Azerbaijan's Long-Term Low Emission Development Strategy

2026

Table of Contents

Glossary of Terms, Abbreviations & Acronyms **3**

1. High-Level Summary **7**

2. National Context **10**

3. Economic Context and Emissions Profile **13**

3.1. Economic Landscape 13

3.2. Contributions to GHG Emissions 13

4. Targets, Decarbonization Pathways and Mitigation Plans Economic Landscape **16**

4.1. Scope and coverage 16

4.2. Overall Sectoral Targets 16

4.3. Sectoral Decarbonization Pathways and Mitigation Plans 18

5. Challenges for Implementing Net-Zero Plans **47**

Glossary of Terms, Abbreviations & Acronyms

3-NOP	3-Nitrooxypropanol
AD	Anaerobic Digestion
ADB	Asian Development Bank
ADSEA	Azerbaijan State Water Resources Agency
AFOLU	Agriculture, forestry and other land use
AREA	Azerbaijan Renewable Energy Agency under the Ministry of Energy of the Republic of Azerbaijan
AERA	Azerbaijan Energy Regulatory Agency under the Ministry of Energy of the Republic of Azerbaijan
ASCO	Azerbaijan Caspian Shipping Company
AZAL	Azerbaijan Airlines
bcma	Billion Cubic Meters per Annum
BAU	Business-as-Usual
Baseload demand	Minimum level of continuous electricity demand that must be met at all times
BTR	Biennial Transparency Report
CapEx	Capital Expenditure
CBAR	Central Bank of Azerbaijan
CCGT	Combined Cycle Gas Turbine
CCS	Carbon Capture and Storage
CCUS	Carbon Capture Utilization and Storage
CH_4	Methane
CO_2	Carbon Dioxide
CO_2eq	Carbon Dioxide Equivalent
COP	Conference of the Parties
CSO	Civil Society Organization
DAC	Direct Air Capture
DACS	Direct Air Capture and Storage
Decarbonization	The process of reducing all greenhouse gas emissions through the use of low-carbon energy sources and technologies.
DSM	Demand side management
DRI	Direct Reduced Iron

EAF	Electric Arc Furnace
EBRD	European Bank for Reconstruction and Development
Eq	Equivalent
ETF	Enhanced Transparency Framework
EV	Electric vehicle
EVCI	Electric vehicle charging infrastructure
FAO	Food and Agriculture Organization
FbF	Forecast based financing
F-gases	Fluoridated Gases: refer to industrial gasses like Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF_6), Nitrogen Trifluoride (NF_3)
GDP	Gross Domestic Product
GST	Global Stocktake
GWP	Global Warming Potential: describe the relative potency, molecule for molecule, of a greenhouse gas, taking account of how long it remains active in the atmosphere and is calculated over 100 years.
GEF	Global Environment Facility
GHG	Greenhouse Gas
GW	Gigawatt
ICE	Internal Combustion Engine
IOC	International Oil Company
ILO	International Labour Organization
Interim target	Refers to a milestone set by a country for reducing GHG emissions within a specified timeframe before the final target date. In the context of NDC 3.0 interim target is set to 2035.
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
IRENA	International Renewable Energy Agency
JTIP	Just Transition Investment Partnership
LDAR	Leakage Detection and Repair
LDES	Long-Duration Energy Storage
Levelized Abatement Cost	The average cost of reducing one ton of CO_2 equivalent emissions over the lifetime of a decarbonization measure, considering both capital and operational expenditures
Lever/measure	Abatement technology or method

