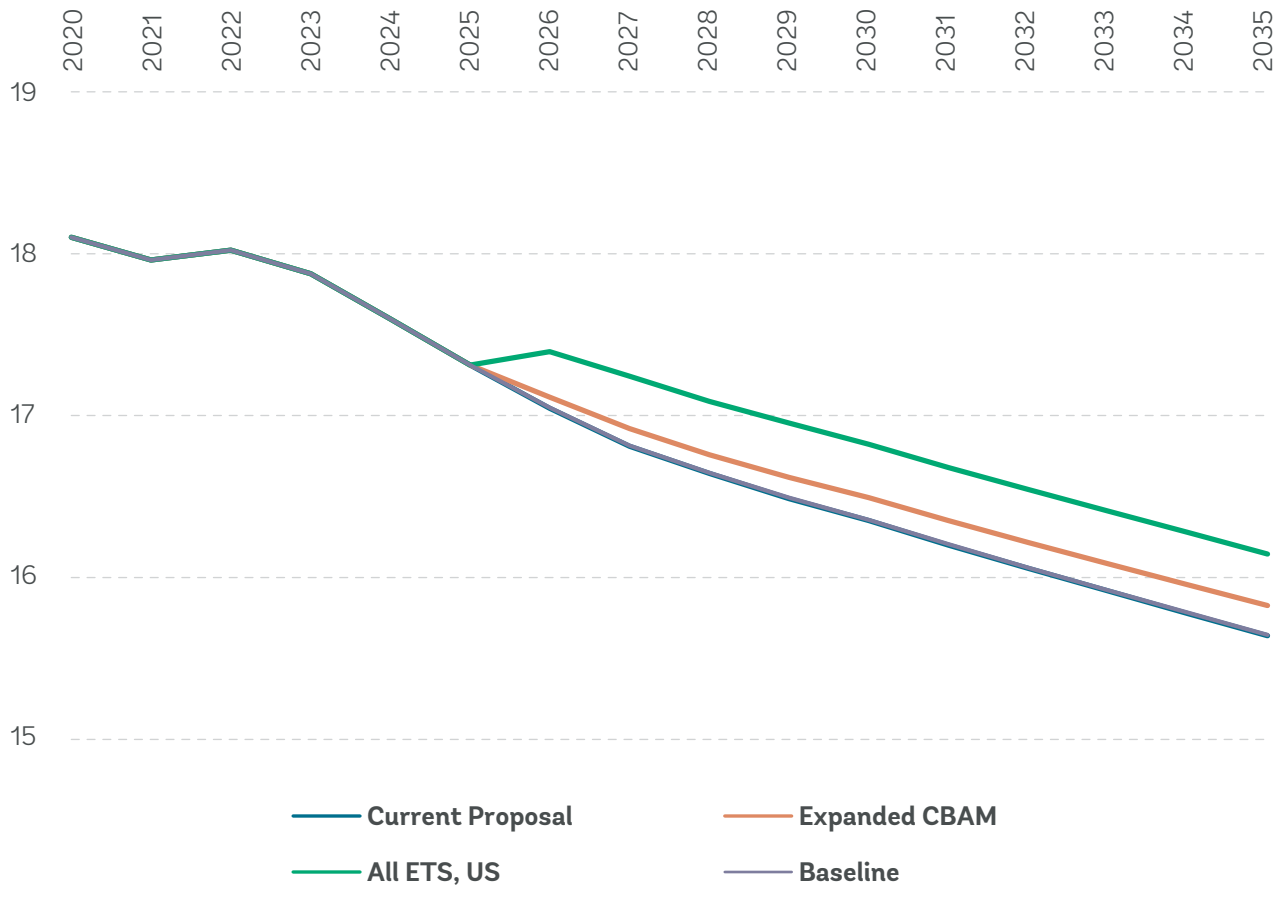


Source: World Bank 2021b: CWON.

Despite current market fluctuations, the remaining oil reserves will not provide the same revenue and economic drive in the medium- to long-term. Azerbaijan's major export markets are already shifting away from carbon-intensive products. Global fossil fuel production would need to start declining after peaking within the next decade. Although the war in Ukraine is increasing market volatility, the long-term global demand for fossil fuels will be weakening, with studies showing that the impact on Azerbaijan's oil revenue will begin as early as the current decade. However, Azerbaijan could consider it as an opportunity to use accumulated Sovereign Fund resources to increase productivity and diversify its economy, building resilience to external shocks.

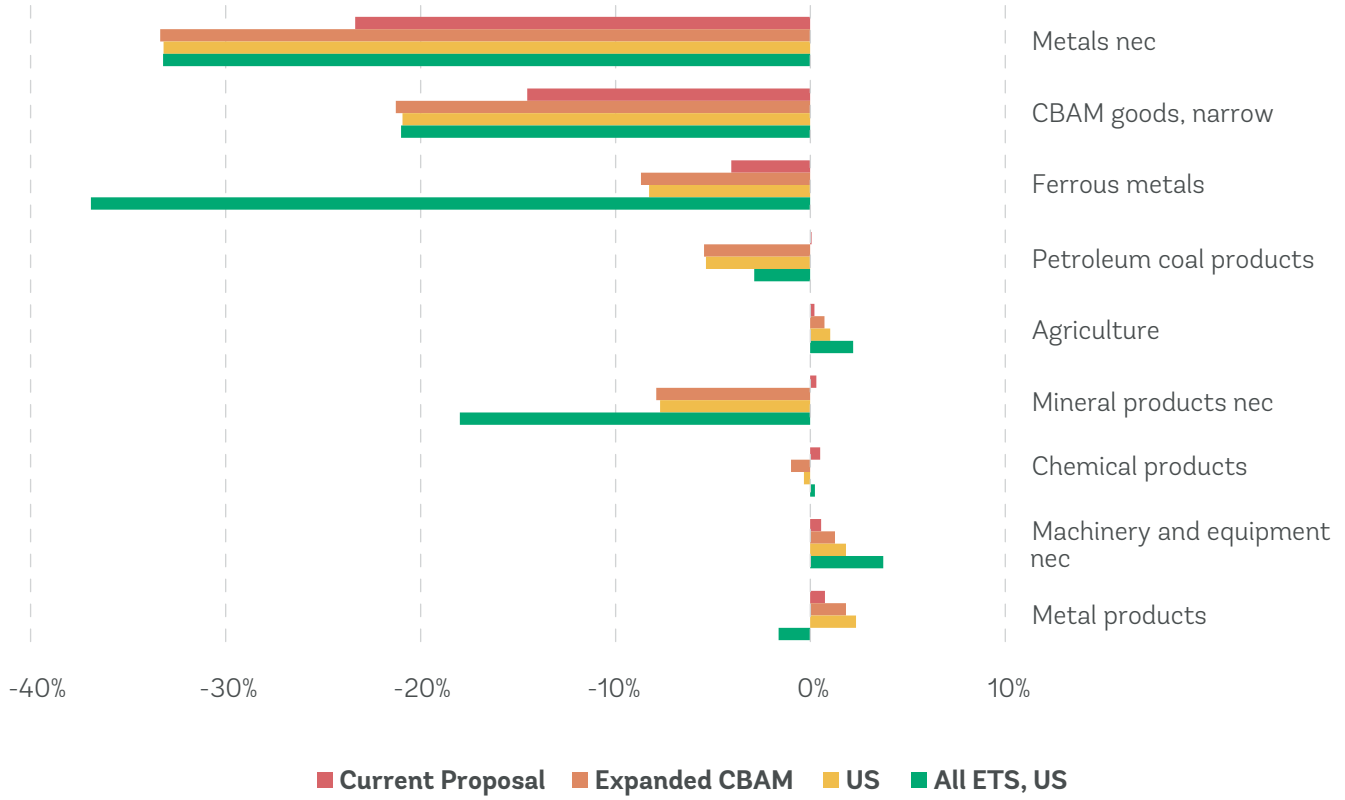
Azerbaijan's oil exports to the EU are expected to decline as the EU continues to cut carbon emissions in line with its Nationally Determined Contributions (NDCs), but the negative effects can be alleviated if Azerbaijan advances its own carbon abatement measures. Analysis has been conducted of the effects on Azerbaijan's oil exports as the EU *en bloc carries out its low-carbon transition plans, and the demand for fossil fuels declines.* The modeling scenarios explore the impact the EU low-carbon transition will have on Azerbaijan's economy overall, as well as on individual sectors, under different policy responses from Azerbaijan and other countries. The scenarios also investigate what might happen under different CBAM coverage, if the US adopted a similar mechanism, and if Europe and Central Asia (ECA) countries respond to the CBAM with carbon pricing. In the baseline scenario (NDC and EGD implementation), Azerbaijan's oil exports to the EU reduce by $2.5 billion by 2035 (Figure 9). This is because, while oil exports are not directly regulated under the first phase of CBAM, oil demand suffers a large drop as the EU cuts its emissions under their NDCs. Under the first phase of CBAM (Current Proposal) where only a list of non-oil products is regulated, the impact on oil exports is largely the same. Oil exports may even recover marginally as the EU substitutes covered imports with domestic production and consumes marginally more oil. When border measures are eventually extended to include petroleum products (under the second CBAM phase - Expanded CBAM) the loss in export revenue will be larger. Azerbaijan could potentially recoup some of the lost oil revenue by advancing its own NDC and qualifying for some exemption. A summary of modeled results is provided in Annex 3.

Figure 9: Modeled Real Exports of Oil to EU if Azerbaijan Doesn't Act, $ Billion



Source: Original calculations for this publication.

Figure 10: Modeled Real Exports to EU in 2030, Selected Sectors, Deviation from 'Baseline'



Source: Original calculations for this publication

Under the current EU CBAM scenario, oil exports from Azerbaijan will be reduced along with the baseline scenario (Figure 8). They may recover marginally as the EU substitutes covered imports with exports production and consumes marginally more oil with the second phase (Expanded CBAM scenario Figure 10). This oil export impact could be higher if the US adopts CBAM as well. In the last scenario, Azerbaijan's oil export could increase by about 3%. If CBAM is introduced by the EU only, the impact on oil export is not significant, especially under the current proposal.

When border measures are eventually extended to include petroleum products under the expanded CBAM, the loss in overall export revenue will be larger. Although the EU's production of petroleum products will expand, resulting in higher EU demand for crude oil and improving the outlook for Azerbaijan's EU exports, they would still not achieve the same level as under the equivalent CBAM scenario where Azerbaijan meets its NDC ('Expanded CBAM). If Azerbaijan acts to meet its NDC, it will reduce the carbon intensity of non-oil export, increasing its comparative advantage. Acting to achieve Azerbaijan's NDC could limit the reduction of non-oil export to the EU, while securing higher revenues from oil exports to the EU. (A summary of modeled results is given in Annex 3.)

Carbon-based trade barriers at the EU border (CBAM) could have a substantial effect on Azerbaijan's non-oil sectors. Under the first CBAM phase implemented in 2023–2025, Azerbaijan's exports to the EU will face substantial declines. Exports of non-ferrous metals products, mostly aluminum, could fall by nearly 35% in 2030, and of ferrous metals between 4 and 40%. Importantly, this could happen before the introduction of further tightening of EU border measures. Azerbaijan could potentially recoup some of the lost revenue by advancing its own NDC and qualifying for some exemptions. When Azerbaijan meets its NDC, a reduction in non-oil exports is modeled at some $200 lower under the expanded CBAM scenario. (A summary of modeled results is given in Annex 3.)

These potential impacts underline the importance of diversification towards 'greener' sectors and assets. CBAM analysis provides some hints of which industries might benefit from a low carbon future. The model shows that exports to the EU of some higher value-added products (like motor vehicles and machinery) which can be important for green growth and diversification, could see potential gains. Under these circumstances, this is an opportunity to consider new growth areas, given that Azerbaijani producers could become more competitive in industries where they have lower carbon intensity than EU producers. In the short

term, the impact of border measures can be mitigated if Azerbaijan applies its own national climate policies and carbon abatement measures to reduce its national emissions footprint, as per the country's NDCs.

As Azerbaijan starts preparing for the upcoming global 'green' shift, its preparedness for low-carbon transition can be assessed from two perspectives: its exposure, and its resilience to the transition. As history has shown, Azerbaijan is highly exposed[28] to transition risks and market volatility, given the large share of fossil fuel exports and resource rents in its GDP. At the same time, the country's resilience[29] to such changes is low due to the lack of economic diversification and weak preparedness overall, including human capital. Various fossil fuel producing countries were included in a study[30] reviewing how they would fare in a carbon-constrained world, based on their exposure and resilience (Box 1: Country Preparedness for Low-Carbon Transition). Azerbaijan's exposure is comparable to Kazakhstan's and established exporters like Qatar and Saudi Arabia, but seems less resilient than the Gulf countries, given Azerbaijan's underdeveloped infrastructure, a lack of investments in non-oil sectors, and limited human capital. Besides, in a new era of market volatility, Azerbaijan will face uncertainties in demand for fossil fuels and a growing cost of capital to attract new investments under greening global financial markets situation.

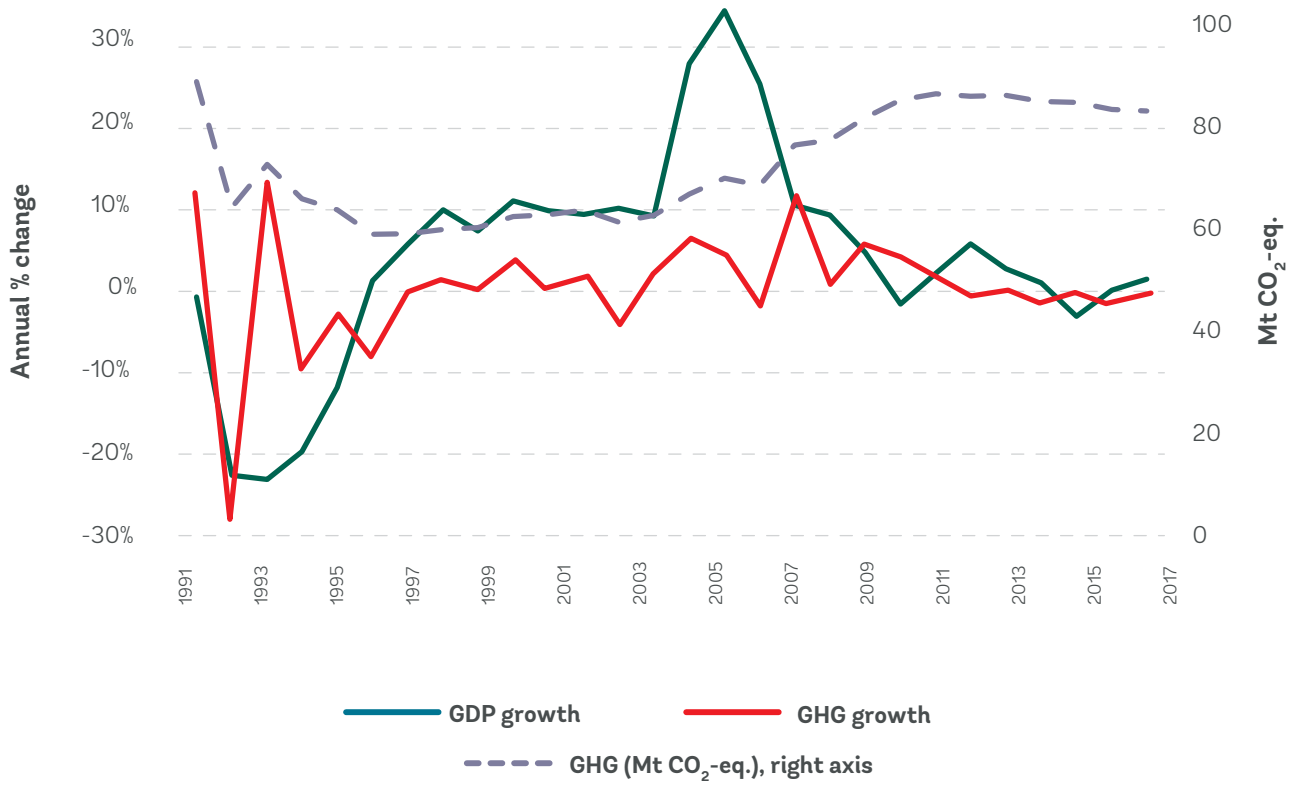
As a result of structural economic problems, economic growth in Azerbaijan has not decoupled from GHG emissions growth. Both economic indicators converged, with a significant increase in GHG emissions from 2003 to 2011. Azerbaijan's most GHG-intensive sectors are the electricity and heat (14.21 million ton), transport (8.51 million ton), buildings (8 million ton) and fugitive emissions (7.45 million ton) (Figure 12). All these sectors are fossil-fuel based. Fossil fuel combustion is associated with air pollution and generates another source of risk — health risk, which is sizable in Azerbaijan.

Box 1: Country Preparedness for Low-Carbon Transition

Note: Red dots - countries most exposed to an LCT; orange dots -countries moderately prepared for an LCT; green dots - countries well prepared for an LCT.

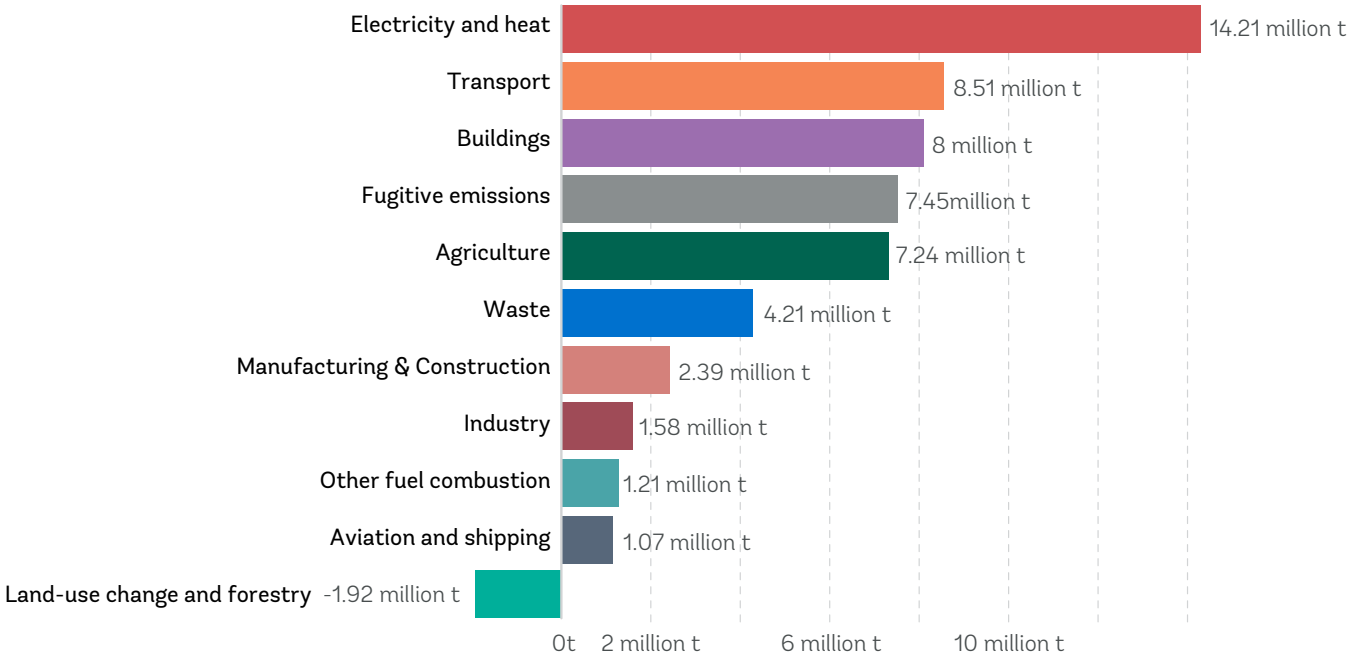
[28] Index consisting of four indicators: (1) Carbon intensity of manufacturing exports, (2) Committed power emissions as a proportion of current annual power generation, (3) Fossil fuel export as a proportion of GDP, and (4) Expected resource rents as a proportion of GDP. (Pesżko et al. 2020) was also adopted as the Transition Risk Indicator by IMF: https://climatedata.imf.org/pages/fi-indicators.
[29] Index composed of 11 indicators including position on global oil supply cost curve and 10 indicators of economic resilience to external shocks (Pesżko et al. 2020) was also adopted as the Transition Risk Indicator by IMF: https://climatedata.imf.org/pages/fi-indicators.
[30] Pesżko, G., van der Mensbrugghe, D., Golub, A. et al. 2020.

Figure 11: Annual GDP and GHG Emissions Growth, 1991-2017



Source: World Bank data 2021.

Figure 12: Greenhouse Gas Emissions by Sector, 2019 (Million Tons of CO_2-eq.)

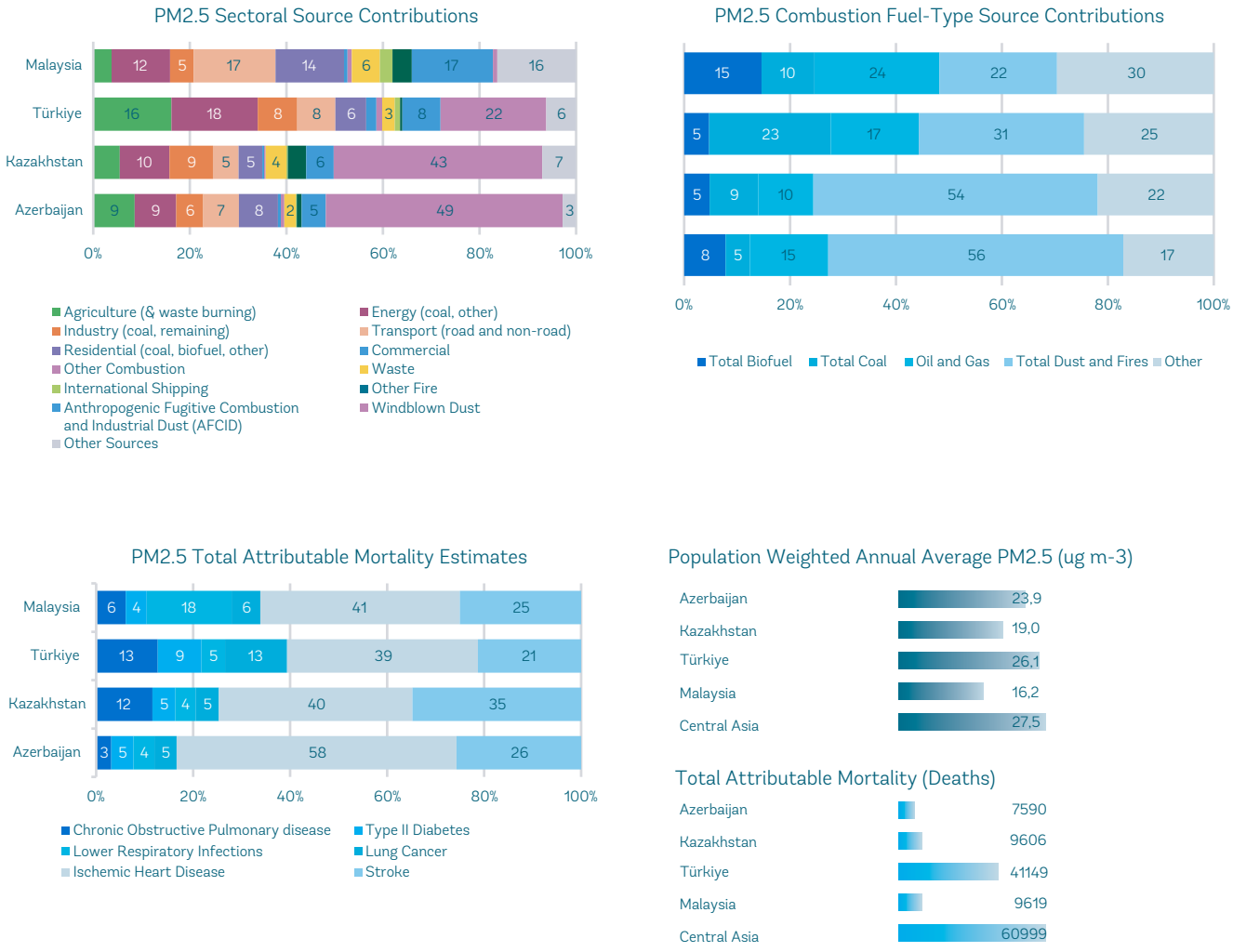


Source: World Bank data 2021.

Azerbaijan's energy-intensive economic model has contributed to deteriorating air quality and related health impacts (Figure 13). Ambient air pollution from fine particulate matter (PM2.5) contributes 10% to 18% to non-accident mortality, which is above the average in the Eastern and Central Europe region. According to Global Burden of Disease[31] estimates, the welfare loss corresponding to this mortality range is equivalent to 3% to 12% of GDP. The sources of particulate matter pollution are given in Figure 13. Fossil fuel-based sources contribute about 45% of the total air pollution, and windblown dust accounts for half of the total pollution. Positive health benefits would result from measures to address some of these leading factors of poor air quality. Deterioration of air quality and climate issues often display feedback loops. Actions for reducing GHG emissions and control of air pollutants need to rest on a holistic approach, such as measures for energy efficiency improvements across all sectors, accelerated adoption of renewable energy and fuel switching in end-use sectors to replace dirtier fuels. Windblown dust is the main source of pollution in urban areas where the combination of airborne particulate matter and industrial pollutants can expose large numbers of the population to toxic aerosols. Coordinated measures to restore and enhance natural systems to control arid conditions, such as reducing soil erosion and maintaining land cover, would help address land degradation issues and combat desertification. Global research on air quality and health impacts estimates that up to 19% of mortality attributable to PM2.5 can be avoided by reducing fuel combustion.[32]

[31] Global Burden of Disease 2019.
[32] McDuffie, E.E., Martin, R.V., Spadaro, J.V. et al. 2021.

Figure 13: Sources of Air Pollution



Source: Original analysis for this publication based on McDuffie et al. (2021).[33]

An effective climate and environmental policy would embed a combination of various instruments. These include energy and carbon pricing, emission trading systems, energy efficiency and air quality standards, green finance, and programs of targeted support, among others. Adjusted to the economic circumstances of a particular country, these would gradually create a system of incentives and norms pushing market actors to redistribute wealth from economic sectors with relatively low productivity and decreasing competitiveness toward new sectors with higher productivity and more relevance in a decarbonized and cleaner world.

This could lead to growth in human capital, renewable natural capital (such as ecosystem services used in agriculture, the renewable energy sector, and tourism), physical capital (such as factories and infrastructure), and institutional capital. Spillover effects include increased innovation in companies, investments in new technologies, and diversification of asset portfolios. At the same time, domestic and international corporations and private consumers will generate production demand in new sectors.

[33] The 'Total Dust and Fires' category is the sum of windblown and anthropogenic fugitive, combustion, and industrial dust, agricultural waste burning, and other fires.

Chapter 2: Green Growth as a Platform for Economic Diversification

The development of non-oil sectors has begun but will take time and resources to grow to a scale comparable to the hydrocarbon sector. Embedding policy actions for sectors such as renewable energy, Blue Economy (BE), water management and tourism that support resilience to climate change impacts will mitigate the low-carbon transition risks and pave the way for diversification. While a concerted and long-term effort to cultivate areas of promise and the full benefits of asset diversification will take years to show full results, the policies to support the transition must be taken now. If chosen selectively, they can also reap short-term benefits and mitigate any negative effects on growth.

Green growth principles can help guide sector prioritization and the process of economic diversification. The green growth model gives priority to sustainable practices that also deliver local and short-term benefits (Table 3). In promoting green goals, for example on resource efficiency, options like energy demand management, energy efficiency, and switching to competitive renewable energy choices such as solar and wind can bring immediate economic and environmental benefits, including through mobilizing private investments. Investments in sustainable intensification of agriculture, better land-use and urban planning, and water and waste management are green measures that deliver immediate benefits. Carbon pricing, fuel and electricity subsidy reforms are designed to shift consumer/investor choices in favor of green and renewable options that derive fiscal merits. But they take time to work, and their net benefits are limited by other costs. Conversely, erosion control and reversing the degradation of forests and natural ecosystems may not produce large short-term benefits but they are essential for sustaining a resilient green economy over the long term (there can be distributional gains if local communities derive jobs and incomes as part of restoration programs). Many green policies are also 'climate-smart.' Though the potential varies from country to country, the economic benefit of climate-smart actions alone in global terms is in the range of $26 trillion through 2030.The World Bank has developed a Sustainability Checklist[34] that can guide a stakeholder-driven process to prioritize the sectors and green measures most likely to deliver economic benefits, and that are deemed appropriate for the country. Future consultations with stakeholders on country-specific aspects of green growth are forthcoming to develop a prioritization matrix for Azerbaijan.

[34] The methodological note is available https://thedocs.worldbank.org/en/doc/223671586803837686-0020022020/original/SustainabilityChecklistforAssessingEconomicRecoveryInvestmentsApril2020.pdf. The use of the checklist is described https://blogs.worldbank.org/climatechange/planning-economic-recovery-covid-19-coronavirus-sustainability-checklist-policymakers.

Table 3: Short- and Long-Term Benefits of Various Green Growth Measures

Measures that bring short-term greening benefits	Measures that bring long-term greening benefits
• **Environmental remediation** - Ready to implement and labor-intensive measures • **Improved forest/natural resource maintenance and management** • **Sustainable intensification in agriculture and climate-smart agriculture** • **Improving water resources management** (water quality and storage, sanitation, waste management) • **Reducing electricity system losses** • **Energy demand side management** • **Energy efficiency retrofits** • **Incentives for green startups and job creation.** • **Green/Smart infrastructure projects** • **Low-emission public transport**	• **Carbon pricing/Carbon tax** • **Higher cost low-carbon energy** • **Enforcement of air and water quality regulations** • **Reforestation and reducing forest pressures/ Enforcement of forest management regimes** • **Coastal zone management and protection of natural areas of significant biodiversity value** • **Fisheries catch management** • **Prevent Illegal fishing** • **Enabling/improving access to green financing**

Source: Original elaboration for this publication.

Economic diversification through greening can also support other national goals and international commitments, helping with alignment to climate policy. One rationale for adopting some low-carbon and climate change policies today is that it can cushion some near-term effects of low-carbon policies in other countries, as was shown in Chapter 1. A shift to low-carbon energy and a focus on efficiency will be needed to meet the target of 35% to 40% reductions in GHG emissions by 2050, as recently committed at the COP26 meeting in Glasgow. For its adaptation goals, the country is currently drafting a national adaptation plan that envisions nature-based resilience measures in agriculture and improved management of coastal areas and water resources. Further ongoing actions include updating NDC and developing a long-term Low Emission Development Strategy (LEDS) considering two scenarios, the first is aimed at achieving a 35% reduction (real scenario), and the second one targets a 40% reduction (best scenario). In addition to supporting these objectives, a greener Azerbaijan would also be consistent with the national socio-economic goals and the regional development vision which promotes more economic cooperation with its neighbors. The European Green Deal includes financing for the transition from brown to green by supporting oil- and gas-exporting countries to diversify, and increase the share of renewable energy and production of low-carbon hydrogen[35] that could be exported to Europe in the future.

2.1. Identifying new growth poles

Azerbaijan's labor market is dominated by employment in the agriculture and service sectors, while most of the GDP is produced in oil-dependent sectors. The share of employment in the agricultural sector was 36% of total employment in 2019.[36] Agriculture has a low value added per worker in Azerbaijan, with the GDP created by agriculture reaching less than 6% of the total that same year (pre-COVID). Employment in services absorbs 50% of the total, while disproportionally contributing to 42% of GDP in 2019. In industry, only 15% are employed, and 49% of GDP is generated. Most of this GDP is created in the oil and gas sectors (about 37% in 2019). In the past decade, Azerbaijan has not seen a reallocation of employment across sectors, which has also contributed to a large gap in productivity between sectors, when productivity in agriculture is 10 times less than in industry.[37]

Areas with green growth potential within the current economic structure and sector clusters could be identified using two criteria: a) higher

[35] The EU has developed a definition of when hydrogen is low carbon (lifecycle CO_2 emitted per kg produced). More can be found in Baker McKenzie (2022) The Recognition of Low-carbon Hydrogen in the EU https://www.bakermckenzie.com/en/insight/publications/2022/02/recognition-of-low-carbon-hydrogen-in-the-eu.

[36] World Bank 2022b.

[37] Ibid.

decarbonization potential in the most productive sectors with higher value added, and b) better jobs potential. The growth potential of these sectors is analyzed by applying a modeling framework based on a Global Trade Analysis Project (GTAP) database that describes international trade patterns and links individual countries and regions.[38] This approach provides useful insight regarding optimal resource allocation within the current economic structure.

Sectoral GHG emissions and the potential for their reduction are important considerations when identifying areas with green growth potential. Carbon emissions in Azerbaijan are dominated by electricity and heat, which account for 14.21 million tons of CO_2-eq. of total GHG emissions.[39] Following electricity and heat, other large contributors to GHG emissions are transport, buildings, manufacturing, and construction. Emissions from land-use change and forestry have been consistently negative since 1990 as carbon sequestration from land has been increasing. Azerbaijan's current nationally determined commitment is to reduce GHG emissions by 35% by 2030, relative to 1990 levels. This would require a reduction of about 9% relative to 2018 levels, equivalent to a reduction of about 4.72 million tons of CO_2-eq. per year.

There is strong decarbonization potential in Azerbaijan's largest sectors beyond oil & gas – mining, trade, construction, and agriculture. These sectors are among the top five contributors to GDP, with agriculture and trade employing over 55% of the population. Decarbonization potential by sector is assessed by looking at: (i) Value Added (VA) per $1 million of investment; and (ii) GHG emissions of each sector per $1 million of investment. This approach is employed to prioritize investments in sectors with the highest potential for reducing emissions while creating value added. Agriculture (including forests and fisheries), water, electricity and gas, mining, and transport are identified as the five sectors with the highest GHG intensity per value added[40] (Figure 14), which signifies an opportunity to invest in greening, low-carbon and climate-smart technologies in these sectors.[41] Besides, greening these sectors could reduce the intensity of GHG emissions while reversing environmental degradation, and is an important country-specific development priority. Investments in green and climate-smart technologies could be costly, but are feasible in the medium-long term while focusing on asset diversification in the short term.

[38] The study uses the data for economic sectors of Azerbaijan from the latest reference year of the GTAP database. Data for the employment, income, and emission multipliers are from the GTAP-POWER database Version 10. It describes the global economy in 2014 via I-O tables. Each country, including Azerbaijan, is presented with values of production and intermediate and final consumption of commodities and services described with a standard input-output (I-O) model. In Taheripour et al. (2021), the I-O model for each country, including Azerbaijan, has been expanded to include a set of data covering economic sectors and inter-sectoral linkages aiming to analyze the investment multiplier effects on employment, value-added, GHG emissions, and air pollution. The model captures the increase in sectoral demand as a consequence of exogenous increase in sectoral investments. Growth potential is measured per million dollars spent on supply-side investments. Since the model relies on the structural coefficients of various sectors of the economy at a point in time, it is limited by a rigid economic structure that only links existing sectors of the economy and ignores the possibility of factor substitution. Moreover, new sectors with high innovation potential are left outside of this static approach.

[39] Our World in Data: https://ourworldindata.org/co2/country/azerbaijan.

[40] Data for the employment, income, and emission multipliers are from the GTAP-POWER Database Version 10.

[41] Further analysis could consider benchmarking GHG intensity of VA production in these sectors in Azerbaijan compared to other countries with similar socio-economic characteristics in the EU and ECA.

Figure 14: GHG Emissions and Value Added per $1 Million Investment

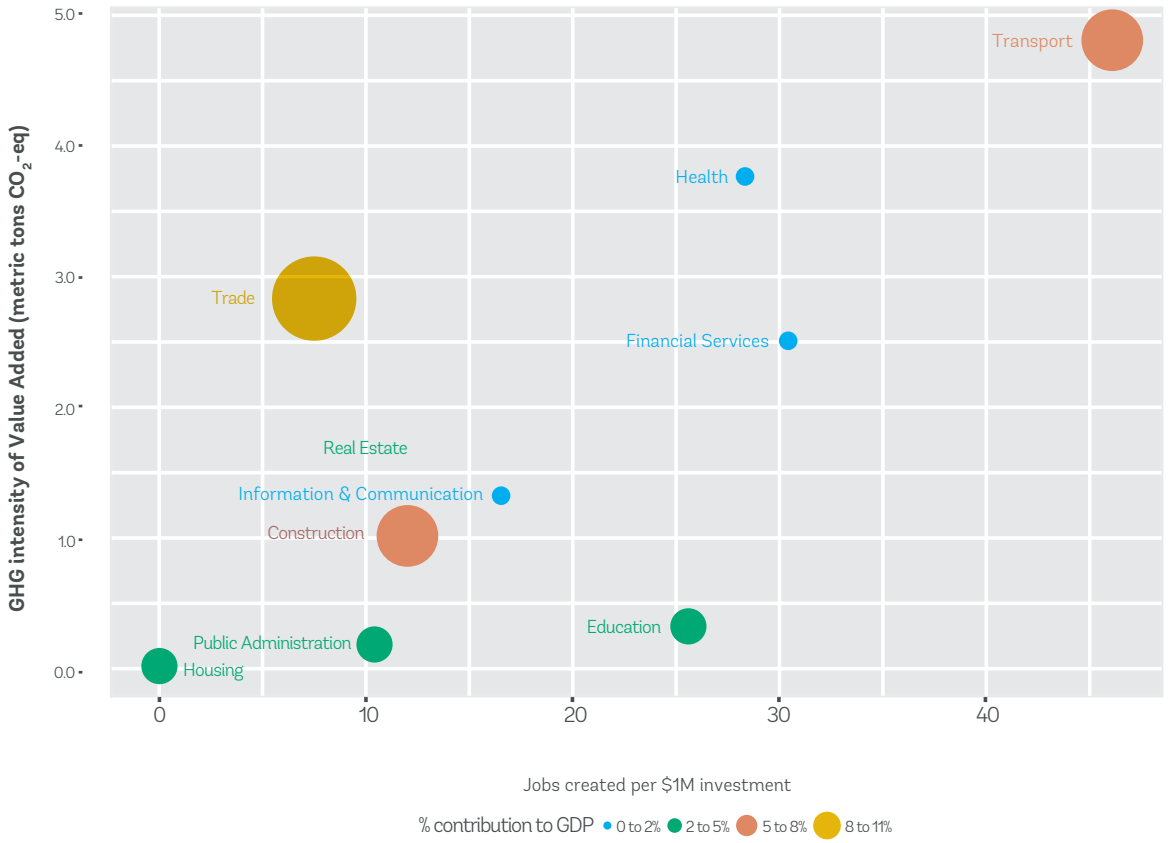
Source: Original estimations for this publication based on data from the GTAP-POWER Database Version 10 and from SSC.

Note: The colors and sizes of the points on the plot reflect the sectoral importance/ contributions to the country's GDP.

Significant job creation potential in sectors with lower GHG intensity in Azerbaijan could be achieved along with assets diversification. Currently, more jobs in Azerbaijan per $1 million of investments are created in brown sectors (electricity, gas, agriculture, water). Asset diversification with a particular focus on human capital accumulation, and strengthening of market infrastructure, is one of the key drivers of growth that can enhance TFP growth in Azerbaijan.[42] Consequently, there is a potential for green job growth in Azerbaijan's lesser GHG intense service sectors such as financial services, health, education, information and communication, and real estate (Figure 15). These are valuable sectors to the economy of the country as well (combined contribution to gross VA is under 15%), but these sectors also create a favorable environment for better jobs creation in other economic sectors via asset diversification. Besides, investments in these sectors have high employment multipliers while reducing the overall carbon footprint of Azerbaijan's economy, advancing Sustainable Development Goal #9, where one of the target's metrics is Carbon Dioxide Emissions per Unit of Value Added. Further details regarding different dimensions of job creation potential, including direct and indirect jobs, jobs creation potential by gender and skill and jobs creation potential per $1 million of investment are included in Annex 2.

[42] World Bank 2022b.

Figure 15: Jobs Creation and GHG Intensity of Value Added Per $1 Million Investment in Selected Sectors with Less GHG Intensity of Value Added in Azerbaijan



Source: Original estimations for this publication based on SSC data and the database for Taheripour (2021).

Note: The colors and sizes of the points on the plot reflect the sectoral importance/ contributions to the country's GDP.

Although not considered in this model, the innovative potential of emerging green sectors and their value for green growth is described in the literature (e.g. see Batini et al. 2021; O'Callaghan et al. 2021).[43] Green investments in renewable energy and nature-based solutions have high economic multipliers, meaning that every dollar of green investments can generate more than a dollar's worth of increase in GDP. Alternatively, equal brown investments in fossil fuel energy generate less than one dollar in GDP increase. Combined with assets diversification, emerging green sectors could boost Azerbaijan's economy.

The following sections summarize the green growth potential and issues for a selection of sectors. They propose initial policy considerations for steering them on a green transition path. The sectors are chosen because of the availability of data, while some other sectors with high diversification potential are not covered. To identify such sectors in a comprehensive way would require further and deeper analysis, including market assessment for potential products, cost, competitiveness, etc., which is beyond the scope of this note.

[43] Batini, N. et al. 2021.

2.2. Human capital development and green growth

Facilitating an effective transition to green jobs requires targeted employment programs (e.g., reskilling and upskilling of workers, social services, intermediation, and matching services). Green transition affects labor markets by generating winners and losers. The impacts of the green transition on employment will depend on the ability of workers to adapt their skills and switch across sectors. Therefore, flexible labor markets and flexible skill mixes are important to alleviating the negative impacts of the transition. Programs for motivating workers in self-learning to absorb social skills integrated with technology for the future would mitigate transition shocks (macroeconomic, health etc.) Adaptive skills and socio-emotional skills are very important to smooth the transition and help reintegrate workers who lose their jobs and also equip them with new skill sets for the green sectors.

There are sectors and activities that offer significant prospects for green job creation. A transformation

of the economy towards less polluting and more resource-efficient activities will require structural changes in consumer preferences and production processes. These structural changes will in turn affect skills demanded in the labor markets. For instance, the green transition could have a direct effect on the agricultural sector which employs the majority of workers in Azerbaijan. The agricultural sector is known to have very low productivity levels. Climate-smart agriculture would boost sector productivity and open opportunities to access key export markets. Adapting to 'green' production patterns (less polluting, biological agriculture) protects workers in the agricultural sector, and it boosts human capital development through the development of new skills. For this reason, developing agriculture policies to encourage climate-smart production and higher productivity, and reducing negative externalities through innovation and technology adoption, could be a win-win proposition in the short term. Nonetheless, during the transition, introducing short-term social protection measures for affected agricultural workers would be essential.

Transition challenges reveal that socioeconomic resilience is extremely low among the poor. In addition to preparing those people for new jobs through Active Labor Market Programs (ALMPs), vulnerable people should be protected by social assistance and targeted services during the transition period. Fortunately, Azerbaijan has recently increased spending on social protection policies and programs, and has well-developed tools for social protection, consisting of both contributory and non-contributory benefit programs. Building on the existing system, especially coverage of the social safety nets, can be expanded to include the population who are at risk of poverty/vulnerability during the transition period. The World Bank is planning to conduct a survey about the Targeted Social Assistance Program (TSA), the largest social assistance program in Azerbaijan. Further areas of research will assess the likely impacts on poverty and inequality and different policy options to mitigate the effects of the green transition.

Climate change impacts food security and consumption in Azerbaijan in various ways. The population engaged in non-irrigated farming already has the lowest productivity levels and cannot resort to irrigation in response to higher temperatures, meaning their food availability and consumption patterns are likely to be impacted. Even in irrigated areas, the potential reduction in water availability and more frequent droughts and extreme temperatures could reduce crop yields. Although the prevalence of undernourishment has fallen in recent years, poorer parts of the population still spent over 60% of their income on food as of 2011, leaving their nutritional intake exposed to swings in food prices. The sharp food price rises of the summer of 2010 necessitated VAT exemptions from the government in order to keep cereal prices (a staple) within an affordable range; this suggests that poorer Azerbaijanis may be vulnerable to the more frequent food supply shocks that may occur in the coming decades.

Transition impacts on the labor market will require mitigation measures in many sectors, including health. During the transition period, some workers will lose their jobs and face fragility and economic difficulties. Offering comprehensive health financial protection systems would not only moderate risks related to catastrophic expenditures but also promote access to and use of health care services, including mental health support. The transition could cause a significant shift in workers' roles and skills in the health sector too. Since many green jobs require workers to learn how to design, manage,build and maintain new technologies, the health sector, as an industry, also needs to develop new skills to be better adapted and aligned with strategies against climate change. These new skills can be used to apply new technologies in health care facilities to minimize resource use in their operation and adopt green medical waste management. Due to the complexity of this topic and sectoral interconnections, there is a need for more targeted research to inform planning and policy making.

2.3. Energy and energy use sectors

By fostering the diversification and low-carbon transition of the energy sector, Azerbaijan would benefit from increasing energy efficiency, decarbonizing power generation by integrating more renewables into the grid, electrifying molecular energy demand where possible (e.g. electric vehicles) and decarbonizing hard-to-abate sectors through the use of hydrogen and derivatives (e.g. ammonia). Increasing energy efficiency is acknowledged as the most cost-effective way to reduce demand, save costs, improve energy security and reduce emissions. Although the government is already investing in the energy sector and fostering exploration through increasing cooperation with renewable energy companies, Azerbaijan has barely begun realizing its extensive potential for renewable energy, particularly wind and solar energy. Realizing this, the Government has set a target of increasing the share of renewable

energy to 30%[44] by 2030, from the current level of 7% of energy generation. An initial assessment by the World Bank reveals that Azerbaijan could develop up to 7.2 GW of offshore wind capacity by 2036, out of a total estimated technical potential of 35 GW for fixed foundation and 122 GW for floating foundation offshore wind technologies. Further work by the World Bank Group is underway to produce a roadmap for offshore wind energy that will identify potential sites, economic viability, network connectivity and possible onshore and offshore environmental impacts. Parallel investments should be pursued in traditional onshore wind and solar PV. Much of this is contingent on the effective implementation of renewable auctions[45] and PPAs for renewable energy, which remains in progress. Renewable integration to the grid will play a crucial role in realizing this potential. Energy efficiency should also be more strongly pursued in order to reduce absolute electricity demand.

In parallel, different options should be explored to decarbonize the energy supply more broadly, especially low-carbon hydrogen. Domestically produced natural gas currently provides for 98% of the electricity generation and should serve as a transitional fuel, ensuring grid stability and providing baseload power, until alternate solutions are ramped up. Initial analyses indicate that with its large offshore wind potential, Azerbaijan has the potential for future production of low carbon and green hydrogen. Hydrogen is expected to find markets in electrified transport, industries, and heating, and for export under future scenarios. Related scientific and engineering expertise for a future hydrogen industry could be drawn from the gas industry, and the government indicated an interest in working on developing a national hydrogen strategy (Box 2).

Public sector intervention and strong policy signals will be needed to incentivize the private sector to invest in renewable energy and unlock commercial capital flows more broadly. The government is pursuing legislative and policy reforms in several areas. The law on Renewable Energy and Energy Efficiency was adopted in 2021. The draft Electricity Market Law has reached the final stages of enactment, which will provide a sound basis for the Market Reform Roadmap supported by the World Bank. The government is currently working on establishing and operationalization of the Energy Efficiency Fund as described in the Energy Efficiency Law. The national climate strategy (under preparation) could provide additional momentum for the energy transition, as it would help unlock climate finance to accelerate the clean energy transition, open up the markets, create new jobs, bring innovation and spillovers into other industries. The Nationally Determined Contribution (NDC) aims to reduce GHG emissions to 35% or even 40% below the 1990 level by 2030.[46] The Azerbaijan government is in discussions on joining the World Bank's Partnership for Market Implementation Program (PMI) to foster NDC implementation. Policies regulating end-use are also urgently needed, including efficiency or emission standards for the industry, buildings, and transport sectors. Private investors bringing capital and technology for green buildings, electrified transport, and value-added manufacturing will bring an additional boost. Removing current barriers to new entrants and enabling access to finance will also help induce investments and promote a more market-oriented behavior among state enterprises. Importantly, while fuel subsidy reforms and carbon pricing that create incentives should be implemented to spur investors and consumers to lower energy consumption and shift to cleaner alternatives, these policies need to be implemented carefully to avoid the potential exacerbation of energy poverty. Azerbaijan's sovereign wealth fund can help plan for the future and leverage more support for diversifying from hydrocarbons.

[44] Ministry of Energy of the Republic of Azerbaijan 2022.
[45] Pursuant to Presidential Decree No. 1209 of May 29, 2019 "On the acceleration of the reforms in the energy sector of the Republic of Azerbaijan," the law on "Use of renewable energy sources in power generation" was issued in 2021. The law defines the main principles of state policy relating to power generation from renewable energy.
[46] Azerbaijan First Intended Nationally Determined Contribution (INDC). https://unfccc.int/sites/default/files/NDC/2022-06/INDC%20Azerbaijan.pdf.

Box 2: Potential for Low Carbon Hydrogen (LCH) Industry in Azerbaijan

Low Carbon Hydrogen can play an important role in the future international competitiveness of Azerbaijan's exports as the world markets increasingly seek products with low carbon intensity. Given the significant renewable resources, natural gas availability, Carbon Capture and Storage (CCS) potential, infrastructure and proximity to key markets, Azerbaijan could become an important producer of blue, green and turquoise hydrogen, jointly known as LCH, and its derivatives, and develop a LCH economy. Blue hydrogen production has the technology maturity, the scale and the relatively low natural gas prices (if we treat the price hike associated with the current international crisis in the region as temporary) to be economically produced today, if a cost on carbon were introduced. Green hydrogen has significant potential in countries with vast renewable energy resources such as Azerbaijan and is expected to become competitive over time in terms of scale and cost. Turquoise hydrogen technology is less mature and therefore more costly, but it is attractive as it transforms natural gas into hydrogen while producing black carbon (not requiring CCS). The size of infrastructure investments required to develop a LCH economy will be huge but can be managed by developing supply-demand hydrogen hubs/clusters much like what's being done in Europe and the US, and by initially using the existing gas infrastructure (by blending hydrogen into natural gas, and repurposing gas pipelines), before building a dedicated hydrogen infrastructure. Global interest in low-carbon hydrogen is ballooning as an avenue for greenhouse gas emission cuts to existing hydrogen producing plants (with fossil fuels as feedstock) and other industries in need of decarbonizing. Hydrogen investments are expected to see an average annual growth of 61% between 2020-2025, reaching $23.6 billion (Rystad). Hydrogen demand is expected to grow between 4 and 6 times by 2050. Still, hydrogen only needs to grow at half the pace that natural gas did in the 1960-70's.