LTS	Long-Term Low Emission Development Strategy
LULUCF	Land Use, Land-Use Change, and Forestry
MACC	Marginal Abatement Cost Curve
MoEn	Ministry of Energy
MoE	Ministry of Economy
MoENR	Ministry of Ecology and Natural Resources
MoU	Memorandum of Understanding
MSW	Municipal Solid Waste
Mt	Megaton
Mln	Million
MDB	Multilateral Development Banks
N_2O	Nitrous Oxide
NAP	National Adaptation Plan
NAMA	Nationally Appropriate Mitigation Actions
NCQG	New Collective Quantified Goal
NDC	Nationally Determined Contribution
Net-Zero	A state where the amount of greenhouse gases emitted is balanced by an equivalent amount removed from the atmosphere.
NGO	Non-Governmental Organization
NHS	National Hydrometeorology Service
NOC	National Oil Company
OCGT	Open-Cycle Gas Turbine
OGDC	Oil & Gas Decarbonization Charter
OGMP	Oil & Gas Methane Partnership
OPEX	Operational expenditure
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund

UNICEF	United Nations International Children's Emergency Fund
UNIDO	United Nations Industrial Development Organization
PM	Particulate Matter
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSA	Production Sharing Agreement
Pathway	Scenario or trajectory that outlines potential future developments in areas like emissions, energy use, or climate impacts.
RCP	Representative Concentration Pathways: a greenhouse gas concentration trajectory used in climate modeling and research.
Reference Year	A year used for comparing emissions to measure the progress. In the context of NDC 3.0 the reference year is defined as 1990.
R&D	Research and Development
RES	Renewable Energy Source
SAF	Sustainable Aviation Fuel
Scope 1	Emissions refer to direct greenhouse gas emissions from sources owned or controlled by the organization
Scope 2	Emissions cover indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the organization
Scope 3	Emissions encompass all other indirect emissions that occur in the value chain of the organization, including both upstream and downstream activities
SDG	Sustainable Development Goal
SOCAR	State Oil Company of Azerbaijan Republic
SOE	State-Owned Entity
SMR	Steam Methane Reforming
T&D	Transmission and Distribution
Target Year	Refers to the specific year by which a country aims to achieve its stated climate goals, such as reducing GHG emissions.
Theme	Group of measures that outlines actions to reduce GHG emissions
TW	Terawatt
VAT	Value Added Tax
VRE	Variable Renewable Energy

1. High-Level Summary

Due to its geographical position, Azerbaijan is particularly susceptible to the negative impacts of the global climate change, including extreme weather events, temperature fluctuations, and declining Caspian Sea level. As a result, the country recognizes the need to safeguard its people and natural environment by contributing its share to the solution of the climate crisis and committing to reducing global greenhouse gas (GHG) emissions. To this end, as a Party to the Paris Agreement, the country acknowledges the urgency of climate action and is dedicated to implementing comprehensive strategies to mitigate the impact of climate change and build a resilient economy.

The first Global Stocktake (GST) assessment by the United Nations Framework Convention on Climate Change (UNFCCC) underscores that while current efforts to meet the Paris Agreement targets are significant, they fall short of what is needed to limit global warming to 1.5°C. Consequently, the GST calls for enhanced mitigation plans, adaptation efforts, and increased financial and technological support for developing nations. Key policy recommendations of the GST include expanding renewable energy, improving energy efficiency, and strengthening international cooperation. The GST also emphasizes that an inclusive approach to engaging diverse stakeholders is essential for effective and equitable climate action.

In light of these GST findings, Azerbaijan is to set more ambitious targets and implement immediate measures to reduce GHG emissions. These measures include expanding renewable energy capacity; developing electrification strategies; improving energy efficiency in the buildings, industry, and transportation sectors; and emphasizing inclusive adaptation strategies, especially for communities more susceptible to climate-related events, while seeking increased financial and technological support.

Furthermore, in line with its commitment to the Paris Agreement, Azerbaijan is dedicated to pursuing efforts to limit the global average temperature rise to 1.5°C above pre-industrial levels. The country aims to achieve 40% emissions reduction by 2035 as set in NDC3.0. Moreover, the country has pledged to make every possible effort to achieve net-zero emissions by 2060. However, the success of this goal depends on securing substantial international financial support, bridging gaps in technology and infrastructure, and fostering strong international cooperation.