A detailed study of the potential for the development of a hydrogen value chain in Azerbaijan (production, transportation domestic demand as well as export opportunities) is indeed a necessity. In addition, a roadmap for policy and investment actions needs to be developed. The pre-planning phase (2023-2025) of a Roadmap for the development of a low carbon hydrogen economy would have to assesses the key governance actions necessary for the establishment of a hydrogen economy in Azerbaijan. Priority actions for the development of LCH in Azerbaijan would include:

- Establish and operate hydrogen (H_2) national excellence center or department to attend to all H_2 related matters
- Develop the legal and regulatory framework for H_2 production, transport, and storage
- Develop consistent H_2 standards covering quality, GHG intensity, safety, and technology
- Phase out direct fossil fuel subsidies to aid blue H_2 development, and bring in new subsidies for green H_2
- Set targets and provide incentives for the conversion from fossil fuel use to H_2 use in the industrial and transport sectors
- Set up monitoring, verification and reporting systems (MRV) and set targets for decarbonization of the gas value chain
- Set up carbon pricing mechanisms such as Emissions Trading System (ETS) or Carbon Tax
- Incentivize investments in R&D for LCH technologies, and developments along the LCH value chain
- Identify areas requiring (human) resource build up and areas with existing competence that can be further developed
- Establish international cooperation to facilitate capacity building and knowledge exchange
- Develop market design and operating rules for trading of LCH (including derivatives like ammonia) and associated technologies
- Promote Azerbaijan as an LCH provider (fuel and associated technologies) in the international arena
- Sign bilateral agreements with countries which will import H_2

These pre-planning actions can help boost demand, scale up supply and establish H_2 valleys, infrastructure etc. in the subsequent phases of a roadmap.

2.4. Water

Investment in climate-smart irrigation, water supply, and sanitation is key to supporting further sustainable growth. Pollution prevention measures will also directly contribute to enhancing water resources. Among the highest investment priorities would be the inefficient irrigation network and inadequate drainage causing large areas of waterlogging, rising groundwater, and subsequent salinization of agricultural lands. Official statistics suggest that on average, about 26% of all total freshwater abstraction is accounted for as network losses (State Statistical Committee of Azerbaijan 2020). Treatment of polluted surface water for domestic use adds significant cost to the utilities and the economy. A lack of sewage treatment systems in the regions and the Greater Baku area has affected the quality of ground water and of the receiving water bodies and the Caspian Sea. To deal with upstream pollution and domestic effluent, the government has doubled the sewage treatment capacity over the past decade. Additional investments into water and wastewater treatment (including World Bank -financed projects) are also planned. To continue supporting future growth, a long-term program of capacity expansions and enforcement of pollution prevention plans is needed, as well as measures to mitigate investment risks in water-efficient technologies and climate-smart agriculture, including by enabling public-private partnerships in the sector.

Ensuring sustained and reliable water access will require complementary management measures. The government has embarked on water security assessments and sector performance assessments to inform the priorities for the sector. There is a need to augment water storage and aquifer recharge capacity. River flows need to be kept at above minimum levels to maintain a healthy riverine ecology. Management measures need to include water extraction rates and water use efficiency. Domestic and commercial water tariffs are one of the instruments for promoting efficiency and their level is not sufficient to incentivize behavioral change and efficient water resource allocation.

Climate change aggravates water scarcity and elevates the risk of conflicts among water users, which needs to be factored into the resource management policy. Raising the efficiency of water use in the largest group of water users irrigated agriculture — will be key. Annually 54% of the total renewable freshwater resources available are withdrawn, of which 74% is used for agricultural water needs. Consumption by households ranks third at just 4%. The economic productivity of water use in agriculture is estimated at $4 / m3, lower than in other countries,[47] and is a major factor in Azerbaijan's low ranking in the food security index.[48] Nature and ecosystem-based solutions can be considered in lieu of grey infrastructure as part of green growth, and they would strengthen resilience to weather shocks.

2.5. Transport

In 2018, Azerbaijan recorded a total of 172,400 tons of air pollutant emissions, out of which 16,700 tons were carbon dioxide (CO_2) emissions. The transport, storage and communication sectors accounted for 23.7% of total air pollutant emissions and 4.7% of total CO_2 emissions in the same year.[49] Within the transport sector, the road sub-sector is by far the largest contributor (about 91%) to the CO_2 emissions followed by the domestic aviation and maritime sectors.[50] As emissions from transport are rapidly growing, Azerbaijan's Intended Nationally Determined Contributions (INDC) call for the promotion of electric mobility, electrification of railway lines, development of public transport, improvement and expansion of the scope of Intelligent Transport Management System, etc. While measures have been introduced to address the issue of polluting emissions from the transport sector (to address an aging vehicle fleet, set and enforce more stringent fuel and emission standards, incentivize non-motorized transport and electric vehicles, improve low-emissions public transportation and urban mobility, etc.), the current respective government policies still don't seem to be sufficient.[51]

Development of non-motorized modes of transportation (NMT) and pursuing a modal shift from road to railway are the emerging priorities for reducing polluting emissions and greening mobility in Azerbaijan. They also have the potential to green the future growth of this important sector. Despite the recent progress on NMT achieved through 'The State Road Safety Program for 2019-2023,' the institutional framework for NMT in Azerbaijan remains extremely fragmented and there is a lack of norms and

[47] The data is from FAO Aquastat (2021); metric — 'water use efficiency' — tracks the value added in $ per volume of water withdrawn in cubic meters, by a given economic activity over time. It considers water use by all economic activities, with a focus on agriculture, industry, and the service sector, assessing to what extent the economic growth depends on the use of water resources.
[48] Global Food Security Index 2021.
[49] OECD/ITF 2020.
[50] Ibid.
[51] World Bank 2018.

standards. Important policy recommendations for the development of NMT formulated in the recent World Bank study[52] call for the recognition of the important status of NMT as a major green urban mobility mode and for the need to address issues that are impeding NMT development. Promotion of the modal shift from roads to railways holds a strong potential to address air pollution and GHG emissions, and "electrification of railway lines and the transition to alternative current system in traction" is among the measures foreseen by the Azerbaijan NDCs. While most rail operators in the region are witnessing a decline in the share of passenger traffic, ADY, the national railway company, achieved a significant increase with a total of 3.9 million passengers transported in 2019. Despite the policy priorities established, however, the share of railways in freight transportation continues to decline. Overall, during the last two decades it has dropped from 20% in 2000 to about 6% in 2019.[53] During the same period the modal share of road transport has respectively increased from 50% to 66%. Thus, the realization of the targeted modal shift in the freight sub-sector has thus far not been achieved, and requires additional efforts to improve rail infrastructure (e.g. rehabilitation, electrification) and services, the overall efficiency of the railway and logistics system, better enforcement of axle load control, and other policy measures

2.6. Blue economy

Azerbaijan's Caspian maritime economy has significant economic potential beyond the established sectors, which include offshore oil and gas production, shipping, and fisheries. Baku Alat port is the most strategic part of Azerbaijan's logistics infrastructure for the transportation of raw materials and finished products from China and Central Asia to Western markets. The Caspian shore continues to attract investments and people. Nearly one-third of Azerbaijan's population lives in the coastal districts, and about 85% of the country's GDP is generated in this region, mostly in mining, shipping, construction and trade associated with oil and gas exploration. At the same time, the Absheron Peninsula is home to a vibrant urban economy centered around the Greater Baku with a rich cultural value that could be a cradle of an emerging green economy with a significant diversification potential linked to private-sector innovations. The infrastructure of a green economy could be based on recent and planned infrastructural projects, but also supported by a rich biodiversity resource of the Caspian Sea, digitalization of urban development and investment in human capital.

The Caspian Sea is connected to the Black Sea by the Don and Volga rivers, which makes Azerbaijan a crucial connecting country between Asia and Europe and East and West transport corridor. The Caspian Sea creates multiple advantages for Azerbaijan to build and develop economic ties through the maritime economy. The growing mobility of the population and connectivity of the region and Azerbaijan's nature and cultural heritage create new opportunities for economic development outside the oil and gas sector, especially in tourism and fishery, fueling Azerbaijan's Blue Economy (BE). Strategies and policies to develop the blue space using an ecosystem approach will offer multiple green solutions. However, these opportunities could be realized only after cleaning and rehabilitating the coastal areas, plugging the abandoned wells, reducing pollution to the sea from oil and gas drilling and transportation, and green redevelopment of coastal areas. USEPA has estimated that every year the abandoned wells emit as much GHG as 21 mil vehicles on the road. They also estimated that plugging abandoned wells could reduce GHG at a cost well within the range of other climate policy options – roughly $67 to $170 per ton of CO_2-eq. GHG reduction. Integrated pathways for implementation of green solutions will offer opportunities for alleviating the stressors to the marine environment, strengthening the resilience of marine and coastal systems and developing of the BE potential. In the medium term, significant benefits of BE could exceed the required investment cost, including both cleaning and development needs. However, comprehensive research will be necessary to determine further what, where and how Azerbaijan's BE potential can grow.

Azerbaijan can tap into the blue-green benefits of the Caspian Sea as another source of economic growth. The Caspian region is rich in biological resources and serves as the world's largest spawning ground for sturgeon. BE has a high potential for green jobs creation, with the fishing sector standing out as generating the most jobs per $1 million of investments. The regional sturgeon industry, which produces up to 85% of the world's caviar, has been an economic mainstay of the Caspian Sea Basin for centuries[54] Overfishing and pollution are the two main reasons for the Caspian Sea's declining fish stocks. Overfishing is driven by demands from local consumers and

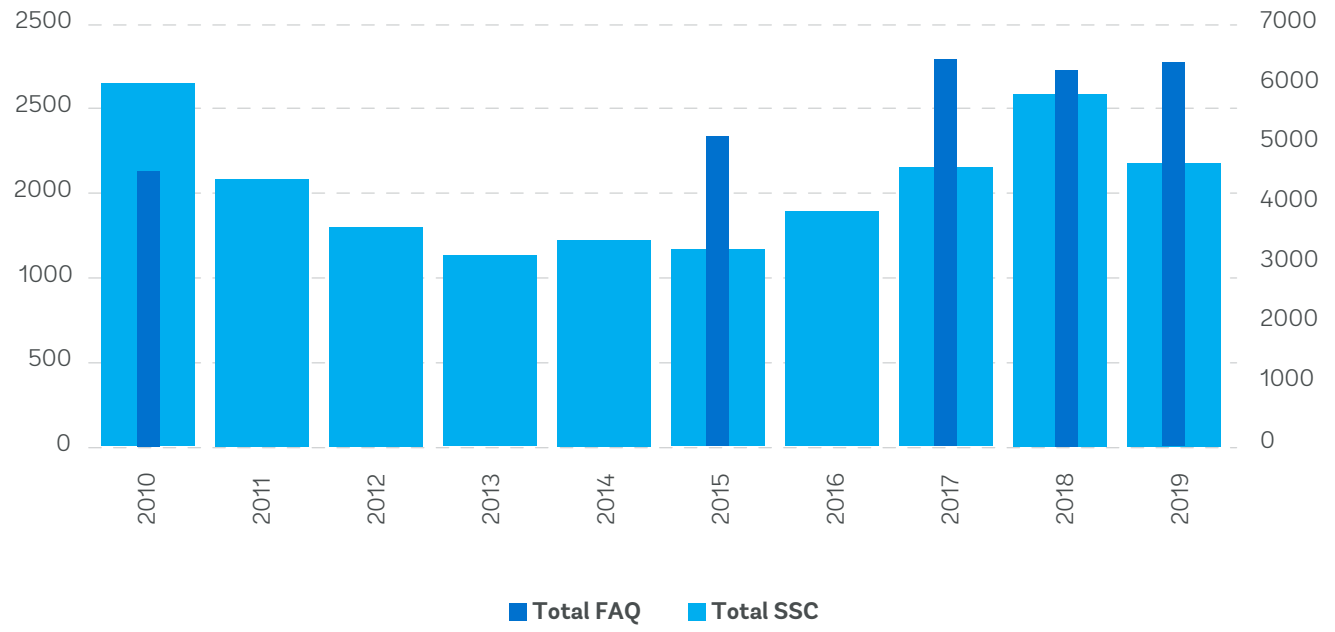
[52] World Bank 2019.
[53] SSC 2020.
[54] UNDP-CEP Report http://www.caspinfo.net.

international demand for black caviar. Improved management of fish stock and effective regulations could address the obvious issue of "too many boats chasing too few fish." There is considerable evidence to suggest that pollutants[55] from petrochemical products, industrial discharges, and untreated municipal wastewater – and other stressors of the coastal ecosystem – are impacting the marine ecosystem.[56] This exacerbates the problem of overfishing, which has already led to declining fish stocks (e.g. sturgeon and other commercial fish species). Azerbaijan has untapped opportunities for inland aquaculture which could grow into a cohesive green growth alternative. Currently, inland commercial fishery activities are concentrated on four larger waterbodies: the Kura River, Lake Sarysu, and the Mingachevir and Shamkir reservoirs. Yet, without further research it is difficult to evaluate the green co-benefits of expanding inland fisheries in Azerbaijan's water bodies. There are significant greening opportunities in establishing models of sustainable fishing, the benefits of which are (a) restoring essential ecosystems in the Caspian Sea, and (b) promoting alternative livelihoods through sturgeon aquaculture – an industry with huge economic potential.

Source: FAO 2020, SSC 2020.

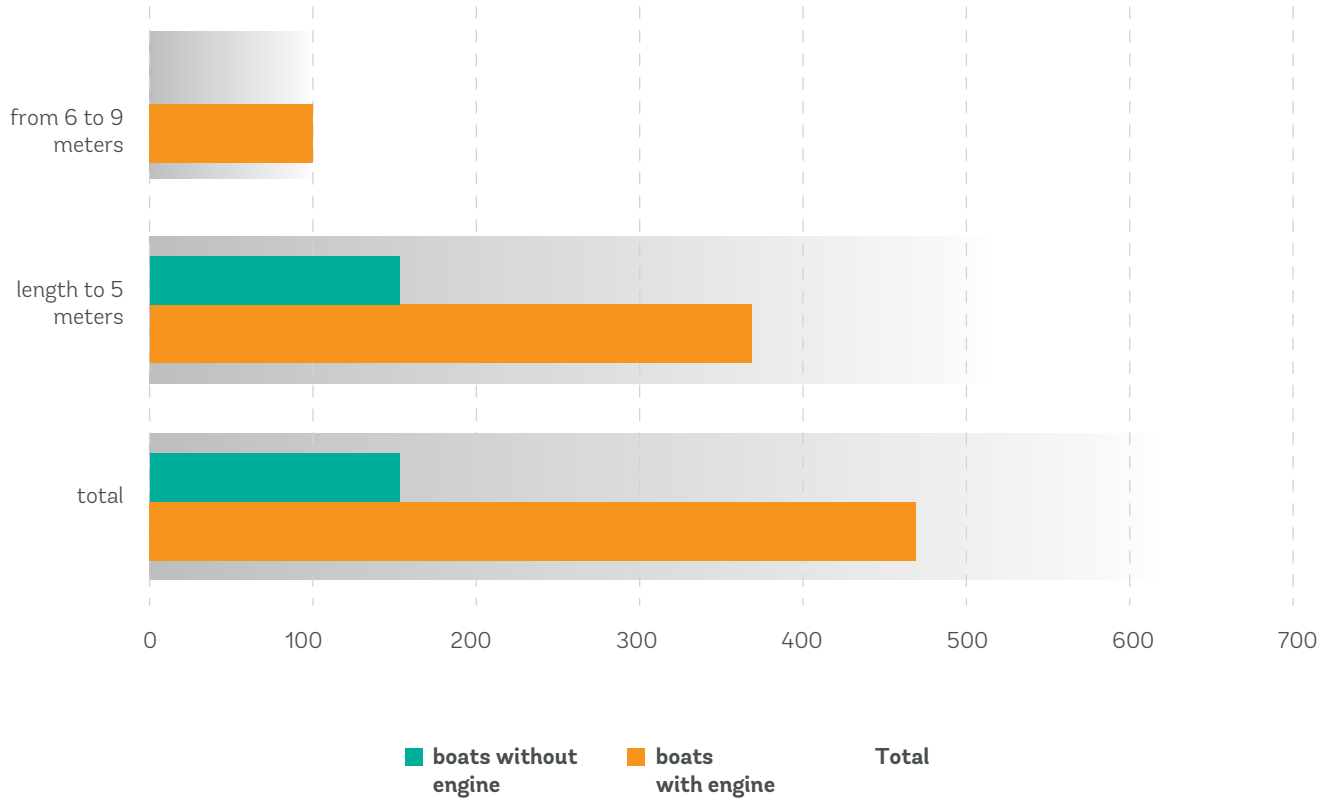
To realize BE opportunities in the Caspian Sea, environmental and sustainable resource management issues need to be prioritized at the regional level. Discrepancies in fish catch and catch quota, from the FAO and the International Commission on Aquatic Resources of the Caspian Sea (ICARCS), point to over-fishing (Figure 16). ICARCS defines and distributes the catch quota to major commercial fish species between Iran, Kazakhstan, Russia, Azerbaijan and Turkmenistan. To sustain the fishing industry, a total allowable catch (Figure 16) should be set and enforced to protect the biodiversity of the Caspian Sea, as well as to regulate the transboundary impact of overfishing. Science-based regulation of fish stock will allow an increase in the value of Azerbaijan's blue resources and protect their significant potential to support the diversification of the national economy. However, climate change will have strong impacts on the Caspian Sea and the coastal areas, which must be analyzed in detail and managed in order to sustain the potential of BE (Annex 4).

Figure 16: Fish Catch (tons)



[55] UNEP 2002.
[56] Jafari, N. 2010.

Figure 17: Number of Boats Engaged in Fishing, 2019



Source: SSC 2020.

Chapter 3: Integrated Approaches to Foster Growth and Climate Resilience

3.1. Adaptation – why and how

In addition to the transition risks, Azerbaijan's economy is exposed to the physical impact of climate change. Addressing the related risks on time and in a strategic manner will bring multiple benefits. The awareness of the importance of resilient societies is increasing after the experience with the COVID-19 pandemic. Globally, climate change has the potential to cause multifaceted impacts on countries and societies of a comparable magnitude,[57] and climate resilience[58] has become an important and growing subset of system-level resilience. Thus, the diversification efforts towards greener growth in Azerbaijan need to consider the anticipated impacts of climate change on different sectors and aspects of life, notably the risks as well as the potential opportunities they bring. An overview of climate-related risks and vulnerabilities for Azerbaijan is provided in Annex 4. Climate Risks in Azerbaijan

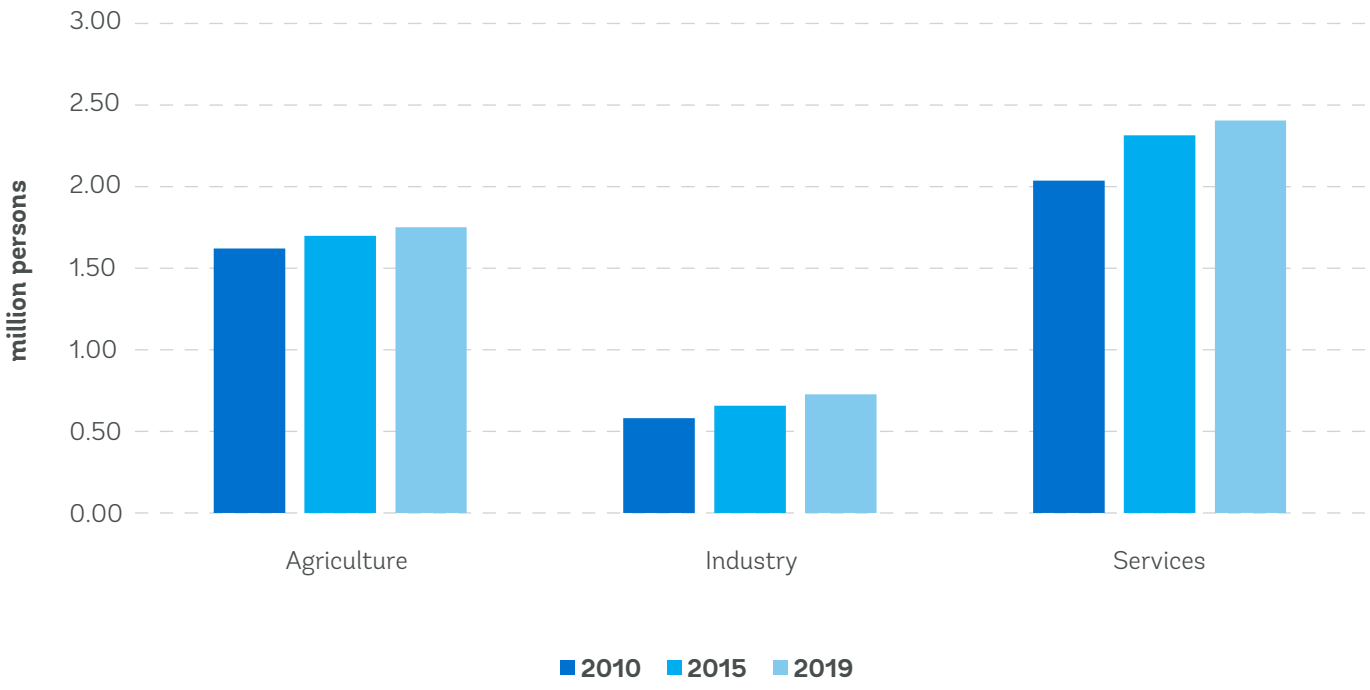
Multiple benefits from adaptation, named as 'triple dividend' by the Global Commission on Adaptation[59] need to be considered when prioritizing actions for green growth. For example, in the context of Azerbaijan, the green growth and climate action prioritization of activities may consider the following criteria (i) both mitigation and adaptation benefits are feasible; (ii) potential for contribution to addressing sector- and country-specific environmental challenges and goals; and (iii) potential for addressing the identified climate risks and vulnerabilities and strengthening climate resilience. Adaptation actions can deliver on several development priorities in Azerbaijan. However, to inform the creation of country-specific green growth criteria (e.g. green taxonomy) and propose policy interventions there is a need for targeted analytical work about the short-, medium-, and long-term physical and transitional impacts of climate change in Azerbaijan and how they would affect the economy and social systems. The following sections summarize the potential for an integrated approach that can steer growth while strengthening climate resilience and generating environmental benefits in some sectors. Other areas (e.g. green cities) also offer opportunities for green and resilient growth and need to be explored in more detail.

3.2. Agriculture and sustainable use of land resources

The agriculture sector is a major employer, but it has not been able to reach its full potential. There is significant scope for higher productivity and value addition, the gains of which could be shared across a large number of workers in the form of better jobs and higher incomes (Figure 18 and Figure 19). The sector is constrained by a host of factors, including farming practices. This has been recognized by the *Strategic Road Map on the Production and Processing of Agricultural Products* (2016) which presented holistic sector reforms via commercialization and reorientation towards markets and exports, value-addition and agro-processing, import-substitution, and the adoption of environmentally sustainable agriculture.