To meet the Net-Zero ambition, Azerbaijan's Long-Term Low-Emission Development Strategic outlook (LTS) outlines a comprehensive decarbonization plan, including detailed themes and levers, to achieve a 40% reduction in emissions by 2035 and Net-Zero emissions by 2060. This plan was developed to address all sectors, including power, buildings, oil and gas, transportation, industry, waste, and agriculture, forestry, and other land use (AFOLU), focusing on all greenhouse gases, namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and industrial gases (F gases).

By 2035, the most efficient and developed technologies are planned to be implemented, including energy efficiency measures, methane reduction, transition to electric vehicle (EV) transportation, shift to renewable energy sources (RES).

Reducing climate-related risks and taking action are essential for environmental sustainability and economic diversification. Investing in green technologies and sustainable practices can create new revenue streams and generate jobs. Transitioning to a greener economy offers opportunities to innovate and develop industries that can prosper in a low-carbon future, thereby strengthening the country's economic resilience and competitiveness.

It is crucial to highlight that the liberation and reintegration of the Karabakh and East Zangazur economic regions into the national economy will significantly intensify the country's efforts toward green growth. By transforming these regions through the "green energy zone" initiative, as mandated by the May 3, 2021, decree of the President of the Republic of Azerbaijan, Ilham

Aliyev (which also became one of the initiatives in the COP29 Presidency's Action Agenda), Azerbaijan is harnessing the considerable potential for renewable energy and launching energy efficiency projects in these areas. This will pave the way for a cleaner and greener future, following a long period of deforestation and exploitation of resources during the occupation. The government's focused efforts on smart agriculture and the reforestation of thousands of hectares in these regions will improve natural habitats and contribute to carbon sequestration, which is essential for combating climate change. Embracing these initiatives and investments in Karabakh and East Zangazur will exemplify a successful transition toward sustainability, demonstrating the commitment to a cleaner future for the region and the planet.

Furthermore, as highlighted in this report, Nakhchivan (an exclave of Azerbaijan) has also been chosen as a "green energy zone" positioning it to benefit significantly from the implementation of renewable energy projects. This transformation will enable the Nakhchivan Autonomous Republic to become a net energy exporter, enhancing its strategic importance in the region and contributing to Azerbaijan's broader goals of sustainable development and energy security.

Additionally, the COP29 Presidency has introduced Action Agenda initiatives and associated pledges and declarations, which were integrated into the development of the NDC 3.0. and aim to drive global climate action. These comprehensive initiatives cover grids, energy storage, green energy zones and corridors, clean hydrogen, digital action, methane reduction, resilient cities, tourism, water, finance, transparency, agriculture and human development, food safety, plant health and animal health. Collectively, these global initiatives underscore the COP29 Presidency's dedication to extensive and coordinated efforts in addressing global climate challenges.

It is also worth noting that Azerbaijan has signed up for the Global Methane Pledge, an important voluntary commitment to collectively reduce overall global methane emissions by 30% by 2030 compared to 2020 levels. Moreover, the State Oil Company of the Republic of Azerbaijan (SOCAR) is one of the participants of the Oil & Gas Decarbonization Charter (OGDC), which was proposed and formed during COP28. The charter sets ambitious goals, including achieving Net-Zero operations by 2050. Additionally, SOCAR has joined the Oil & Gas Methane Partnership (OGMP 2.0-the flagship oil and gas reporting and mitigation program of the United Nations Environment Programme (UNEP)), further demonstrating its commitments.

Transitioning to green economy in a just, orderly and equitable manner will expedite emission reductions and pave the way for a sustainable and diversified economy.

Decarbonizing the country's economy depends heavily on inclusivity, ensuring that all societal groups, including women, elderly, refugees, internally displaced persons, and children, are actively engaged in the transition. The participation of civil society organizations (CSOs), non-governmental organizations (NGOs), academic institutions, the private sector as well as the government entities is vital to the decarbonization efforts and has been actively leveraged in the development of this document.

The country aspires to be a fast follower in decarbonization efforts. To advance these goals, it has established strong collaborations with United Nations (UN) organizations, and other international bodies.

Building upon these collaborations, this report aims to provide transparency on the plans to address climate change and outline a roadmap for achieving the country's mitigation targets. It also accounts for the National Adaptation Plan (NAP) and reaffirms the commitment to reducing GHG emissions, promoting climate resilience, supporting global sustainability, and ensuring an inclusive transition for all.

The ultimate goal is to achieve a resilient, Net-Zero future, enhancing ambition and enabling action in solidarity for a green world.

NDC and LTS Alignment

The LTS and NDC 3.0 are complementary but distinct in their roles within the nation's climate action framework. Both share the same timeframe for targets, addressing near-term and long-term objectives in line with the broader vision of achieving Net-Zero emissions by 2060. While the NDC outlines commitments for decarbonization, the LTS strengthens the NDC by providing detailed sector-specific decarbonization levers, abatement potentials per lever, a timeline for mitigation actions, comprehensive roadmaps for levers, and further elaboration on implementation enablers, such as finance mechanisms and governance.

The development of both documents followed a consistent decarbonization strategy, utilizing the same datasets, modeling approaches, and qualitative insights. Together, the NDC and LTS create a unified and transparent narrative that communicates the country's decarbonization journey, aligning its short- and long-term climate ambitions with international commitments under the Paris Agreement. Depending on the achievement of interim emission reduction goals set by NDCs, country's LTS and its target year might be further reconsidered.

2. National Context

GEOGRAPHIC AND POPULATION PROFILE

Located at the crossroads of Eastern Europe and Western Asia, Azerbaijan spans 86,600 square kilometers[1] of diverse landscapes, including mountainous regions, coastal areas, and fertile plains. The country has a growing population of 10.3 million as of January 1, 2026, with 54,3% of the population living in urban areas. This demographic and geographic diversity poses both opportunities and challenges in addressing the effects of climate change across different regions of the country.

CLIMATE PROFILE

Average annual temperatures across the country have increased more significantly since 2010. In 2010, the average annual temperature was 1.3°C higher than the norm. Air temperatures began to rise more sharply after 2010.

During this long-term period (25 years), the country's average annual temperature was 13.9°C, which is 1.6°C above the norm.

In 2018, the temperature was 1.9°C above the norm; in 2019, 1.5°C above; in 2020, 1.6°C above; in 2021–2022, 2.0°C above; in 2023, 2.4°C above; and in 2024-2025, 2.0°C above the norm.

Projections suggest that the temperature could rise by an additional 1.5°C[2] by 2035, exacerbating the challenges posed by droughts, heatwaves, and changes in precipitation patterns. While the agricultural sector and water resources are particularly at risk, there is ample opportunity to implement immediate and effective long-term low-emission development and climate adaptation strategies.

NATIONAL ADAPTATION PLAN (NAP)

In alignment with commitments to the Paris Agreement, particularly Article 7 on adaptation, a comprehensive range of policies and measures are being implemented to enhance resilience against the adverse effects of climate change. These policies and measures have been incorporated into the relevant NAP that was officially submitted to the secretariat of UNFCCC during COP29, in 2024.

The NAP aims to strengthen climate resilience and long-term planning, focusing on key areas such as water resources, agriculture, and the Caspian Sea's coastal zones.

Climate change-related increases in temperature, irregular precipitation patterns, intensified evaporation, prolonged drought periods, and potential reductions in transboundary water flows should be recognized as key long-term risks to the country's water security.

Due to significant decreases in water availability, the government plans to build reservoirs, modernize irrigation systems, and explore alternative water sources, like wastewater and seawater treatment. In agriculture, efforts include promoting climate-resistant crops and improving land and water use.

Besides that, adaptation policies and measures in agriculture envisage use food safety, plant health, animal health matters. Additionally, the declining Caspian Sea levels pose risks to coastal infrastructure, including risks to offshore oil and gas infrastructure which will be addressed through integrated management and early warning systems to enhance resilience across sectors.