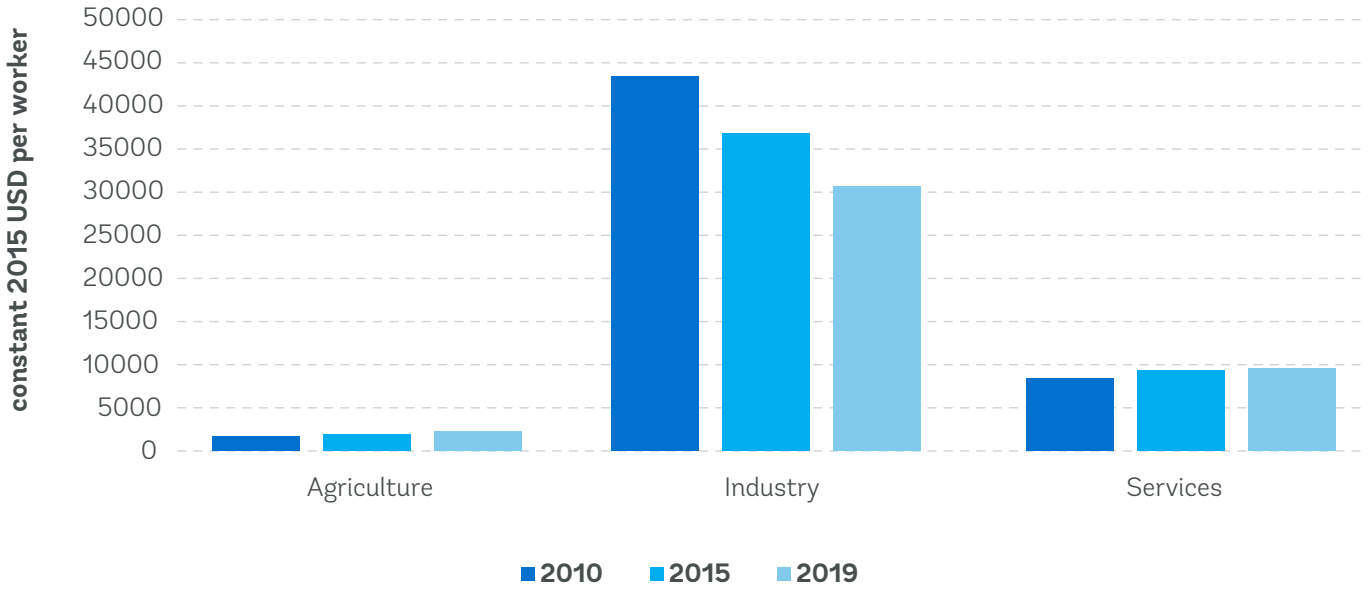
[57] According to World Economic Forum (2021), environmental and climate-related risks are accounting for four of the top-five risks by likelihood and three by impact.
[58] Climate Change Adaptation is the process of adjusting human systems and societies to the impacts or expected impacts of climate change, and Climate Resilience is the capacity of a system to cope with, or recover from, climate change impacts, while retaining the essential components of the original system. Strengthening the resilience of a system to withstand climate-related shocks or stressors is where adaptation and resilience intersect.
[59] The first dividend is avoided losses through climate informed adaptation investments that are targeted to reduce future losses. The second dividend comes from the economic benefits through reducing risk, increasing productivity, and driving innovation through the need for adaptation. The third dividend comes from the social and environmental benefits derived from adaptation investments. See Global Commission on Adaptation (2019) https://gca.org/report-category/flagship-reports/.

Figure 18: Azerbaijan's Employment by Sector and Year



Source: World Bank 2022a (forthcoming).

Figure 19: Azerbaijan's Value-Added per Worker by Sector and Year



Source: World Bank 2022a (forthcoming).

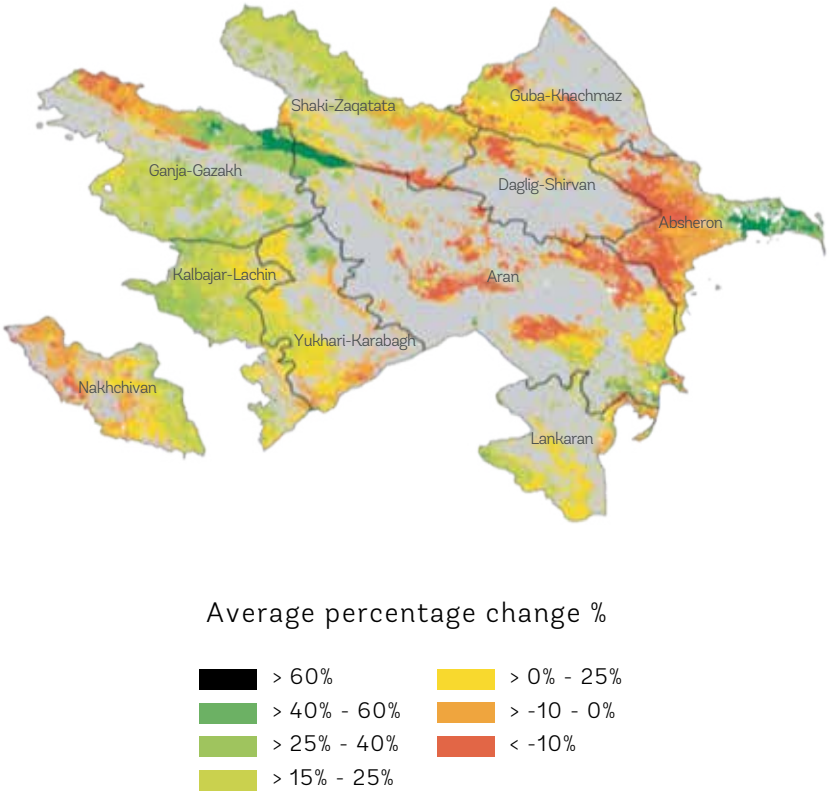
One of the impediments to achieving higher agricultural productivity is the sub-optimal irrigation system and water resource management. Around 1.4 million hectares of the country's arable land are irrigated (SSC 2020) but irrigation systems are plagued by water delivery issues, including high water losses and poor or no drainage. This has led to high levels of salinization and water logging. Irrigated agriculture is also highly susceptible to the impacts of climate change, with drought frequency being a prominent production risk. Shortfalls in irrigation and seasonal runoff variations during the April-November period are estimated to be responsible for crop loss of over 60% for irrigated areas in some southern regions, while the Eastern Lower Kur basin experiences over 20% crop loss.[60]

Climate Smart Agricultural (CSA) technologies can address productivity issues while enhancing resilience and reducing emissions. Modern technologies for climate change adaptation (such as modern irrigation technologies, drought-resistant seeds and livestock, and others) do exist in Azerbaijan to a very limited extent, and only on large farms. Farmers in Azerbaijan are not well prepared to respond to the impacts of climate change.[61] Azerbaijan is actively seeking[62] and participating in international cooperation[63] in water resources management also to address the need for improving water use in the country's growing agriculture sector, among other priorities.

Reversing the degradation of Azerbaijan's scarce land resources and investing in climate-smart agriculture that also builds climate resilience will be important to fully realize the potential of the country's natural resources. Agriculture accounts for 57.6% of land use, more than half of which is permanent pastureland. Forests account for just under 14% of land cover, a number that has been steadily creeping upwards since independence when it was around 10%. Land degradation from soil erosion affects 42% of the territory of Azerbaijan.[64] Soil erosion can potentially reduce land productivity by 1.2% and generate 0.024% losses in GDP annually.[65] Heavy precipitation and flooding are responsible for most of the land erosion in Azerbaijan. Since 1978, over 500 km^2 of Azerbaijan's coastal areas have experienced flooding. Every other year, around 300 km^2 of land is affected by flooding, with up to 1 million m^3 of soil getting eroded. Between 2000–2007, damages from flooding and erosion alone cost Azerbaijan $490 million.[66] Erosion and landslides damage important infrastructure and affect crop yields. Many areas experiencing soil erosion (indicated by changes in primary productivity) are adjacent to important croplands (Figure 20 and Figure 21). These include the mountainous areas of the Greater Caucasus impacted by frequent floods, and where a loss of forest cover in the Shinchay, Kishchay, Girdimanchay, Pirsaat, and Gozluchay areas have been known to cause soil erosion.

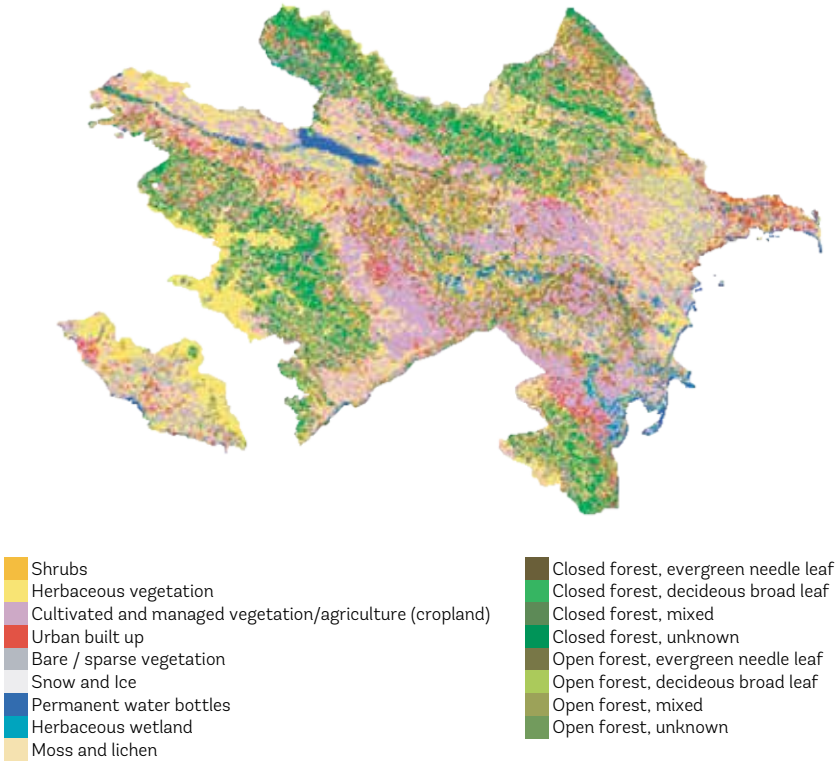
[60] Industrial Economics Incorporated. 2013. Reducing the Vulnerability of Azerbaijan's Agricultural Systems to Climate Change: Impact Assessment and Adaptation Options. Prepared for the World Bank.
[61] Industrial Economics Incorporated. 2013. Reducing the Vulnerability of Azerbaijan's Agricultural Systems to Climate Change: Impact Assessment and Adaptation Options. Prepared for the World Bank.
[62] AzerNews 2022.
[63] Turan Information Agency 2022.
[64] World Bank. 2012. The Republic of Azerbaijan: Climate Change and Agriculture Country Note.
[65] MENR estimates for 2011 are used as a benchmark year in Sartori et al (2019).
[66] Ibid.

Figure 20: Changes in Net Primary Productivity in Non-Cropland Regions, 2000-2013



Source: Original analysis for this publication (GRID benchmarking 2021).

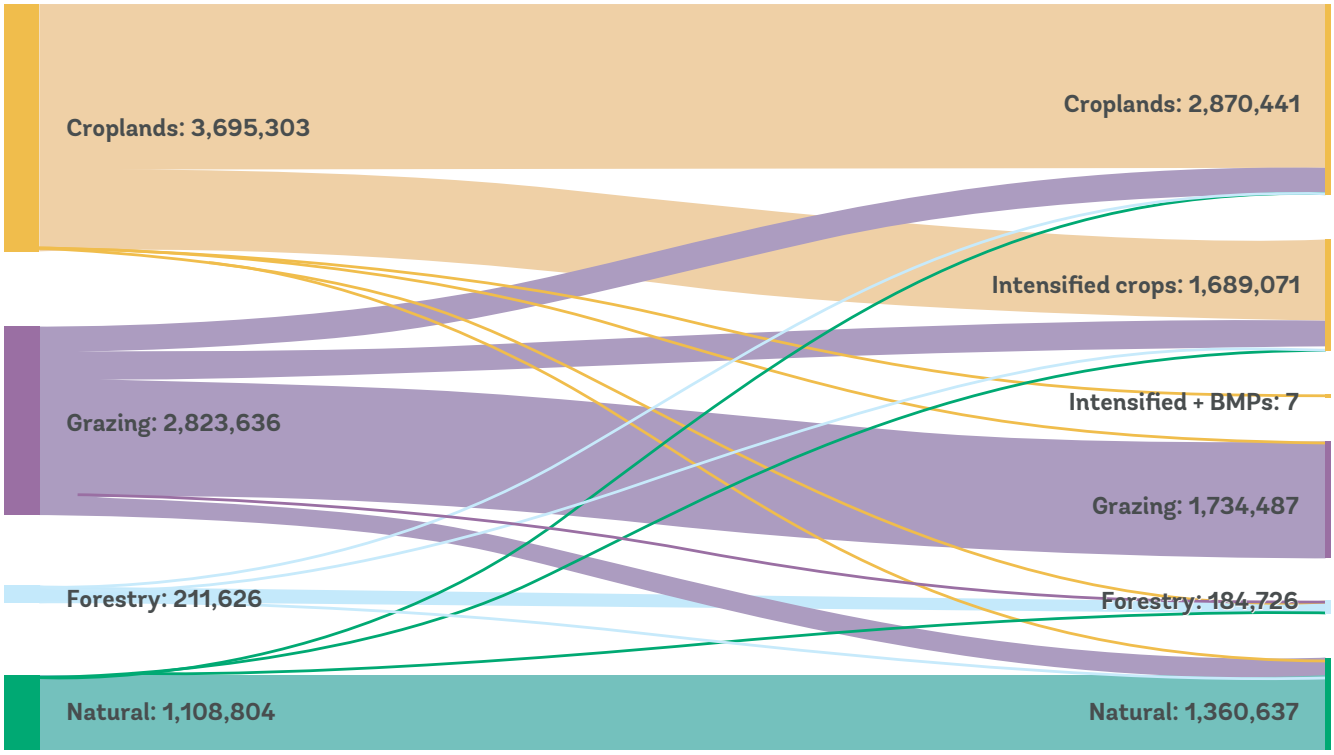
Figure 21: Land Use



Source: Copernicus Global Land Service (Buchhorn et al. 2020).

Azerbaijan currently achieves only 70% of the full economic production potential of land use in crop production, livestock, and forestry, given the observed level of pressure on natural resources. Land use efficiency could be improved largely through intensification of crop lands, and also converting grazing land to cropland (Figure 22 and Figure 23). Significant improvements could be made in biodiversity and carbon storage without any reduction in monetary returns. Maximizing carbon sequestration which holds economic production value constant would lead to an increase of 116 million tons of CO_2-eq. being sequestered, which is equivalent to about 1.5 years of Azerbaijan's GHG emissions in 2018. As shown in Figure 23, these gains are achieved by reallocating approximately 85% of grazing land, with a majority of it being returned to natural land, and the rest split between irrigated and rainfed cropland. In the highlands in the north and south of the country, most of that natural land must be returned to a state of natural forest, whereas the lowlands in the center of the country and near Baku are most productive as natural vegetation and grasslands. About 40% of remaining croplands are intensified through irrigation investments (where sustainable and economical) and increased use of modern inputs. Such changes would help Azerbaijan make progress towards its NDC.

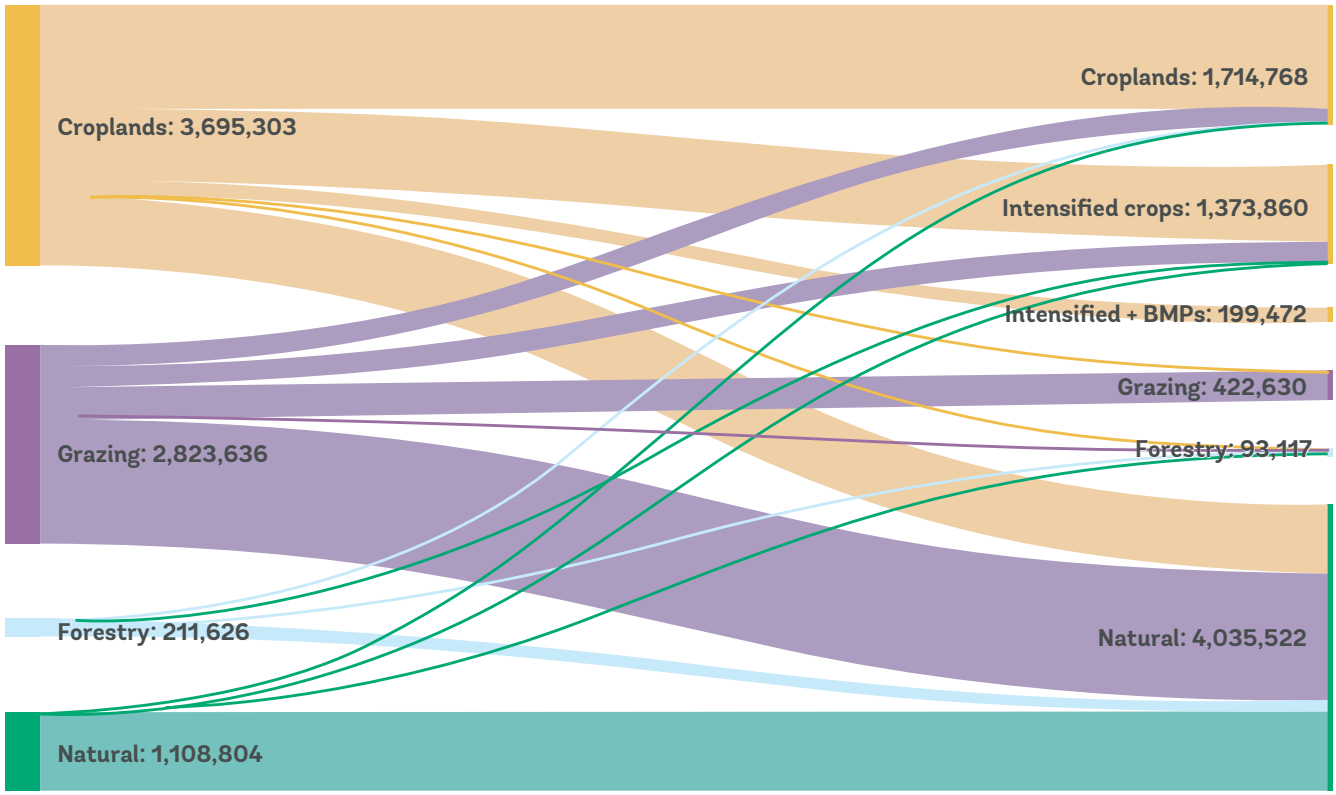
Figure 22: Land Use Land Change Transitions from Current to the Optimal Production Value,[67] Azerbaijan



Source: Original estimations for this publication.

Note: Based on 2018 levels. Numbers shown are hectares. Minor land uses (e.g., urban, mixed use) are not included.

Figure 23: Land Use Land Change Transitions from Current to the Optimal GHG Reduction, Azerbaijan



Source: Original estimations for this publication.

Note: Based on 2018 levels. Numbers shown are hectares. Minor land uses (e.g., urban, mixed use) are not included.

[67] Optimal level in this model corresponds to the Pareto max which is a theoretical maximum of economic efficiency of resources and goods allocation in the economy, and no change can be made without making someone worse off.

Box 3: Khojasan Lake Urban Regeneration

Due to a lack of municipal wastewater infrastructure around the Khojasan Lake (almost 30% of households have no sewage network connections), all effluents are directly discharged to the lake at its northernmost point. Unabated pollutants are mainly concentrated in the north, northwest, and northeast areas of the lake, infiltrating the soil and affecting the shoreline ecology. The total inflow to the lake comprises domestic sewage from nearby residential areas and industrial units, rainwater mixed with sewage water, residual water from small oil extraction plants, direct precipitation, and surface runoff.

Eco/Biodiversity Benefits: Preserving the urban lake ecosystem will increase the landscape's aesthetic value, provide recreational services, and free up additional land for housing and economic activities.

Health Benefits: It could also help mitigate local climate extremes in urban areas, decrease risks for public health associated with contaminated ambient air, volatile pollutants, and contaminated ground and surface water.

Regional Tourism Benefits: It would improve neighborhood living conditions, while potentially creating jobs and new business opportunities and thereby increasing the area's development potential and property value.

The implementation of the remediation plan is estimated to generate a seven-year burst of economic benefits in and around the Khojasan municipality area, and will increase permanent and temporary jobs and wages.

Landscape restoration and land rehabilitation in the polluted areas of Azerbaijan is another component of the efficient land use that is a prerequisite for urban rehabilitation. While reversing environmental damage is important for agriculture and ecosystems' health, it brings other important benefits to land value and living conditions. The case of the Khojasan Lake regeneration illustrates the potential environmental and economic benefits of remediation of land and urban lakes (Box 3: Khojasan Lake Urban Regeneration). Here, remediation and regeneration programs can directly benefit local communities. An estimated 5–6% of the cost of remediation and regeneration works can potentially accrue to communities as wages. The implementation phase will boost gross domestic product (GDP) of the project area by an estimated 5–7% per year during the seven-year environmental remediation period, considering the spinoff effects generated by wages and consumer purchases.

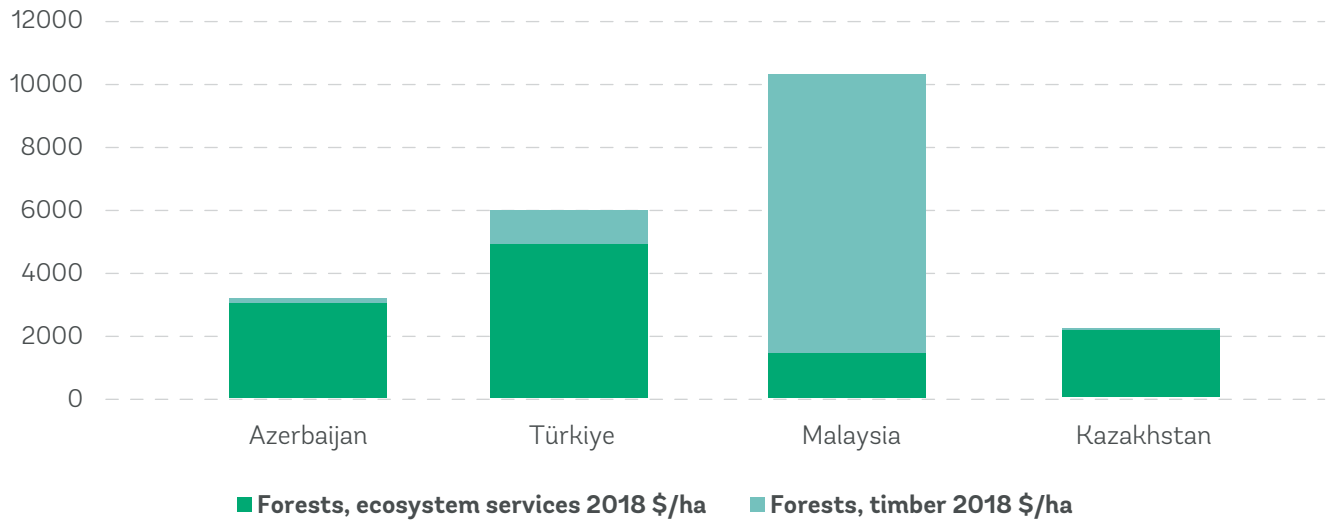
While there is considerable scope for efficiency improvements in Azerbaijan, the challenge lies in finding the right policy mix to deliver these gains. For Azerbaijan, solutions can be categorized into those that encourage shifts away from livestock grazing to the intensification of agriculture, and those that catalyze the desired land-use changes and urban land regeneration. In practice, there are no simple policy panaceas, and hybrid approaches need to be guided by cost, feasibility, distributional concerns and the effectiveness of each policy instrument. Regardless of whether Azerbaijan pursues a path of maximizing economic production or environmental benefits, one of the clear results of the analysis is that there is a need to transition from grazing to both natural vegetations/ forests, and intensified agriculture. Livestock grazing in Azerbaijan is both economically less efficient than crop production and also responsible for significant soil erosion that reduces critical ecosystem services like flood protection and land fertility. Also, addressing legacy pollution is a critical first step for urban development on the Absheron peninsula and unveiling the benefits of BE in the coastal area.

3.3. Forest sector and ecosystem services

The forest sector has multiple opportunities for green growth, climate action, and ecological benefits. There is potential for better rent capture from forestry and forest services in Azerbaijan. The forests are state property and managed with a special focus on watershed services, soil protection, and climate-regulating functions. Accordingly, the main forestry activities are concentrated on forest protection and reproduction, and logging is conducted mainly for sanitary care of the forests as well as plantation management. The unit rent per cubic meter of timber (Figure 25) has decreased since 2010, signaling reduced economic use of forest rents from timber over the expected lifetime of the present timber stock. The causes are likely tied to adjacent land degradation and land-use conversion (World Bank 2021), which could be addressed by environmental policies. According to SSC, forest cover has stabilized at 12% since 2005 with no significant further loss in the forest cover.[68] Logging for fuelwood roughly halved between 2000 and 2016 (World Bank 2020). Yet studies show the value of natural capital (forests and ecosystem services) per hectare of forest cover in Azerbaijan being considerably lower than for peers such as Türkiye, though slightly higher than for Kazakhstan (Figure 24). Although timber reserves have grown by 18% from 2000 to 2018 (SSC 2021), the natural capital value of timber resources per hectare of forest cover is smaller compared to its ecosystem services (Figure 25).

[68] SSC 2021.

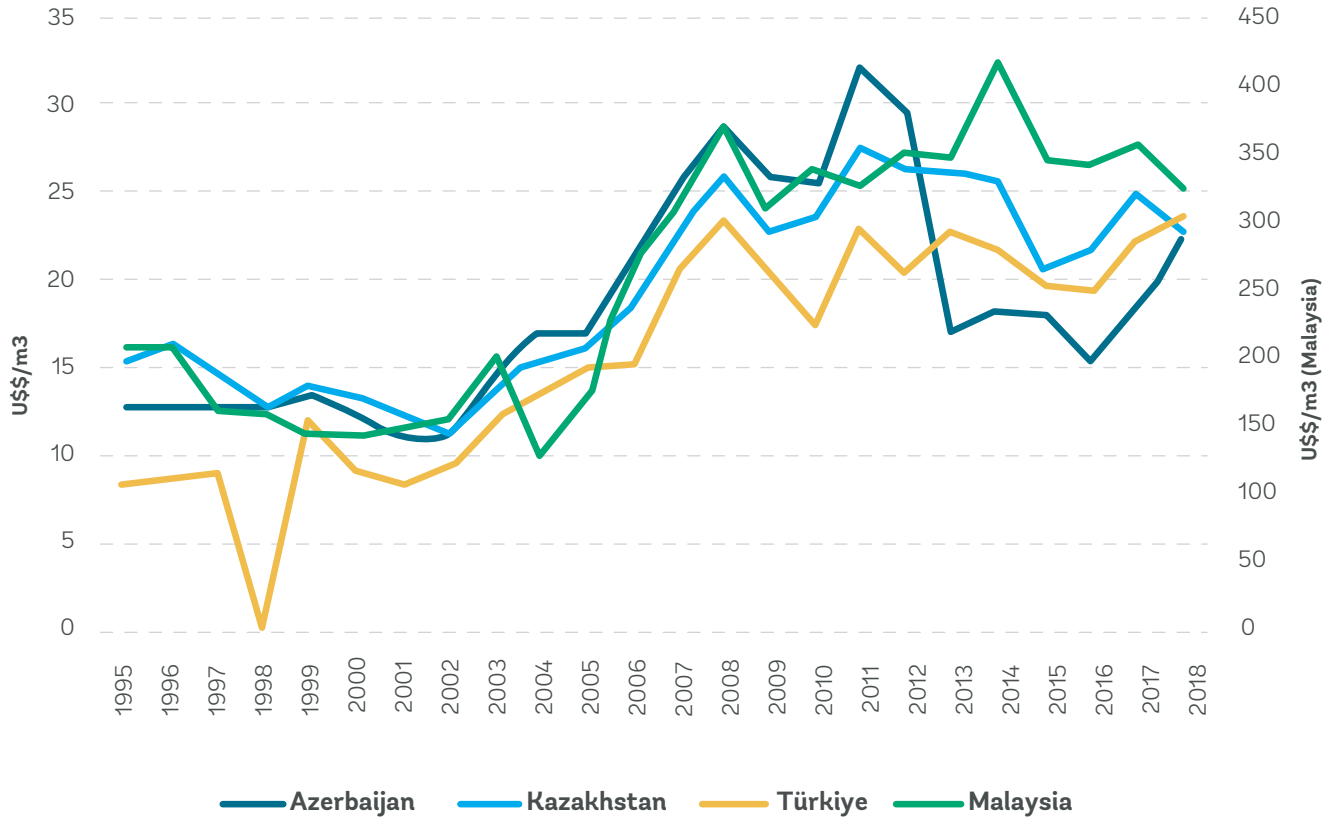
Figure 24: Natural Capital in Forest and Ecosystem Services, 2018 ($/ha)



Source: World Bank 2021b; Forest cover (ha): FAO GFW 2021.

Note: Natural capital in millions, constant 2018 USD.

Figure 25: Timber Unit Rent ($/m³), 2018



Source: World Bank 2021b.

The value of non-wood forest products and services also needs to be captured. The state forest fund accounted for 1,213,700 ha in 2017, with only 2% of the forest fund territory assigned to a recreational area (World Bank 2020). The value of these services is estimated at $72.6 per hectare, which is lower than the ECA average value of $162 per hectare (Siikamäki et al 2015). There are tangible economic benefits from forests to be captured for recreational use and ecotourism. Green policies to halt land degradation, that affect forestry and restore healthy ecosystem services, also have other benefits. Forests also support carbon sequestration potential, and enhancing this function would help Azerbaijan achieve its NDC targets while enhancing the resilience of mountainous landscapes. Implementing Nature-Based Solutions for adaptation, with high economic and employment multipliers, will also contribute to building resilience and improving rural livelihoods. Optimum and efficient sustainable utilization of forest resources will improve the resilience of forest ecosystems against the impacts of climate change and other natural disasters.

Enhancement of ecosystem services in Azerbaijan could be achieved using different policies to incentivize sustainable use of renewable natural resources. PES schemes or conservation land tenders, which incentivize the restoration of forests in the Greater and Lesser Caucasus, are worth exploring. In addition to the carbon and biodiversity benefits that they can generate, they can also help capture tangible economic benefits from forests for recreational use and ecotourism. Other policy instruments like land-protected area zoning and land taxes based on land use could also generate the desired land-use change results, but may have harmful distributional consequences for landowners.

Chapter 4: Strategic Underpinnings and Institutions for Green Growth

Moving the economy on a greener path will foster multiple socio-economic benefits but sustaining them will require stronger institutions and effective policy coordination. Green growth can reduce the burden on land, air and water resources while creating expanded opportunities for gains in productivity, quality of life and social equity[69] (OECD, 2011). Continued economic growth, as an imperative for Azerbaijan, is translated in the national socio-economic development strategy (Azerbaijan 2030 National Priorities for Socio-Economic Development) and has the potential to unlock additional opportunities for sustainable growth. This includes innovations and technology development and more jobs to become part of the national 'green growth' strategy. Of imminent importance will be capacity development for assessing the economic and social impacts and incorporating measures in each sector affected by the green transition to mitigate short terms risks.

Azerbaijan's Vision 2030 transpires the spirit of the 2030 Agenda for Sustainable Development. As the overarching strategic document, it declares five national priorities for the socio-economic development of Azerbaijan, including the 'clean environment and green growth' (Priority #5). The main goals under this Priority are (i) 'high-quality environment,' and (ii) 'green energy zones,' envisioned to be achieved through the introduction of environmentally friendly technologies, use of renewable and alternative energy sources, waste recycling and rehabilitation of contaminated areas. The Azerbaijan Vision 2030 is followed by drafting the Strategy for the Socio-Economic Development for 2022-2026 which also builds on the State Program for Socio-Economic Development for 2019-2023.

Pursuant to the ratification of the Paris Agreement, Azerbaijan has communicated the Nationally Determined Contributions (NDC) in 2015. The NDC established a GHG emission reduction target at 35% by 2030 in selected sectors of energy, agriculture, transportation, and land use. The NDC is currently being updated within the scope of the UNDP implemented EU4Climate Project, envisioning an increase in the target to 40% by 2050; however, the proposed update is pending a formal commitment from the government. Another strategic document under development is the National Adaptation Plan (NAP) which sets specific and time-bound actions in line with adaptation priorities and an updated NDC. In coordination with the NDC update, the Long-Term Low Emission Development Strategy (LT-LEDS) is being developed, which will define new sectoral abatement strategies until 2030 and 2050. The strategies elaborate on the scenarios considering abatement effectiveness and cost-effective analysis. To achieve these ambitious GHG reduction goals, Azerbaijan needs to gradually launch a total of about 1,500 MW of newly installed renewable energy capacity from 2021-2030.[70]

Shifting the development focus away from the dominant oil and gas sector is an important paradigm shift supporting the national climate change agenda. This transformation was embraced by the State Strategy for the Use of Alternative and Renewable Sources for 2015–2020, which determines areas where renewable and alternative energy sources could be introduced for the generation of heat and electricity. This was followed

[69] OECD 2011.
[70] Ministry of Energy of the Republic of Azerbaijan 2021.

by the adoption of the Law on the Use of Renewable Sources in Electricity Generation in 2021, which establishes a mechanism for attracting private (foreign) investments in industrial development. Such mechanisms envision, among others, auctions on renewable energy sources for which the rules are being developed with support from EBRD. This law establishes a framework in line with the respective legislative acts and regulations to be further developed. For example, while the Law introduces the concept of an Auction of the Producer of Electric Energy, the details that differentiate it from the public procurement process are not defined. Tariffs for renewable energy are envisioned, however the difference between regular tariffs and related government subsidies are not considered. The Law mentions the Atlas of Renewable Energy Potential to be developed for each administrative unit (rayon) of Azerbaijan. Once developed, this Atlas will be an important tool for long-term planning of energy generation and area-specific economic profile and opportunities.

The Law on Rational Use of Energy Resources and Energy Efficiency was developed and adopted in 2021, along with the draft Action Plan on Energy Efficiency which stipulates the respective mitigation measures. The Law[71] states the main public policy objectives as follows: (i) ensuring the reliability and security of the energy system; (ii) ensuring competitive economic development through efficient use of energy resources; (iii) creating a favorable environment for the efficient use of energy resources, encouraging investment in energy efficiency measures and high-efficient technologies; and (iv) strengthening cooperation between energy producers, transmitters, distributors, suppliers and consumers, as well as state bodies (institutions) and local self-government bodies.

Given multiple challenges surrounding low-carbon development, stronger and more proactive policies and institutions aligned with national development priorities could effectively support the green transition. Transformative policies that move away from top-down approaches could have significant firepower for the private sector's uptake of green technologies. This includes policies promoting an enabling environment that fuels market changes and incentives for firms and the whole economy to reach their 'green' potential.

Box 4: Institutional Mandates for Sustainable Development

The *Ministry of Ecology and Natural Resources (MENR)* is a National Designated Agency (NDA) for the United Nations Framework Convention on Climate Change (UNFCCC). Following the ratification of the UNFCCC in January 1995, the government established the State Commission on Climate Change (SCCC)[72] in 1997. Its composition was reconsidered and approved in 2020, with Prime Minister chairing and heads of selected state agencies included as members. The mandate of the Commission is to coordinate the efforts of various stakeholders towards the implementation of a country's commitments under the UNFCCC. There is the SCCC Permanent Secretariat under the MENR, which started its operation in March 2022 with the purpose of monitoring the implementation of the NDCs and administrating decisions of the SCCC. The Secretariat closely follows up with all agencies assigned with the implementation of NDCs, analyzes their reported performance and provides regular updates to the SCCC. There is also the Climate Change Center under the Hydrometeorological department of MENR, which coordinates the GHG inventory process, through GHG sectoral data collection and analysis.

The *National Coordination Council on Sustainable Development* and the *Ministry of Economy* lead the voluntary national reporting on SDGs for Agenda 2030 through consultation with various stakeholders including the Parliament, line ministries, public institutions, NGOs, private sector, and academic institutions.

The *Ministry of Industry and Economy (MIE)* is responsible for formulating and implementing the state economic policy and regulations, including, inter alia, management of government assets, development of public investment programs (PIP), determining directions and activities for socio-economic development, and support to private businesses and entrepreneurship. The MIE, along with MENR, is a designated Focal Point for the EU-funded EU4Environment program which is designed to support Azerbaijan in pursuing its path of green transformation and unlocking opportunities for greener growth. Within the MIE, a Coordination Council on Sustainable Development of Azerbaijan has been established to determine and streamline the directions for the socio-economic development for the period 2022-2026.

[71] Prepared under the EU4Energy project and with support from the International Energy Charter (IEC).

[72] SCCC members: Ministries of Finance; Economy; Agriculture; Health; Ecology and Natural Resources; Foreign Affairs; Transport, Communication and High Technologies; and National Academy of Sciences; SOCAR; Azerenergy OJSC; and Amelioration and Water Management OJSC.

Greening the financial system is key to the green transition. In setting the public investment programs (PIP), the MIE closely coordinates with the Ministry of Finance (MoF) which is responsible for setting the medium-term fiscal targets and assigning costs to sectoral public expenditures. The MoF has recently adopted a Medium-Term Expenditure Framework (METF), which should enable the MoF to provide realistic estimates for costing the green budget and linking expenditure allocations to government policy priorities and moving to results-based budgeting. Starting from this year, results-based budgeting began to be implemented in three pilot areas, namely Environment, Agriculture and Education. In an effort to ensure that climate financing is well reflected in the state budget, the MoF has identified the implementation of the Climate Budget Tagging as one of the medium-term fiscal policy priorities.

The transition to a carbon-neutral and climate-resilient economy provides banks and investors with opportunities in green finance. There is both a need as well as an opportunity for the financial sector to support efforts by firms to re-align their business models by funding private sector initiatives, innovations, and the adoption of green technology. To realize these opportunities, the right framework would need to be put in place so that the financial sector can make decisions and allocate capital to align with the goals of climate risk management and mobilization of green finance and to stimulate the development of instruments and markets.

Climate Budget Tagging (CBT) and expenditure tracking could be an important milestone in addressing Azerbaijan's climate-related policy ambitions and goals. The CBT and result-based budgeting are currently piloted by MoF in three sectors – Environment, Education and Agriculture. Along with public finance, aligning the private financial sector with national sustainability and green growth goals is a short-term priority to scale up and speed the green transition. Introducing CBT may be hampered by the lack of expertise in MoF, and lack of transparency in the budget process. Introducing clear measurable targets and performance indicators for green investments that are consistent throughout the entire program implementation, and the accountability of eligible beneficiaries, could facilitate the greening of public and private finances (Box 5). For instance, since 2014 Indonesia has introduced mitigation budget tagging (Low Emission Budget Tagging and Scoring System – LESS) in key ministries to track resources spent on achieving the national emission reduction target of 26% by 2020 while the Philippines has mandated CBT in national budget submissions for all government entities in FY2015.

Box 5: Climate Budget Tagging and International Experience

Climate budget tagging (CBT) builds on the OECD's Development Assistance Committee (DAC) Rio markers as well as the MDB's Joint Methodology for reporting on international flows of climate finance. The UNDP and the World Bank have supported the development of many of the climate budget tagging methodologies through their work on Climate Public Expenditure and Institutional Reviews. There are three essential design elements to climate budget tagging methodologies: definition of climate-relevant expenditures, definition of appropriate coverage, and estimation of climate-relevant spending. There are two distinct approaches to the definition of climate-relevant activities and expenditures. Objective-based definitions distinguish climate-relevant activities on the basis of their intended impact. Most of the countries following this approach have applied the definitions used in the Rio markers. Policy-based definitions limit climate-relevant activities to those that are specifically referenced in national climate change policy documents.

Almost all methodologies cover both central government recurrent and investment budgets, though some countries tag expenditures in a limited number of key institutions. Some countries have extended their tags to local governments. Some include transfers to state-owned enterprises (SOEs). Only one country has tagged climate-relevant tax expenditures.

Countries have followed one of three approaches to the estimation of climate-relevant expenditures: limiting tagging to programs that have climate change as a primary objective; estimating the expenditures associated with the climate-relevant elements, components, or activities; and applying climate-relevance weights to estimate the fraction of program or project expenditure that is climate-relevant. All of these approaches require informed judgments to assign the proportion of expenditure classified as climate-relevant. Tagging methodologies are generally developed by central finance or planning agencies, often in coordination with specialized environment and climate change institutions. Responsibility for the application of climate change tagging is almost always delegated to line ministries and agencies.

Some countries have put validation mechanisms in place to review tagged expenditures, confirm their climate relevance, and reduce the risk of 'greenwashing'—that is, the exaggeration of the climate relevance of programs and projects. Expenditures are generally tagged during budget preparation and in this way provide information on allocations. Rarely do they cover actual expenditures. Even where tagging is integrated into financial management systems, expenditure reports are rarely presented or analyzed.

Source: World Bank 2021a.

Recognizing the implications of climate change for the financial sector, the Central Bank of Azerbaijan has started to develop a strategy, while important work lays ahead towards achieving the objective of greening the financial sector. The strategy which CBA is currently developing would set out the overarching objectives of sustainable finance development aligned with the country's vision for economic development until 2030. It would include action plans to embed principles of sustainable finance in the financial sector, including banking, insurance, and capital markets, and take advantage of the opportunity to develop products and service and improve intermediation. Great emphasis is placed on stakeholder engagement, both in the public and private sectors. In February 2022, CBA also became the newest member of the Sustainable Banking and Finance Network, which is a platform for knowledge sharing and capacity building on sustainable finance for financial sector regulators and industry associations across emerging markets, with 70 member institutions from 47 countries. In addition to the role of commercial financial institutions and the central bank as regulator/supervisor, Azerbaijan also has major government programs supporting access to finance, which could be aligned with climate and environmental objectives. The main agencies include the Azerbaijan Mortgage and Credit Guarantee Fund (AMCGF), the Entrepreneurship Development Fund (EDF) and the Agrarian Credit and Development Agency (ACDA).

Coordination among the institutions on emerging priorities is critical for meeting the national commitments to the United Nations' 2030 Agenda for Sustainable Development. Monitoring the impact of transition outcomes through measurable, comparable, and timely indicators commensurate with the national emission reduction targets is key to ensuring that green transition is effectively taking place. Developing the necessary capacity for evaluation will allow the government to adjust transition directions and policies in response to changing dynamics using new evidence and data.

Chapter 5: Getting Ready for the Future

Azerbaijan is entering a strategic development phase determined by the post-pandemic and post-conflict environment. Acknowledging the global trends and challenges, the government of Azerbaijan has set the country's long-term development on a pathway toward socio-economic and environmental development based on five pillars of the national development priorities for 2021-2030. These priorities are aligned with Azerbaijan's commitments under the 2030 Agenda. The government is committed to encouraging clean technologies and using clean energy sources, recycling, and remediation of contaminated areas. In this regard, selected priorities include a high-quality ecological environment and spaces for green energy and building smart cities and smart villages based on national development strategies and priorities and SDG 11.[73]

Azerbaijan aims to create new economic opportunities in the liberated territories not only for itself but also for the region. In this regard, rehabilitation, reconstruction, and reintegration of the liberated and conflict-affected areas will be among the main directions of Azerbaijan's development path in the coming years.

High and volatile oil and gas prices and market disruptions are likely to increase the pressure and accelerate the global transition toward renewable energy and faster adoption of low-carbon fuels. The expectations are that green hydrogen will become a cost-competitive fuel towards the end of the decade. Nonetheless, it is widely recognized that the transition to a hydrogen economy requires all sources of hydrogen that can be characterized as low carbon.[74] Attuned to that, the EU has published the Hydrogen and Gas Markets Decarbonization Package[75] (2021), which puts forward policy measures required for supporting the creation of an optimum and dedicated infrastructure and markets for the development of a hydrogen industry. This course of action in the global arena could fuel Azerbaijan's impetus to use its comparative advantage from decades of experience in the fossil fuel industry and ratchet up scientific research and technology development to become a leader in green hydrogen.

Undoubtedly, Azerbaijan's long-term socio-economic vision is aligned with sustainability. To realize this vision, developing a strategy that would create a new wave of green and well-paid jobs and taking action to align policies, institutions, and finance around it should start now. A set of recommendations summarized below can help kick-start the green transition and facilitate addressing country-specific challenges.

(i) Addressing the Bottom line: Policy Development and Institutional Capacity for Green Growth

Identifying and developing non-oil sector candidates as alternative drivers of economic wealth will take time and resources. On the positive side, Azerbaijan has a rich natural resource endowment - other than fossil fuels - that can sustain economic growth during the transition. Efficient and sustainable use of land, water, forests, and marine resources has the potential for a higher contribution to future growth and wealth generation. There is also significant potential for developing the national human capital and also

[73] National Coordination Council on Sustainable Development of the Republic of Azerbaijan 2021.
[74] IEA. 2021. Global Hydrogen Review 2021. IEA, Paris. https://www.iea.org/reports/global-hydrogen-review-2021.
[75] The review and revision of the Gas Directive 2009/73/EC and Gas Regulation (EC) No 715/2009 is referred to as Hydrogen and Gas Markets Decarbonization Package. https://ec.europa.eu/commission/presscorner/detail/en/ip_21_6682.

innovation as sources of growth, as the country is accelerating its efforts to promote research and development and digitization. For the transition to green growth, Azerbaijan needs public support and policies informed by adequate pricing of environmental and climate externalities (e.g. green taxation), scientific research and innovation. Implementation of green growth policies also needs the support of knowledge and institutional capacity to implement actions for mitigating transition shocks (e.g., improving the population's living conditions, training, and skills development to facilitate the delivery of green jobs), all of which, in the long term, would help develop the necessary human capital for green growth.

A comprehensive green growth strategy, supported by low carbon policies, regulations, incentives, and finance could create opportunities for spearheading the green transition in Azerbaijan. Strategizing and prioritizing the investment needs of non-oil and gas sectors will, in the long run, contribute to the higher value-added that these sectors bring to the economy. Investments in human capital development for the emerging green sectors would direct private investments to green and less polluting technologies. Targeted public sector interventions will provide incentives and create a reliable policy and regulatory environment for steering the economy on a greener path. Defining and applying green growth targets to the whole spectrum of public sector operations will become a positive influence and spur a shift towards more environmentally friendly products and solutions. One example of defining and applying such green growth targets is through green procurement. As a major buyer of goods and services, the public sector will influence service providers and suppliers to be more sustainable and encourage private companies to grow their capabilities to thrive in the low-carbon economy. As sustainability becomes a key consideration in procurement decisions, the companies will start factoring in sustainability-related policies and practices when bidding in government tenders.

Implementation of the NDCs would benefit from mitigation actions across carbon-intensive sectors and from prioritizing public sector support based on green transition targets. The increased pace of international climate action calls for a stronger focus on mitigation and adaptation in Azerbaijan. Even though achieving current NDC targets is already challenging, the updated NDC and future commitments are expected to increase the ambition of the country's climate action even more. Therefore, accelerating existing climate action (e.g., increasing the share of renewables in electricity generation), conducting analyses of potential focus areas in support of achieving NDC targets and policies targeting the most urgent climate vulnerabilities and increasing resilience (e.g. reducing fugitive GHG emissions, developing a low-carbon hydrogen industry, treating water scarcity and quality, and climate-smart agriculture) should be among the highest priorities. Alignment of climate actions with the national development strategies (Azerbaijan 2030: National Priorities for Socio-Economic Development) and their contributions to building human and natural capital, mobilizing the private sector and supporting innovation and digitization, should all be considered as well.

(ii) Stepping up Private Sector-led Green Growth

Putting public policies in place that enable private sector growth into green markets will bring multiple benefits, innovation, financing, and a stronger focus on efficiency. The potential for job creation, private spending, and economic spillovers to other industries from private investments in green businesses will surpass the public spending in the green transition over time. Private investments will drive new poles of growth like the Blue Economy (BE), healthcare, and services. With the right policies and incentives over time, in sectors where capital financing requirements are the highest, such as green energy and smart infrastructure, the role of the private sector is indispensable.

Azerbaijan could further accelerate technology development and innovation and venture into new markets. Green technologies will help achieve environmental improvements at lower costs and open up business opportunities and markets. The creation of new products, processes and methods would be fundamental to creating green job opportunities and increasing productivity. Azerbaijan's academic and scientific potential in the extraction industry provides major opportunities for green innovations, which include, among others, technologies for renewable energy, carbon capture and storage, heating and cooling in buildings, and hydrogen technologies. Despite some progress, Azerbaijan's current level of innovation is insufficient to achieve its ambition for economic diversification. An important opportunity is to bolster funding for innovation. This calls for short-term policy changes to remove existing barriers. Typical barriers to innovation include financing, information asymmetries, the uncertainty of future policy strategies, and trade barriers. For instance, high-tech, high-investment, and initially risky solutions like hydrogen will only get off the ground if the government puts a high enough price on carbon (see Box 6 on Japan's hydrogen strategy).

Box 6: Japan's Hydrogen Future

Hydrogen can be widely used in various sectors (power generation, industry, and transportation etc.). It is a key technology to achieving carbon neutrality. Japan was the first in the world to formulate the 'Basic Hydrogen Strategy' and possesses advanced technology in multiple fields. Europe and Korea, among others, have also established strategies and are following suit. Wider utilization and application of hydrogen is expected while global decarbonization takes place in various fields such as electric power generation (fuel cell, turbine), transportation (automobile, shipping, aircraft, railway, etc.) and industries (steelmaking, chemical, petroleum refining, etc.). Large-scale hydrogen power generation using turbines is one of the options for power sources in the era of carbon neutrality, which may also contribute to the stabilization of systems as a balancing capacity. Future launches of international hydrogen transactions are expected as Germany and other countries are showing interest in importing hydrogen.

Japan is ahead of the curve and estimates that 10% of hydrogen will be traded in the international market in 2050. The size of the trading market is anticipated to be up to ~55 million tons per year (~5.5 trillion yen per year).

Japan has built one of the world's largest electrolyzers in the world and possesses the underlying technologies. Technology development aiming at further enlargement of the hydrogen markets is underway in companies in European countries.

The government of Japan continues to work on R&D and verification of the innovative technologies related to utilization, transportation, and production of hydrogen through cross-thematic efforts. It also is actively implementing verification of hydrogen utilization in various fields, mainly in locations, including Fukushima, where hydrogen production facilities have already been developed, and in ports, coastal areas, airports, and other facilities for which a large hydrogen demand is anticipated.

Source: Government of Japan. 2020. *Green Growth Strategy Through Achieving Carbon Neutrality in 2050.*

(iii) Supporting Decarbonization Solutions through Green Financing

Public support for green investments will bring stability in the capital markets and financial institutions. Private investors need new public policies to benefit from green investment opportunities. Overcoming the perception of excessive private investment risk in low carbon projects requires the support of new policies based on more ambitious market-led principles and guidelines including the environmental, social, and governance (ESG) principles to foster green investments. Creating a new institutional ecosystem, including developing a green public taxonomy to distinguish between green and dirty economic activities, is a way to minimize the risk of greenwashing. The green taxonomy is an agreed-upon framework for what constitutes green / climate change projects in a specific country context. It can minimize the uncertainty of what counts as 'green' and help the financial actors make informed decisions. The development of a national taxonomy through careful planning, extensive consultations, collaboration, and technical expertise would open new investment opportunities and reduce investors' transaction costs. Another important step for greening the public finances will be introducing Climate Budget Tagging (CBT) and starting to monitor and track climate-related expenditures in the national budget system.