Since the global climate change has been negatively affected health and wellbeing of all communities, particularly vulnerable ones, the health community reached a significant milestone by placing human health at the forefront of climate change action starting with COP26. As a follow-up to these initiatives Baku Guiding Principles on Human Development for Climate Resilience announced by the Azerbaijani COP29 Presidency and Baku Initiative on Human Development for Climate Resilience was adopted during COP29 Moreover, nowadays rapid global urbanization accompanied with climate crises place cities at the

[1] The State Statistics Committee of the Republic of Azerbaijan
[2] Ministry of Ecology and Natural Resources of Azerbaijan Republic

critical juncture of environmental and public health action redefining the social and environmental determinants of the whole health sector.

STAKEHOLDER ENGAGEMENT

Azerbaijan is committed to fostering an inclusive climate agenda by involving multiple stakeholder groups in formulating and implementing national initiatives to achieve Net-Zero goals. The Ministry of Ecology and Natural Resources ensures that this process is inclusive, transparent and equitable.

The development of LTS, including baseline estimation, scenario projections, target setting, and decarbonization pathways identification, involves extensive collaboration with various entities such as central and regional government bodies, municipalities, NGOs, academia, civil society organizations (CSOs), major private sector companies, SMEs, and sector associations. The country remains committed to collaborating with all stakeholders to ensure inclusiveness and representation of various societal groups. Global experience and expertise are also continually integrated through active engagement with international and multinational organizations. Collaboration with international and multi-lateral organizations exemplifies the country's commitment to international environmental standards and practices.

INTEGRATION INTO AZERBAIJAN'S GREATER COUNTRY-LEVEL VISION

LTS aligns with the "Azerbaijan 2030: National Priorities for Socio-Economic Development" the 10-year-vision, as well as its first 5-year-implementation program, focusing on expanding renewable energy, improving waste management, and increasing forest land to guide the country's decarbonization. This plan further emphasizes green energy, renewable technologies, and a high-quality ecological environment, all integrated into the LTS. Moreover, in continuation of the five-year implementation program, a draft Action Plan has been developed under the "High-Quality Ecological Environment" objective of the "Socio-Economic Development Strategy of the Republic of Azerbaijan for 2027-2030", aimed at ensuring the effective realization of the targets set for the forthcoming phase. Within the scope of climate change mitigation efforts, the draft envisages the continued implementation of activities related to the LTS.

Supported by the NAP, which addresses medium- and long-term climate resilience, these efforts will ensure that comprehensive climate goals are met.

ALIGNMENT WITH INTERNATIONAL FRAMEWORKS OR OTHER PLANS

The LTS report aligns with international frameworks like the Paris Agreement and the UN's Sustainable Development Goals (SDGs). Sustainable Development Cooperation Framework between the United Nations and the Government of the Republic of Azerbaijan 2026–2030 marks a new phase in the partnership aimed at accelerating the progress toward the Sustainable Development Goals. The Cooperation Framework serves as a strategic platform to address Azerbaijan's priorities, targeting to advance sustainable development pathways across two strategic priority areas: advancing inclusive socio-economic growth and human development and promoting ecosystems and climate resilience, green growth, and just transition. Furthermore, the country is committed to working collaboratively with and continuing its pursuit of the key outcomes from the GST, including the recognition of the need for deep, rapid and sustained reductions in greenhouse gas emissions in a nationally determined manner, taking into account different national circumstances, pathways and approaches and a global pledge to triple renewable energy capacity and double the average annual rate of energy efficiency improvements by 2030, among others.

LTS is also aligned with COP29 Presidency's Action Agenda initiatives, which provide targets for climate action. The associated pledges and declarations aim to substantially enhance global energy storage and grid capacity by 2030, promoting regional cooperation and economic growth and fostering investment in green energy zones and corridors. In addition to these efforts, they focus on unlocking the potential of clean hydrogen markets by addressing regulatory and technological barriers. Moreover, the declarations highlight the critical role digital technologies play in climate action while addressing their environmental impacts.

Furthermore, the pledges aim to enhance multisectoral cooperation to tackle climate challenges in urban areas and catalyze urban climate finance. There is a call for integrated approaches to combat climate change impacts on water resources and ecosystems and to develop policies for methane reduction in waste and food systems.