The State Oil Fund of the Republic of Azerbaijan (SOFAZ), the sovereign wealth fund established in 1999, accumulates and preserves Azerbaijan's oil and gas revenues for future generations. SOFAZ is an extra-budgetary fund that was established to ensure intergenerational equality with the country's oil wealth and serves to accumulate and safeguard oil revenues for future generations.[76] The main objective of SOFAZ is to preserve macroeconomic stability in the country, while it could also be used to decrease hydrocarbon dependency. Currently, it also serves to ensure intergenerational equality, finances major social and infrastructure projects to benefit society, and supports socio-economic progress within Azerbaijan. SOFAZ is governed by a Supervisory Board headed by the Prime Minister of Azerbaijan, and its investment portfolio is managed based on Rules on Managing the Foreign Currency assets of SOFAZ. In 2018, SOFAZ ranked 10th among the *100 most significant, resilient, and impactful asset owners and public executives.* As of 2022, SOFAZ had $45.26 billion in Assets Under Management (AUM).[77] See Box 7 for Saudi Arabia's sovereign wealth fund example for using the sovereign wealth fund resource to diversify its economy and reduce dependency on fossil fuels.

[76] International Forum of Sovereign Wealth Funds n.d.
[77] SOFAZ 2022.

Develop a Roadmap for expanding the Green Finance opportunities. The Roadmap will be informed by a review of the enabling environment for financial instruments for private sector engagement in green projects, which continue to gain momentum worldwide (e.g. guarantees for low-carbon and climate-resilient infrastructure, green credit lines to promote energy efficiency, and renewable energy among SMEs), particularly with a focus on identifying the barriers and success factors determining environmental outcomes, and how trade-offs are managed. Further research could be geared towards formulating more practical 'hands-on' guidance for the development of action plans that expand green finance in Azerbaijan.

In the short term, public finance will take center stage when confronting the key social and environmental challenges. Yet public finance could play a powerful market-shaping role as it does not face pressure to deliver short-term returns, meaning it can provide lower-cost and longer-term financing, prioritize wider social objectives, and take a different approach to risk and reward. Developing a range of policy reforms and regulations to promote climate change mitigation and adaptation and improved environmental performance to create an enabling policy environment for private climate investments (e.g., green value chain development, capacity building programs, using environmental certification and labels to access and benefit from growing markets for green-certified products) while using limited public finance to leverage green private investment will go a long way toward steering green growth led by the private sector. The example of Saudi Arabia shows how the sovereign wealth fund can finance the low-carbon transition, fuel modernization in the agricultural sector, and invest in human capital and poverty reduction programs (Box 7).

In the long term, new fiscal rules will be necessary for the gradual replacement of or substitution for government spending on climate and the environment. Worldwide, the Green / Sustainability / Blue bonds have mobilized financing for green investments and spearheaded the implementation of the green growth agenda. Green finance instruments conforming to internationally recognized standards, such as the International Capital Market Association (ICMA's) Green Bond Principles (GBPs) are recognized by institutional investors, who have been the strongest backers of green bonds. This also calls for an accelerated and strategic use of public resources. In recent years, the UK has established a range of new State-owned Financial Institutions (SOFI) and their leading role in funding a rapid transition to net-zero. See Box 8 for the UK example.

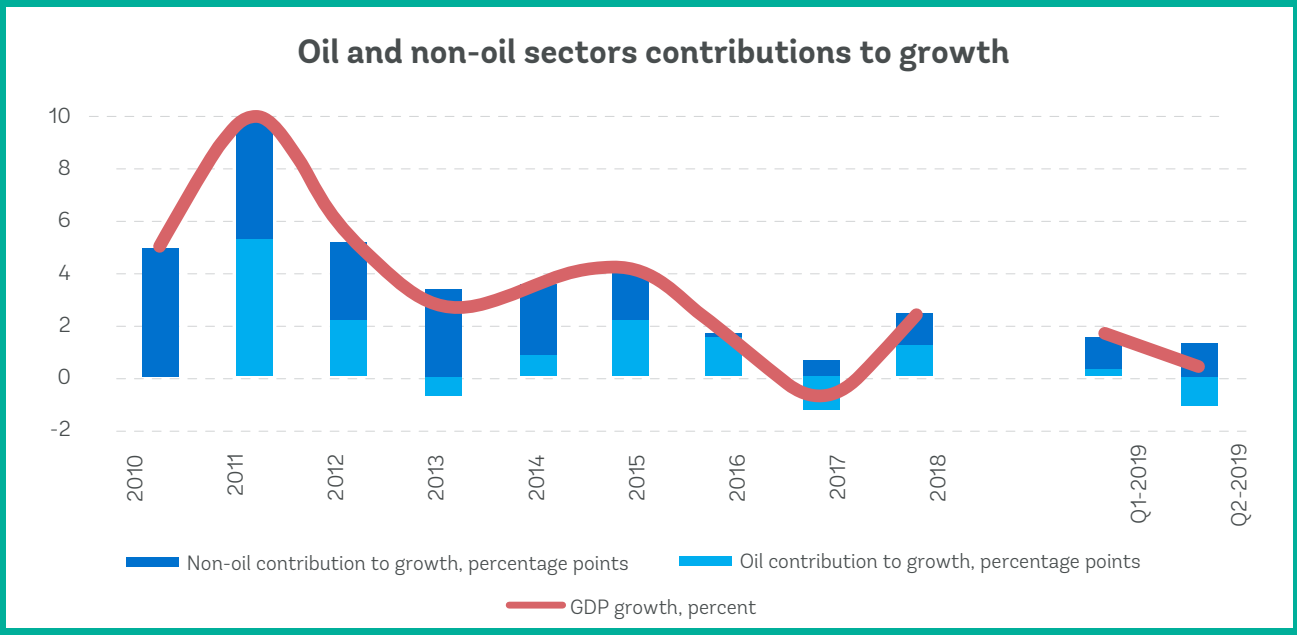
Box 7: Using Sovereign Wealth Funds for Economic Diversification

An expected fall in hydrocarbon reserves and revenues has motivated countries to diversify their economies by developing non-hydrocarbon sectors and by producing goods and services, other than hydrocarbons and their derivatives, which can be traded with the rest of the world. Addressing the issue of economic diversification, policy efforts should be directed to restructure wealth-sharing channels, making them more transparent, economically efficient, and socially equitable, removing constraints of expanded public services, government employment, and exclusive business contracts. Generating sustainable economic growth in a post-hydrocarbon future requires a competitive, dynamic private sector.

Saudi Arabia, for example, shows that an increasing non-oil private sector contribution to GDP (in 2018 totaling just 40%) is a viable approach to assure positive economic growth, even at falling contributions of the oil sector (see Figure below).

Public Investment Fund (PIF) is Saudi Arabia's sovereign wealth fund. Established in the 1970s, it is designed to uncover new growth potentials by investing in international and domestic projects and companies supporting the advancement of 13 priority sectors (see Table below). PIF value in 2020 assets under management (AUM) was $0.4 trillion, compared to Norway's ($ 1.2 trillion) and Azerbaijan's SOFAZ ($ 0.04 trillion) sovereign wealth funds' size.

Unveiled in 2021, the PIF's second Vision Realization Program (VRP), implemented in 2021–2025, unfolds new opportunities for non-oil GDP growth and economic diversification within four themes for domestic investment in all 13 sectors: (i) create industries at scale, (ii) unlock resources potential, (iii) diversify revenue sources, and (iv) improve quality of life. PIF's increasingly diversified portfolio is a key driving factor in the country's economic growth. Until 2025, it will contribute $0.32 trillion to non-oil GDP through the companies in its portfolio and create 1.8 million new direct and indirect jobs. Under VRP, the PIF will continue its progress towards its 2025 goal of S$1.07 trillion in AUM and its 2030 goal of $2 trillion in AUM.



Source: World Bank Group. 2019. "Economic Diversification for a Sustainable and Resilient GCC," *Gulf Economic Update 5: 10.*

PIF's investment focus sectors:			
Construction / Development	Financial Services/ Investment	Entertainment, Leisure, and Sports	Real Estate
Aerospace and Defense	Metals and Mining	Renewables and Utilities	Food and Agriculture
Healthcare	Retail and Consumer Goods	Automotive	Transport and Logistics
Information and Communications Technology			

Box 8: UK Public Finance Ecosystem

The Green Investment Bank (GIB) was established in 2012 to address market failures in the renewable energy finance market, and was privatized in 2017. There are several other SOFI at the sub-UK level, including the Scottish National Investment Bank, the Development Bank of Wales, and various local authority-led initiatives; however, this report focuses on the major UK SOFI.

UK Infrastructure Bank (UKIB) was established in 2021 to replace the loss of access to the European Investment Bank (EIB) and "help tackle climate change and promote economic growth across the regions and nations of the United Kingdom."

British Business Bank (BBB) was established in 2012 with a mission to "make finance markets work more effectively for SMEs." To date, the Bank's core programs have supported nearly £8 billion of finance to almost 94,800 smaller businesses.

UK Export Finance (UKEF) was established in 1919 as the Export Credits Department. UKEF is the UK's export credit agency. It helps UK exporters by "providing attractive financing terms to their buyers, supporting working capital loans and insuring against buyer default." UKEF's maximum financial commitment is £50 billion.

CDC Group was established in 1948 as the Colonial Development Corporation. CDC is the UK's development finance institution. It "helps solve the biggest global development challenges by investing patient, flexible capital to support private sector growth and innovation." The Group has investments in over 1,200 businesses in emerging economies, mostly in Africa and Asia, with total net assets of £6.5 billion and a portfolio of £4.7 billion.

Source: Source: Macfarlane, L. and Kumar, C. 2021.

(iv) Creating Green Job Opportunities and Building the Necessary Human Capital

Employment creation will be driven by the higher demand for skilled jobs in several new sectors and green growth initiatives, across the entire value chain switching to new energy sources, more renewable energy, low carbon-intensive production, and introducing material circularity. There will be opportunities for expanding the job market in BE sectors (new and established sectors) where innovation and adoption of new technologies will raise the importance of analytical skills, such as science, mathematics, and programming along with demand for mechanical skills and equipment maintenance and repair. Activities that curb pollution, GHG emissions, and the use of fossil fuels in favor of more renewable sources and increased energy efficiency and recycling will be at the center of new BE sub-sectors, like marine biotechnology, ocean energy, provision of ecosystem services, and aquaculture, among others. All areas for green / blue job creation will have a common denominator — integration based on innovation, reducing user conflict, and maximizing sector synergies.

(v) Acting on Low-hanging fruits and Greening the Economic Sectors

Reducing fugitive emissions from oil and gas has significant potential to lower Azerbaijan's GHG emissions profile, which may have been underestimated. Methane emissions are a significant driver of human-induced climate change, and given its high fugitive methane emissions (over 50% of total methane emissions),[78] Azerbaijan can play an important role in methane mitigation efforts. To do so efficiently, it will require more accurate information about the state of emissions, a monitoring system, and a set of common-sense mitigation measures, which will need to be widely implemented. Cutting emissions from system leaks is especially important, and measures could include phasing out the gas-powered controls used to manage oil-field valves and pressure and flow systems, which regularly release methane, and introducing new controls and technologies (e.g., using compressed air rather than gas). These measures are not costly and are well within the capabilities of Azerbaijan's industry. Removing the barriers to accurate calculation of methane emissions from the oil and gas industry involves finding the sources of emissions, which would help to identify effective mitigation technologies. Current technology

[78] Our World in Data: https://ourworldindata.org/emissions-by-sector#methane-ch4-emissions-by-sector.

has been improving, and the industries are able to acquire measurement tools for the first time to achieve the spatial and temporal granularity needed to have impactful solutions to address fugitive emissions.

Reducing methane leaks from old/abandoned wells in oil and gas fields is a win-win solution to a decades-old problem that creates environmental and health risks and has a meaningful effect on reducing GHG emissions. In countries with similar problems, regulators and industry officials are looking at emission reduction opportunities by using the most up-to-date information and technologies to address leakages and restore surface locations, revitalizing land in areas that have high economic potential. Absheron Peninsula is such an area with high demand for land development. A government-sponsored program that integrates plugging abandoned wells and revitalizing coastal areas as part of a national BE development program could provide multiple socio-economic benefits, including employment. A dedicated program with funding could alleviate oil and gas companies' responsibility for decades-old production facilities and aid future remediation costs.

Azerbaijan can address environmental challenges and human health risks by promoting sustainable consumption and production and by shifting its current development trajectory towards low carbon development. Promoting policies for circularity, eco-efficiency, and cleaner production will help enhance the environmental performance of enterprises, including pollution prevention and industrial ecology. This involves reducing or eliminating waste at the source by modifying production processes, promoting the use of non-toxic or less-toxic substances, implementing conservation techniques, and reusing materials rather than putting them into the waste stream. Promoting investments by focusing on shifting traditional waste-producing industrial processes to closed-loop systems, where wastes become inputs for new processes, will set Azerbaijan's economy up on a greener trajectory. This includes smart redesign of manufacturing processes that use less energy, reject less waste, and substitute non-polluting inputs instead of using more traditional chemical processes. An added value of investments in sustainable consumption and production is accelerated clean energy transition to meet climate goals.

One of the priority areas for green growth is the sustainable use of renewable resources, including land and water for forestry and agriculture. In In Azerbaijan, this dimension could be explored for potential win-win approaches to advance both economic efficiency and environmental sustainability. Land use and land management influence economic outputs, natural capital, and resulting ecosystem processes that provide flows of ecosystem benefits to people ('ecosystem services'). Taking advantage of the new technologies will contribute to the proper valuation of biodiversity, ecosystems and their economic and health impacts, and consequences of landscape change, as well as to the definition of alternative management practices.

(vi) Blueing the Caspian Economy

Another opportunity for green transition is the Caspian Sea maritime sector with its established and emerging sectors. The Caspian Sea offers multiple economic opportunities and newer pathways for green solutions in the blue space, but this will take time, effort, and cross-sectoral cooperation to realize them. The sectors where new opportunities exist include: (i) blue biotechnology and blue bioeconomy for plant-based alternatives to plastics and other petrochemical applications; (ii) marine renewable energy including floating offshore wind, wave, and tidal energy and floating solar photovoltaic energy; and (iii) maritime security and surveillance focusing on digitalization and technological innovation to help transform the maritime sector. The BE concept creates a framework for integration of efforts for responsible use and stewardship of the maritime resources in support of growth. An integrated approach based on the value and potential of the Caspian marine and coastal capital and tailored for delivering economic and social infrastructure, ecosystem regeneration, and optimizing the performance of existing assets could serve multiple purposes including job creation. This includes cleaning and regenerating the polluted coastal land, preventing untreated effluents into the marine environment, and opening new business opportunities where sea meets the land. However, determining what, where, and how Azerbaijan's BE potential can grow will need further research and planning. A transition to BE that is clean, green, sustainable, and inclusive will require significant investments over time. The 'green' investing is becoming the new normal in a decarbonizing world, and Azerbaijan may fast-track public policies which facilitate green/blue investments to reinforce the opportunities for market-led low carbon development in the blue space.

(vii) Strengthening the analytical capacity and toolkit to support Green Growth

Augmenting the analytical capacity and tools for key

policy development institutions will be needed for a successful green transition. This includes natural capital valuation, wealth accounting, and nature-based solutions as part of the systemic approach to mainstream sustainable development in key sectors of the economy. The most immediate analytical tasks include investigating distributional and macro-fiscal impacts of green transition, modeling decarbonization scenarios, estimating adaptation needs and cost, market assessment of more promising diversification options, and prioritization/sequencing of actions. Adopting the concept of modeling, quantifying, and optimizing potential synergies between natural capital (land, water resources, and biodiversity), the natural and built environment and climate, innovations, and green design and products will help to lower the implementation cost and enhance the green benefits across the economy. Expanding science-based policy solutions for low carbon development will allow Azerbaijan to get the most out of analytical tools and to apply a multi-functional approach to low carbon co-benefits across sectors.

The upcoming Country Climate and Development Report (CCDR) that will build on this Green Growth study will deepen the analysis in priority areas with the objective of bolstering support to Azerbaijan in charting its long-term green growth path.

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Annex 1. Methodology

The assessments use a methodological approach for diagnostics and combine several desk-based analytical tools to help develop the baseline and from that, determine priorities for Azerbaijan's Green Growth transition. Benchmarking of different development paths is conducted against the UMI or ECA countries' comparators, namely with those advancing green transition through the sustainable use of natural resources (minerals, land, water and clean air, and biodiversity), reduction of greenhouse gas (GHG) emissions, strengthened resilience to climate change, and a focus on market openness and technological innovation to stimulate new industries and jobs.

A Green, Resilient and Inclusive Development (GRID) diagnostic is used to provide a snapshot of Azerbaijan on the green transition pathway (see below), Natural Capital Accounts (NCA) is used to estimate the contribution of natural resources to national wealth, and a hybrid of the cost of environmental degradation (CoED) and macro modeling is applied to estimate socio-economic impacts of climate policies and environmental degradation on the population's well-being. The study synthesizes and presents the results of the diagnostics based on several desk-based analytical tools:

GRID diagnostic to provide a snapshot of Azerbaijan's positioning on the green transition pathway

The RISE (Resilience, Inclusion, Sustainability, Effectiveness) framework presents a tailored way to identify the challenges preventing countries from achieving Green, Resilient and Inclusive Development (GRID). Green transformation will require governments to make hard choices among multiple facets of 'better growth' or GRID, especially in the context of limited green investments in the fiscal space due to other priorities. RISE is designed to provide the information necessary for better-informed policy and investment decisions and to assess trade-offs. By identifying 'pinch points' using a variety of methods, the approach assures that the results are robust against a variety of sensitivity tests. Benchmarking is used to compare a country's performance across the RISE indicators to determine where major development roadblocks lie and identify opportunities to improve growth and livelihoods. Benchmarking involves comparing indicators against target values and values in countries at a similar level of development. Collectively, these comparisons provide robust evidence of gaps and achievements on the path to GRID.

Natural capital accounting to estimate the contribution of natural resources to the wealth of the country

Natural capital accounting, reflected in the Changing Wealth of Nations (CWON) database, integrates natural resources and economic analysis, providing a broader picture of development progress than standard measures like GDP. The scope of the analysis tracks the key sources of natural capital wealth of the country that are reported in the national statistics and global databases. Annual estimates of stocks and flows are presented in $ and expressed as a percentage of GDP. The 2021 CWON accounts for natural capital elements relevant to Azerbaijan and includes ecosystem services such as agricultural land (calculated annually for each of 10 major crops), forest timber, forest ecosystem services (three of which are valued at the grid cell level), and minerals (mine-level data on production costs for each mineral). The cost of air pollution, which affects the welfare of the population, although not included in CWON, could be estimated as well. Finally, this approach allows an exploration of how the volume and composition of wealth have changed over time and an assessment of the potential risk of fossil fuel and mineral assets declining in value from a policy change to a low-carbon energy transition.

Hybrid of CoED and macro modeling to estimate the socio-economic impact of environmental degradation and potential of green investments

CoED or macro modeling depending on data availability: modeling at the national level can be used to derive an estimate of degradation costs at an economy-wide level. For example, reductions of agricultural and forestry productivity, impacts on labor force from air pollution, asset damages by floods, among others, have both direct and indirect effects. The former is estimated using the CoED approach. The latter works through changes in prices of all commodities reflected in the ENVISAGE model (GTAP 10 Powerbase and ENVISAGE – see Annex 2). Data for the employment, income, and emission multipliers are from the GTAP Power database Version 10. It describes the global economy in 2014 in the form of I-O tables. Each country, including Azerbaijan, is presented with values of production, and intermediate and final consumption of commodities and services described

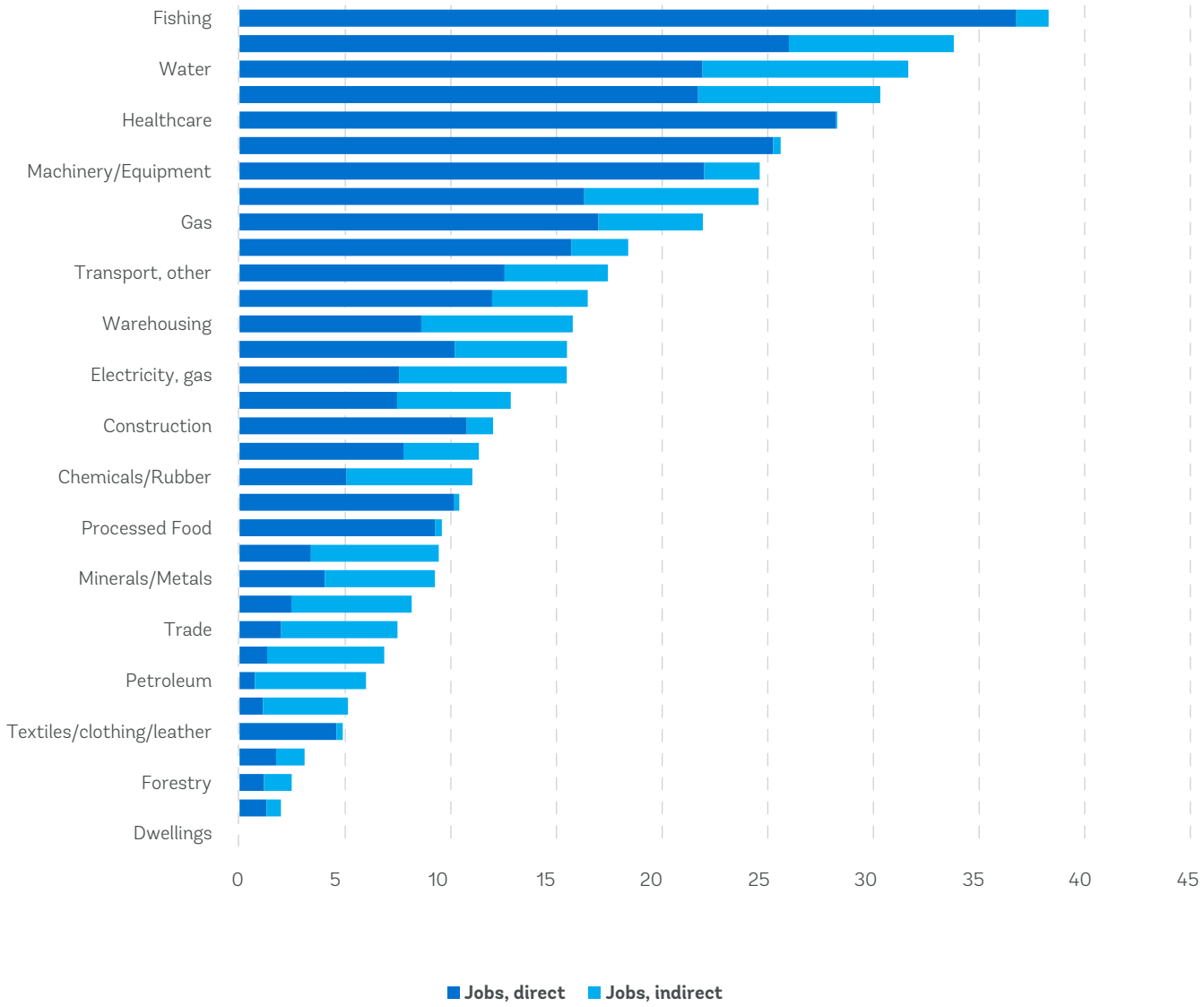
with a standard input-output (I-O) model. In Taheripour et al. (2021), the I-O model for each country, including Azerbaijan, has been expanded to include a set of data covering economic sectors and inter-sectoral linkages aiming to analyze the investment multiplier effects on employment, value-added, GHG emissions, and air pollution. The model captures the increase in sectoral demand as a consequence of the exogenous increase in sectoral investments. Growth potential is measured per million dollars spent on supply-side investments. Since the model relies on the structural coefficients of various sectors of the economy at a point in time, it is limited by a rigid economic structure that only links existing sectors of the economy and ignores the possibility of factor substitution. Moreover, new sectors with high innovation potential are left outside of this static approach.

For the assessment of the EU CBAM's impacts on Azerbaijan's economy, the simulation uses the Global CGE model ENVISAGE specifically tailored to analyze climate change mitigation policies. The modeling is also based on the GTAP 10 Power database. Simulations cover the period 2014–2035, where 2014 is the base year. Baseline projection for the years 2014–2035 covers all variables of the model, including industry outputs, the trade in commodities, relative commodities prices, aggregate economic categories, energy use, and GHG emissions. Baseline assumes that countries reduce their emissions in line with their NDC until 2030 as part of the Paris Agreement. Emissions reduction is partly facilitated by assumed exogenous technical change, such as energy efficiency improvements and expansion of renewables in the generation of electricity. Where these exogenous changes are insufficient, an endogenous price of emissions (a carbon price) is determined to facilitate further emission reduction. The price of emissions invokes substitution of energy for capital (and therefore, further energy efficiency improvement), substitution of fuels for electricity, substitution of more carbon-intensive fuels for less carbon-intensive fuels, and changes in the power generation sector's technology mix.

Annex 2. Different Dimensions of Potential for Jobs Creation

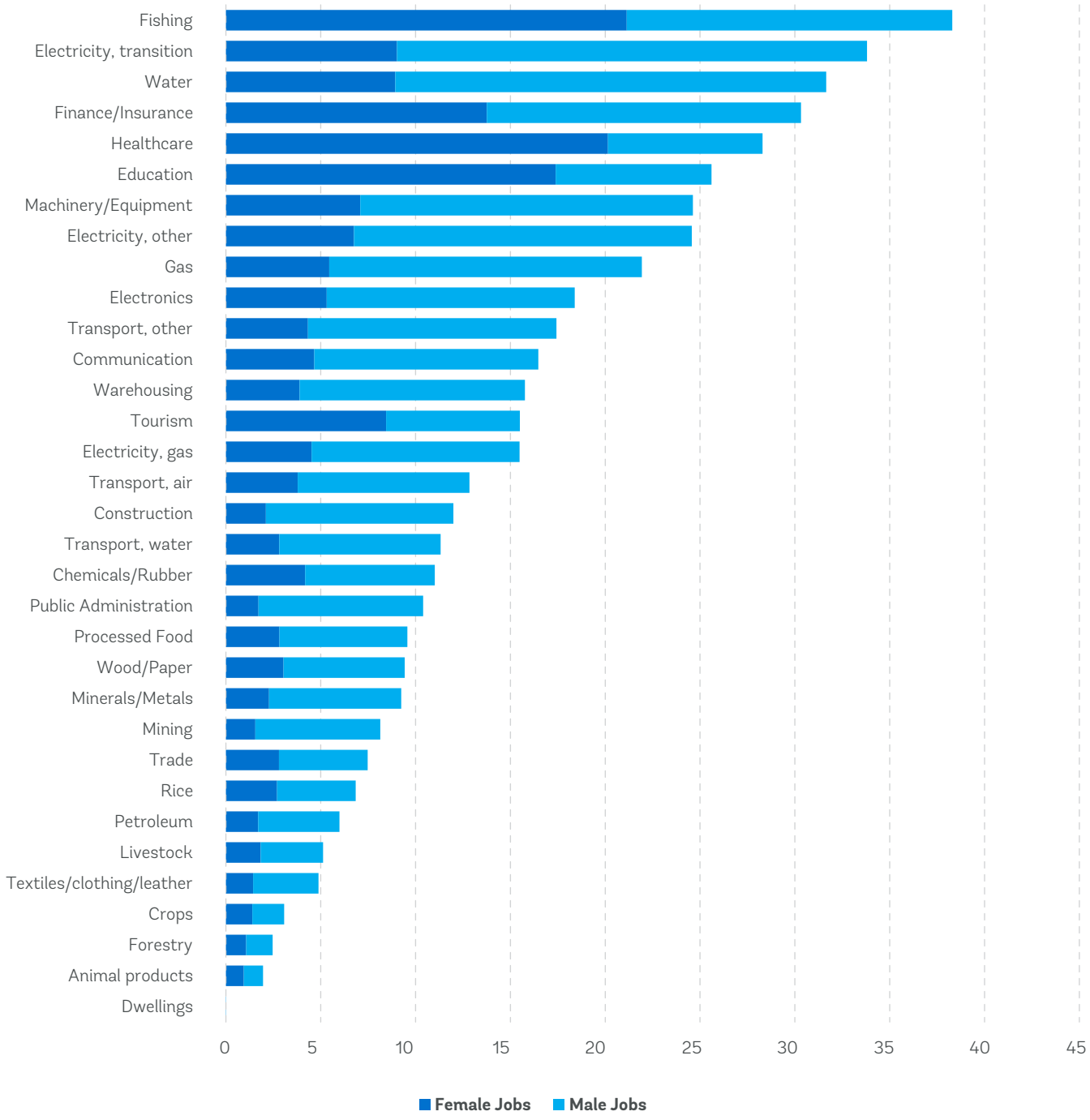
The study generated the information on the potential for jobs creation per $1 million of investment in every sector of Azerbaijan's economy. Data for the employment, income, and emission multipliers are from the GTAP Power database Version 10. This database describes the global economy in 2014 in the form of I-O tables. Each country, including Azerbaijan, is presented with values of production, and intermediate and final consumption of commodities and services described with a standard input-output (I-O) model. In Taheripour et al. (2021), the I-O model for each country, including Azerbaijan, has been expanded to include a set of data covering economic sectors and inter-sectoral linkages aiming to analyze the investment multiplier effects on employment, value-added, GHG emissions, and air pollution. The model captures the increase in sectoral demand as a consequence of the exogenous increase in sectoral investments. Jobs potential in different sectors of Azerbaijan's economy is presented in different dimensions: direct versus indirect, gender, and skills level.

Direct/Indirect Jobs per $1 Million of Investment



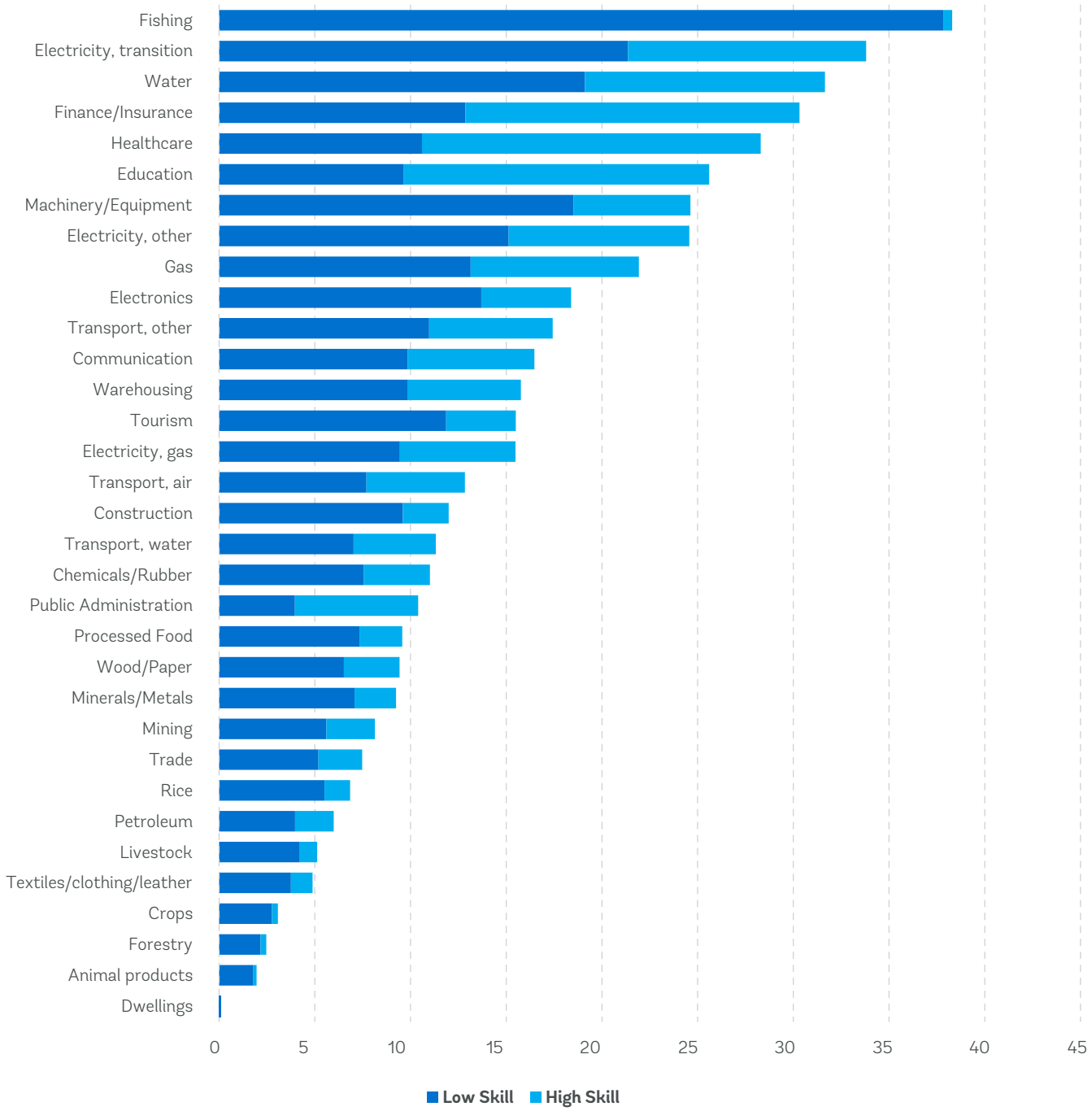
Source: Original calculations for this publication.

Jobs by Gender per $1 Million of Investment



Source: Original calculations for this publication.

Jobs by skill per $1 Million of Investment



Source: Original calculations for this publication.

Annex 3. Simulation of CBAM's Possible Impacts on Azerbaijan's Economy

The EU plans to introduce a CBAM to prevent carbon leakage and support the mitigation ambitions of the EU and other countries.[79] Under the current proposal, the CBAM will be linked to the EU Emissions Trading System (EU ETS), requiring importers to purchase certificates to cover emissions embodied in imported goods. The CBAM price will mirror the EU ETS permit price but will be reduced for products that are subject to carbon pricing in their country of origin. This provides an opportunity for countries to implement domestic carbon pricing, effectively reclaiming government revenues that would otherwise be payable to the EU. It is proposed that the CBAM price will also be adjusted to account for any free allocation of EU ETS permits that the EU industry receives in sectors subject to CBAM.

The embodied emissions will be determined based on the carbon intensity of production of the covered commodities in exporting countries based on a robust MRV system. Where robust emissions measurement, reporting and verification (MRV) is not in place, a default value, equivalent to the worst-performing 10% of EU installations, is used. This means that producers in countries that can demonstrate relatively low emissions intensity of production will face lower CBAM costs, while those without MRV systems will pay a higher default rate.

Under the current proposal, the CBAM will come into full force in 2026, with a transitional phase from 2023–2025, during which importers will report the embedded emissions in the covered products. It will cover Scope 1 (direct) emissions from certain products in the Iron and steel, cement, fertilizers, electricity, and aluminum sectors. The European Commission has signaled that it will likely expand sectoral coverage of the CBAM to other emissions-intensive, trade exposed (EITE) products such as glass, chemicals, petroleum and other fossil fuels, and perhaps other metals, and to Scope 2 (electricity use) emissions.

The CBAM would act like an increase in tariffs imposed by the EU, with tariffs based on products' emissions intensities. The impact on each country will ultimately depend on many factors, including the elasticity of demand, the level of cost pass-through to consumers, each country's emissions intensity and emission reduction opportunities relative to that of competitors, opportunities to divert exports to other countries, and the ability for exporting countries to robustly measure and report emissions.

In order to quantify the potential impact of the CBAM on Azerbaijan's economy and that of other countries in Europe and Central Asia (ECA), the ENVISAGE model that utilizes GTAP 10 database[80] **is applied.** The modeling scenarios explore the impact of the EU CBAM on the overall economy, as well as on individual sectors, under different policy responses from Azerbaijan and other countries. It also investigates what might happen under different CBAM coverage, if the U.S. adopted a similar mechanism, and if ECA countries respond to the CBAM with carbon pricing. The scenarios modeled and discussed in this report are outlined in Table A 1.

[79] European Commission 2021.
[80] https://www.gtap.agecon.purdue.edu/databases/v10/index.aspx.

Table A 1: Modeled Scenarios

Short name	Description
All countries take action to meet NDCs	
Baseline	All countries reduce emissions in line with NDCs. No CBAM is introduced.
Current proposal	As under 'Baseline,' but CBAM introduced in EU & EFTA, with obligation to buy permits from 2026, covering Scope 1 emissions for certain products in iron and steel, aluminum, cement, fertilizers and electricity in line with the current proposal. Countries' domestic carbon prices credited towards CBAM charges. Free allocation is accounted for in the CBAM price applied.
Expanded CBAM	As under 'Current proposal,' with coverage extended to all chemicals, all non-ferrous metals, petroleum and coal production (embedded emissions during processing, not on the carbon content of fuels), extraction of asphalt bitumen and iron ore, and glass. Scope 1 and Scope 2 emissions are included.
US	As under 'Expanded CBAM,' but with the US also imposing a CBAM on the same emissions scope, from 2026. No free allocation is included for the US CBAM.
All ETS, US	CBAM applied to Scope 1 and Scope 2 emissions for all products in all ETS sectors by both the EU & EUFTA and the U.S.
ECA countries do not take further action to meet NDCs	
Baseline, No NDC in ECA	Non-EU/EUFTA countries in Europe and Central Asia (ECA countries) take no further action beyond current measures, so may not meet NDCs. All non-ECA countries reduce emissions in line with NDCs. No CBAM is introduced.
No NDC	As under 'Baseline, No NDC in ECA', but CBAM introduced with coverage aligned with 'Expanded CBAM'.

Emissions intensities for each country's outputs are derived from GTAP data and could deviate from actual emissions intensities. The model reflects an improved competitiveness for countries with less emissions-intensive production versus those that are more emissions-intensive. However, importers will only be able to use their actual emissions intensity if there is robust MRV. For example, if exporters in Azerbaijan are not able to provide robust emissions intensity numbers, their products may be subject to a higher CBAM cost (reflecting the EU default value) than is simulated.

The simulations revealed minor impacts on Azerbaijan's GDP and emissions from the EU CBAM introduction. The model forecasts Real GDP in 2030 to be marginally lower than under the baseline if the CBAM is implemented as currently proposed (0.004%) (Figure A 1). This remains the case even with an expanded CBAM (0.009%) or the U.S. adopting a similar mechanism (0.015%). Under all scenarios emissions reach nearly 51 million tons of CO_2-eq. in 2035 (Figure A 2). Emissions in 2030 are forecast to be between 0.08% and 0.26% lower with the CBAM in place: a saving of 0.040.13 million tons of CO_2-eq.

Figure A 1: Modeled Real GDP, Deviation from 'Baseline' EDIT AXIS

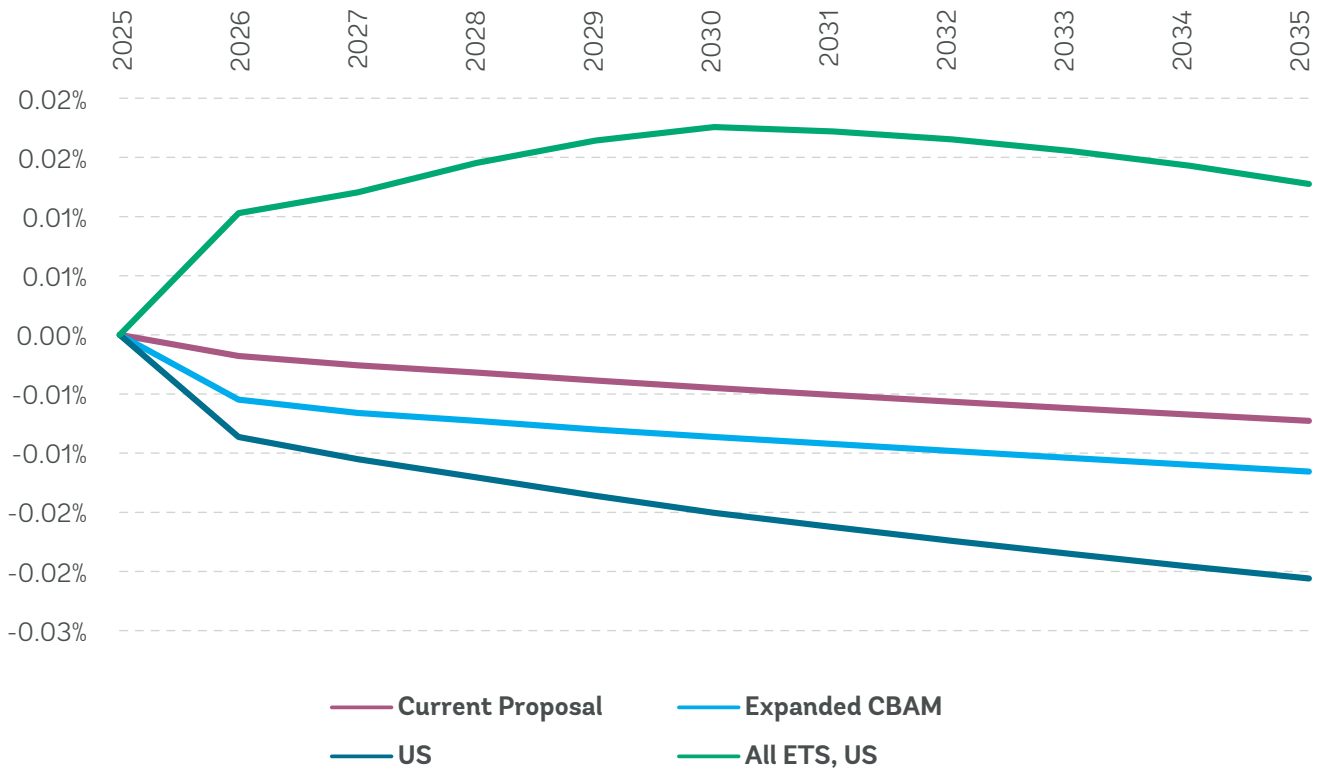


Figure A 2: Modeled Emissions, Million Tons of CO_2-eq.

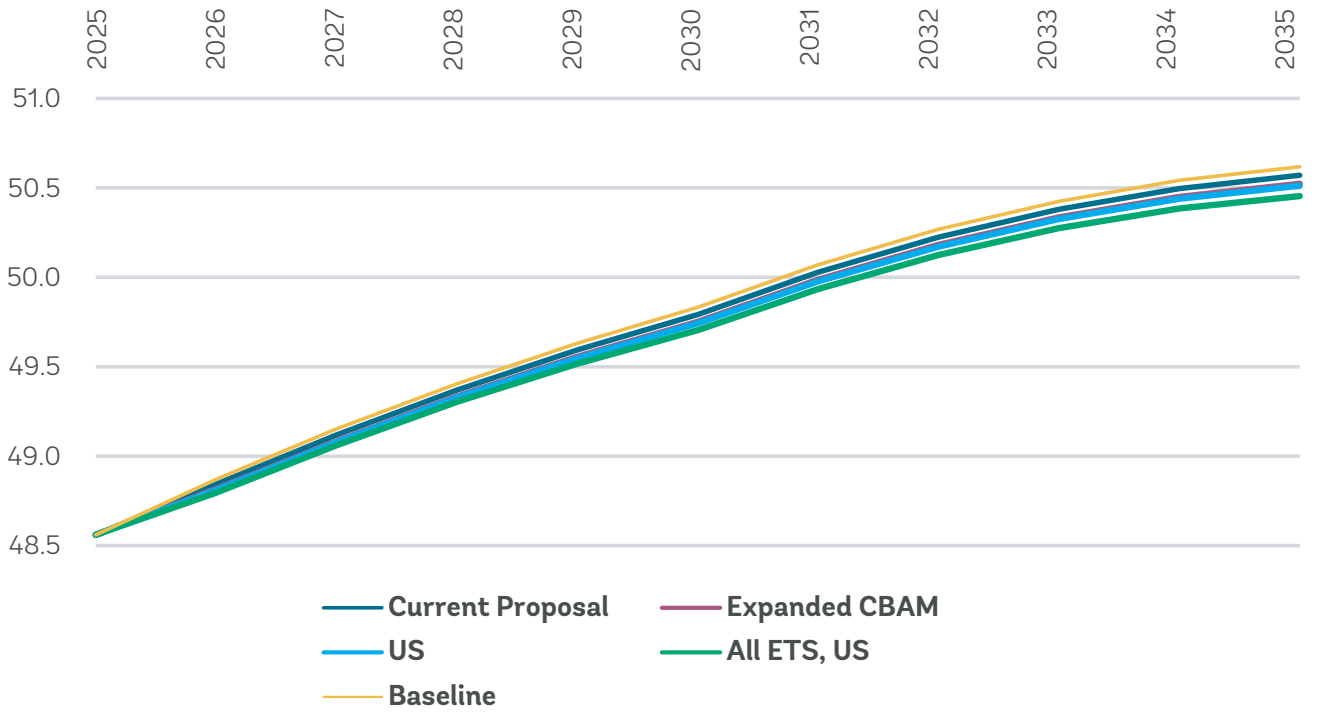


Figure A 3: Modeled Real Exports of Oil to EU, Azerbaijan Doesn't Act, $ Billion

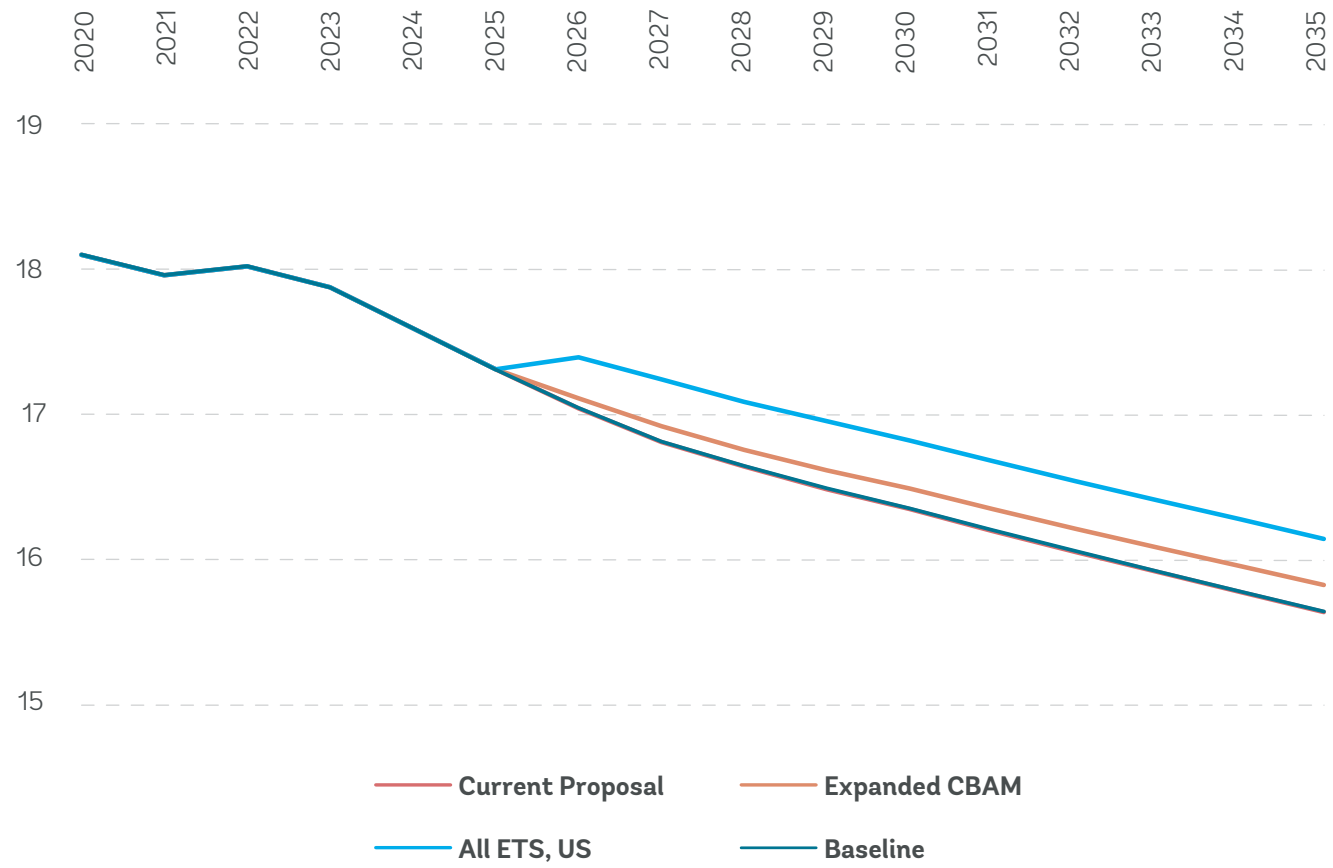


Figure A 4: Modeled Real Exports of Oil to EU, Azerbaijan Acts to Achieve NDCs, $ Billion

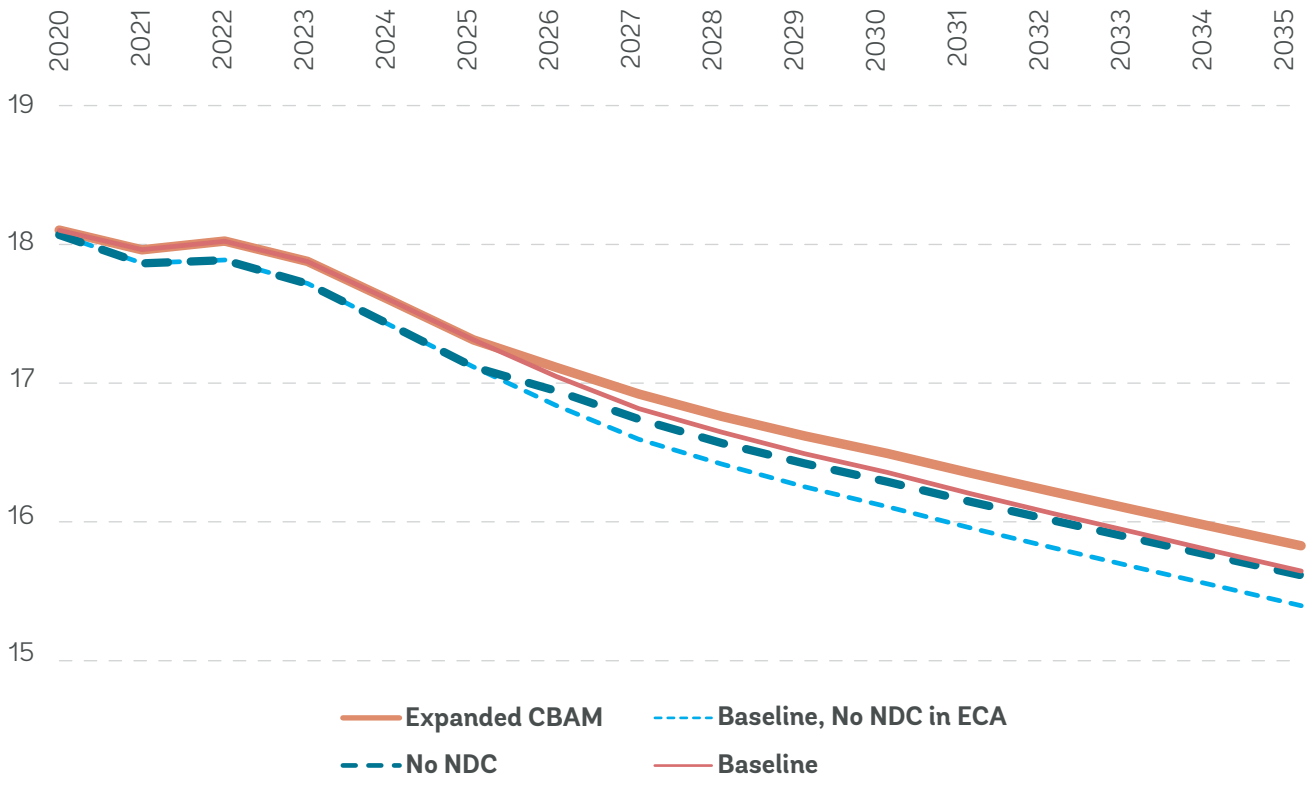


Figure A 5: Modeled Real Exports to EU in 2030, Deviation from 'Baseline,' $ Million

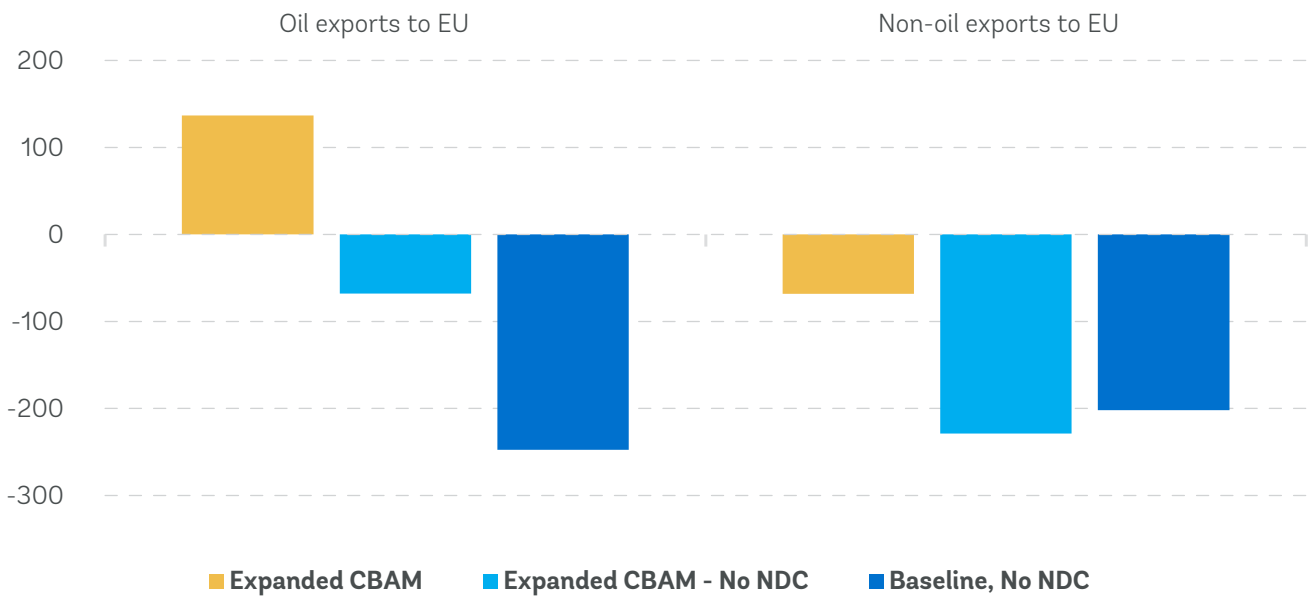
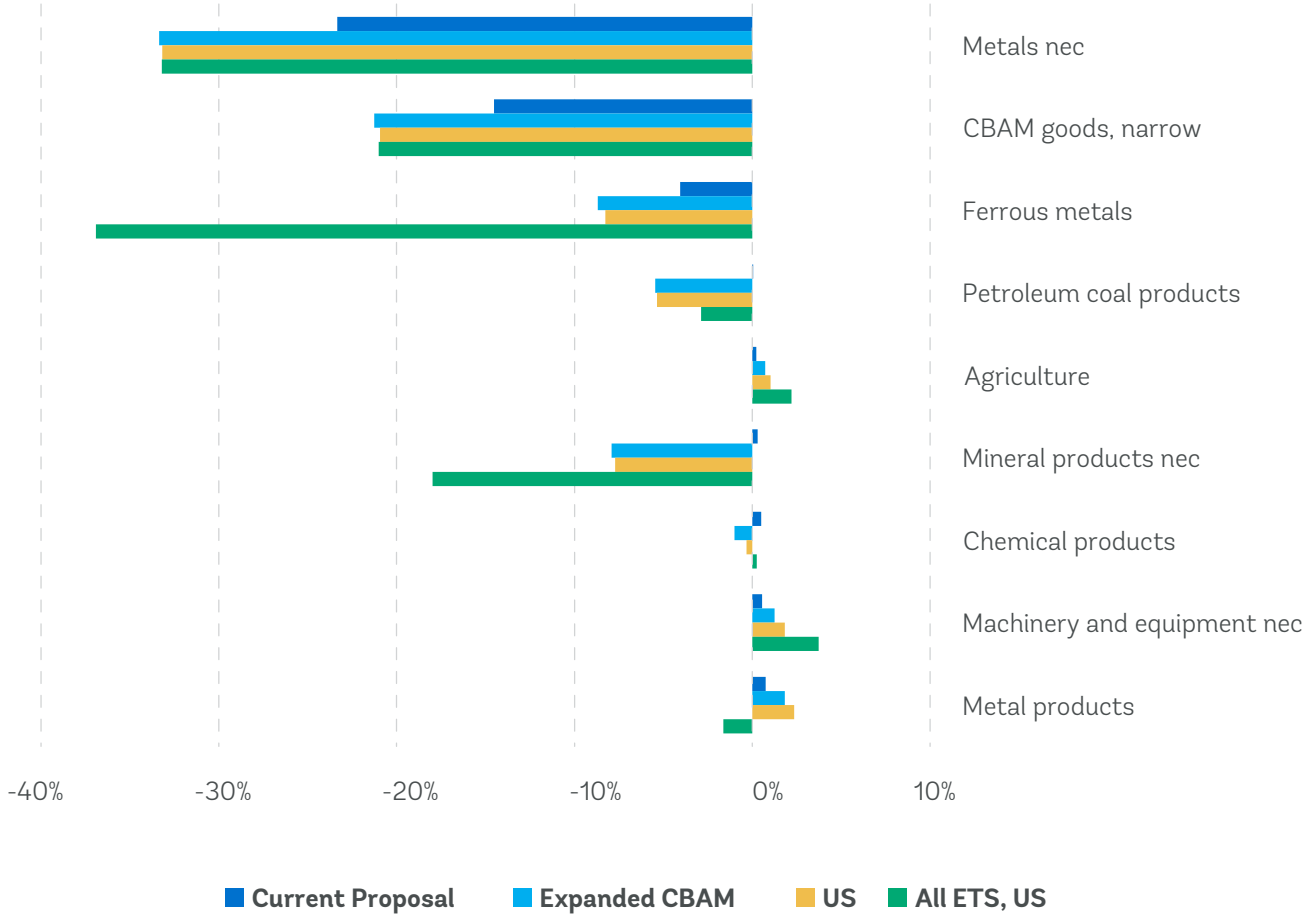


Figure A 6: Modeled Real Exports to the EU in 2030, Select Sectors, Deviation from 'Baseline'



Azerbaijan's oil exports are at risk even though they are not covered by the CBAM. The modeling forecasts that under all scenarios, even without the CBAM, Azerbaijan's oil exports to the EU face substantial declines in the coming decades (Figure A 3). These exports represent around 49% of Azerbaijan's total goods export value. Under the 'Baseline' scenario, where countries, including the EU, achieve their Nationally Determined Contributions (NDCs), a reduction in demand for fossil fuels could see the value of Azerbaijan's oil exports to the EU decline by $2.5 billion by 2035.[81] Moreover, the EU CBAM is not expected to have a substantial impact on oil exports to the EU. Conversely, under most scenarios, the CBAM is expected to have a slightly positive impact on oil export. There are two main factors at play: increasing demand from the EU as the EU's own production of EITE products becomes more competitive (particularly in scenarios where petroleum products are covered by the CBAM); and the relative ambition of Azerbaijan's NDC compared with other oil exporters may mean their exports face lower CBAM charges. Increased exports to the EU are partly offset by lower exports to other countries.

If Azerbaijan acts to achieve its NDCs, it will reduce the impact on oil export to the EU. An even greater and earlier decline in Azerbaijan's exports to the EU is simulated if Azerbaijan does not take action to meet its NDC, ('No NDC,' 'Baseline, no NDC in ECA'). There are two main drivers of this outcome: the EU imports slightly less oil in total, and the contribution of some other ECA countries like Russia and Kazakhstan to the EU's oil supply will increase. When the CBAM expanded to cover petroleum products (for 'No NDC' scenario), the EU's production of petroleum products became more competitive, resulting in higher EU demand for crude oil. This improves the outlook for Azerbaijan's EU exports, but they would still not achieve the same level as under the equivalent CBAM scenario where Azerbaijan meets its NDC ('Expanded CBAM'). Acting to achieve Azerbaijan's NDC could secure higher revenues from oil exports to the EU of over $200 million per year from the late 2020s – whether or not the CBAM is implemented (see Figure A 5).[82]

Non-oil exports to the EU are lower if Azerbaijan does not act to meet its NDC (Figure A 5, 'No NDC', 'Baseline, No NDC in ECA'). Non-oil exports to the EU under these scenarios are modeled to be around $200 million lower than comparable scenarios where Azerbaijan meets its NDC.

Azerbaijan's exports to the EU of goods covered by the CBAM face substantial declines (Figure A 6). Exports of 'Metals nec,' mostly aluminum covered under all CBAM scenarios, could be nearly 35% lower in 2030 than under the 'Baseline' scenario. Exports of 'Ferrous Metals,' also mostly covered under all CBAM scenarios, could be 4% to nearly 40% lower compared with the 'Baseline.' Similarly, under scenarios where petroleum products are covered, these exports could be between 3% and 12% lower ('Expanded CBAM,' 'US,' 'All ETS, US,' 'Others Act, Azerbaijan Not'). For covered products, exports to the EU tend to be most affected when other countries in ECA respond to the expanded CBAM with carbon pricing ('Others Act, Azerbaijan Not'). The modeling found very limited opportunities for Azerbaijan to divert lost exports to other countries.

Under the EU CBAM, exports to the EU of some higher value-added products (like motor vehicles and machinery) that are important for the green growth perspective and diversification could see gains. Azerbaijani producers become more competitive relative to EU producers who face higher input costs. For example, when the CBAM is applied to Metal imports, the input costs (which are covered under the CBAM) for EU manufacturers of Metal products increases, and Azerbaijan's output becomes more competitive.

The modeling found the loss of exports flowed through to lower output and employment for the affected sectors (Figure A 7 and Figure A 8). Metals (mostly aluminum) are the most affected, due to the high proportion of the sector's production that is exported. The lost output in this sector would be worth around $24–35 million in 2030, depending on the scenario. Changes in exports and output also impact employment following similar trends, although in some scenarios the impact on employment in ferrous metals is larger than the impact on output (Figure A 8).

[81] All modeled $ figures used in this note are constant 2014 $.
[82] The most direct comparisons are: 'Expanded CBAM' (oil exports over $135 million higher than 'Baseline') with 'No NDC' (oil exports $68 million lower than 'Baseline'); and 'Baseline' with 'Baseline, No NDC in ECA' (oil exports $247 million lower than 'Baseline').

Figure A 7: Modeled Real Output in 2030, Selected Sectors, Deviation from 'Baseline'

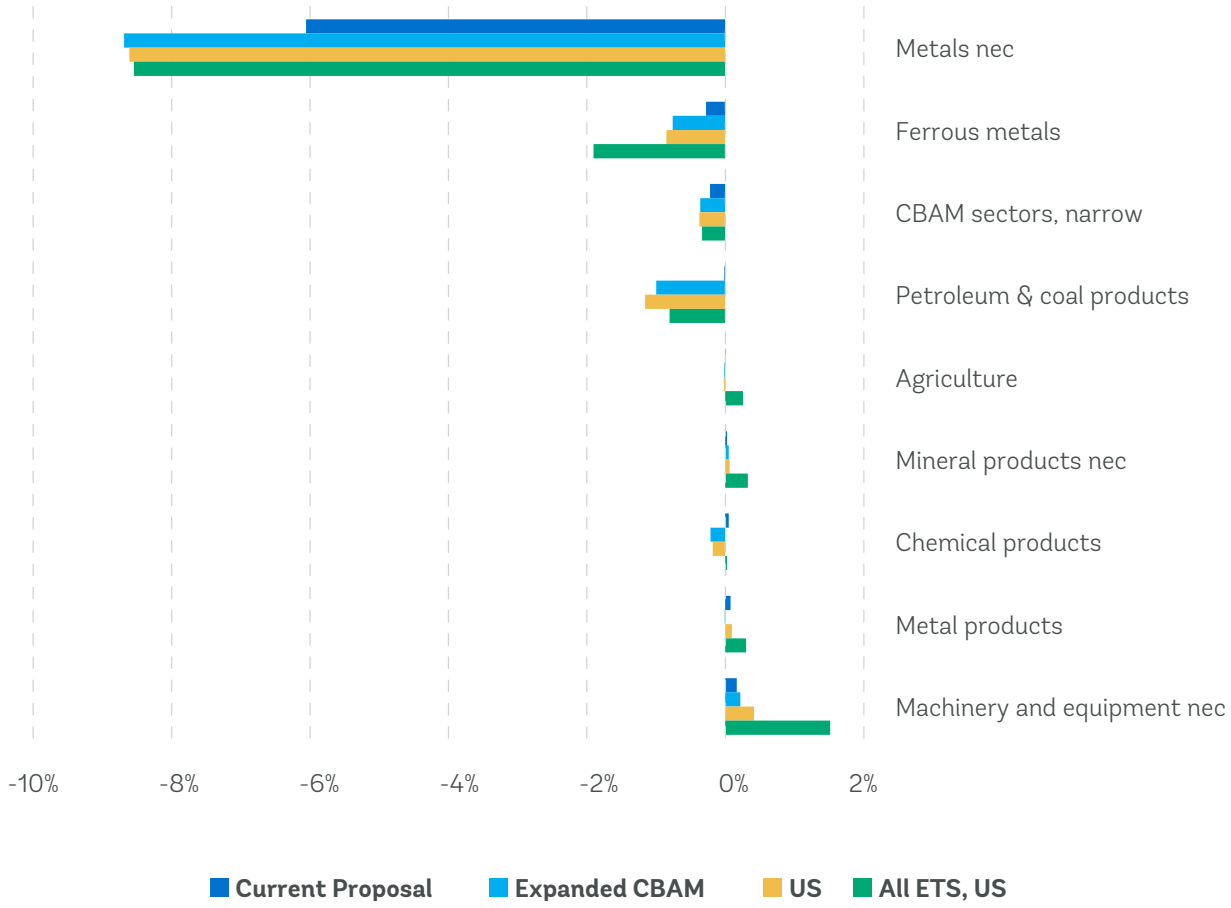
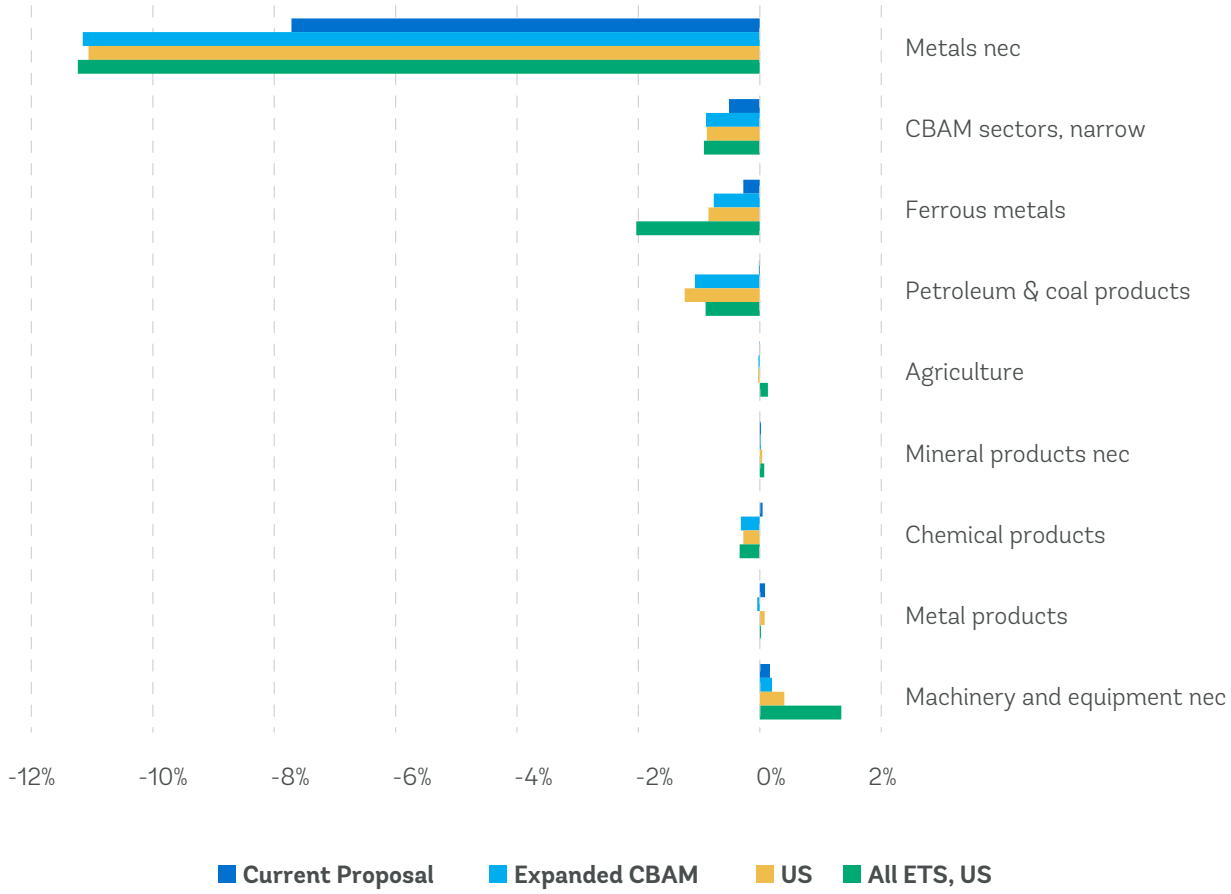


Figure A 8: Modeled Employment in 2030 for Select Sectors, Deviation from 'Baseline'



Annex 4. Climate Risks in Azerbaijan

Climate physical risks that reflect a potential impact of rising temperature and changing precipitation patterns are high in Azerbaijan, a mountainous, arid country. These risks are associated with increased frequency and intensity of natural disasters (floods, droughts, landslides, heatwaves), and with the economy and population's increasing vulnerability to resource scarcity due to aridity and associated impacts on productivity. Those risks affect assets, publicly traded securities, private and public investments, and companies. The financial system is under stress due to multiplying recovery costs, and the private sector will bear additional expenses to maintain the current level of productivity, undermining the capacity to invest in future growth. Adaptation to climate change based on robust optimization is part of a green growth strategy that will build resilience to climate risks for the population, economy and infrastructure. Adaptation and resilience building in agriculture should be addressed first, as it is the sector most affected by climate risks and provides livelihoods for a significant part of the population.

Climate physical risks in Azerbaijan are listed below:

a. *Floods and droughts*. Azerbaijan already experiences frequent flooding. The parts of the country at greatest risk of floods are in the central and south-eastern regions,[83] while some parts of the country, such as the south slope of the Greater Caucasus, experience mudflows caused by flooding.[84] Azerbaijan's water resources depend primarily on two key river basins, that of the Kur and Aras rivers, and their future hydrology will determine fluvial flooding trends. Severe flooding like what occurred in Azerbaijan in 2003, when 30,000 people were affected and over $70 million in damage resulted, could become more frequent. The probability of droughts is predicted to increase as well, which would further reduce agricultural productivity.

b. *Impact on Agriculture and Water Stress*: Climate change will have direct effects on crop growth processes via changes in temperature and rainfall, and indirect effects such as changes in soil organic matter. Estimates on the effect on crop yields point to a likely impact on food production. Global analysis[85] of wheat and maize yield for the most ambitious 1.5-degree pathway shows that between a 5–6% decline in agricultural output can be expected. As up to 80% of Azerbaijan's agricultural output is rain-fed, the overall impact on total food production is likely to be more negative than the estimate suggests. Climate impacts will cause greater variability in precipitation and increase the probability of drought and long-term water stress for irrigation systems. Extreme heat is expected to be more frequent, with one study suggesting an increase of 16% in water demand by 2030 in eastern Azerbaijan.[86]

c. *Coastal Vulnerability:* As of 2015, Azerbaijan's coastal areas were home to approximately 4 million and included the country's largest cities and 75% of its industrial resources. The economy of the capital Baku is tied to the Caspian marine and coastal resources and contributed approximately $39 billion (71%) of the country's GDP in 2015. A projected Caspian Sea level decrease of 4-5 m by the end of 21st century will lead to a 23–34% reduction of the sea's surface area while likely increases in average temperatures in the coming decades will have socio-economic impacts on the urban economy of Greater Baku.

d. *Heat Islands: urban centers*: The effect of urban heat islands (UHI) from urban expansion will elevate temperature peaks. Though there is a lack of research on the extent of the UHI effect in Baku, there is evidence that city residents are suffering ill health from extremely high temperatures in the summer months. Research for the period from April to September 2003–2006, indicates that a temperature increase of 1.5°C in Baku correlates with an increase in first-aid calls and a 20–34% rise in health incidents. Annual heat-related mortality has been increasing at 4% on average since 1990, and resulted in 120 deaths in 2019.[87] Besides the impact on public health, damage to productivity in the service sector economy is likely, both through direct impacts on labor productivity and supply (up to 18.6% in Asia[88]), as well as also through the additional health care costs.

[83] GFDRR 2017.
[84] Naumann, G. et al. 2018.
[85] Tebaldi, C., and Lobell, D. 2018.
[86] Sadat, A. P., Bozorg, H. O., and Miguel, A. M. 2013.
[87] Original estimates based on GBD (2019). (http://ghdx.healthdata.org/gbd-results-tool).
[88] Dasgupta, S., van Maanen, N., Gosling, S.N., Piontek, F., Otto, C. and Schleussner, C.F. 2021.

e. *Impact on Energy System:* On average, a one-degree increase in ambient temperature can result in a 0.5–8.5% increase in electricity demand.[89] The projected increase in cooling demand places a strain on energy generation systems which is compounded by the heat stress on the energy generation system, including a declining output in hydropower, which in 2016 accounted for 8% of generation in Azerbaijan. While there is little certainty in precipitation forecasts for the coming decades, the accelerated melting of glaciers and increased evaporation could limit hydropower capacity in the long term.

f. I*mpact on poverty and inequality:* Azerbaijan posted lower levels of income inequality in comparison with its neighbors, though high levels of inequality across financial and social outcomes prevail.[90] Climate-related hazards are likely to slow progress in improving the well-being of poorer groups and eradicating poverty and malnutrition. Additionally, heavy manual labor jobs are common among the lowest paid while also being most at risk of productivity losses due to heat stress,[91] and poorer businesses are the least able to afford air conditioning. In rural areas, poorer farmers and communities are the least able to afford local water storage, irrigation infrastructure, and technologies for adaptation. Productivity in agriculture is already below the national average, with the sector employing a major share of the workforce but accounting for only 5% of GDP (2013 to 2017). Greater variability in precipitation, increased probability of drought, and increased temperatures are likely to exacerbate regional and sectoral inequality in Azerbaijan by having a disproportionately severe effect on rain-fed agriculture.

[89] Santamouris, M., Cartalis, C., Synnefa, A., and Kolokotsa, D. 2015.
[90] The World Bank Group and Asian Development Bank 2021.
[91] Kjellstrom, T., Briggs, D., Freyberg, C., Lemke, B., Otto, M., and Hyatt, O. 2016.

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