The COP29 Declaration on Water for Climate Action calls on nations to address climate-related water challenges through international cooperation, enhanced scientific knowledge, and integration of water considerations into climate policies. The initiative promotes effective sustainable water management, the protection of water-related ecosystems, and the use of early warning systems for water-related disasters. It also includes launching the Baku Dialogue on Water for Climate Action to ensure continuous and coordinated efforts in this area. Additionally, the Baku Harmonia Climate Initiative for Farmers aims to unify various initiatives, coalitions, and networks to empower farmers through sharing experiences, identifying synergies and gaps, facilitating finance access, and fostering collaboration in agriculture, food, and water sectors.

3. Economic Context and Emissions Profile

3.1. Economic Landscape

The nation's robust economic growth since the early 2000s has been pivotal in driving extensive infrastructural development. The diversification of the economy has been a key focus for the government, aiming to reduce reliance on hydrocarbons and utilizing respective benefits in developing other sectors. As a result, sectors such as agriculture, tourism, construction and manufacturing have seen growth, contributing to a more balanced and diversified economic structure.[3] Moreover, in line with the COP29 pledge on the Declaration on Enhanced Action in Tourism, growth in the tourism sector will be enhanced by promoting innovative sustainable practices to reduce emissions.

Azerbaijan's economy continues to demonstrate resilience and sustainable growth. In 2025, the non-oil sector contributed 71.5% to the country's GDP, growing by 2.7% compared to 2024, driven by strong performance in agriculture, construction, and services, reflecting the government's ongoing efforts to reduce the economy's dependency on oil and gas.

Investment activity remained robust, with capital investments showing solid growth. Notably, investments in the non-oil sector demonstrated an increase, further strengthening economic diversification strategy. At the same time, the energy sector continues to play an important role in overall economic structure. Advancements in energy-related infrastructure enhance energy security through efficiency and reliability improvements, generating consistent revenue streams.

The country has demonstrated substantial economic resilience and a strong commitment to climate action through strategic GDP growth, impactful climate change initiatives, and a dedicated shift towards the objectives of the Paris Agreement.

3.2. Contributions to GHG Emissions

Azerbaijan's GHG emissions are driven by seven key sectors, each contributing uniquely to the national emissions profile.

OIL AND GAS (UPSTREAM AND MIDSTREAM)

The oil and gas sector, which is one of the core pillars of the country's economy, accounted for about 29% of total emissions in 2022, totaling to 20.05 $MtCO_2eq$. The main sources of emissions are fuel combustion for power and heat generation, and machine drive (e.g., compressors), along with flaring, venting, and fugitive emissions from upstream operations.

POWER

The power sector is a critical component of the energy landscape, contributing significantly to the nation's GHG emissions. In 2022, the power sector accounted for approximately 21% of the country's total emissions, accounting to 14.4 $MtCO_2eq$. The main source of emissions in this sector is the combustion of natural gas for electricity generation.

BUILDINGS

The buildings sector accounted for approximately 14% of total emissions in 2022, totaling to 10.0 $MtCO_2eq$. This sector includes residential and

[3] The Ministry of Economy of the Republic of Azerbaijan

commercial buildings, with emissions mainly driven by energy consumption for heating.

TRANSPORTATION

The transportation sector is a significant source of emissions, accounting for approximately 13% of total GHG emissions in 2022 constituting 9.3 $MtCO_2eq$. One of the main drivers was road transport, which relies heavily on gasoline and diesel fuels. Other drivers include domestic aviation, railways, water-borne navigation, and other transportation.

INDUSTRY

The industry sector accounted for about 11.6% of the total emissions in 2022 with emissions of 8.05 $MtCO_2eq$. The main sources of emissions in this sector include downstream oil and gas (refining and petrochemicals) operations and industrial sector, such as production of cement, steel, and chemicals, which involve energy-intensive processes. Additionally, emissions are generated from the use of raw materials and the chemical reactions that occur during manufacturing.

WASTE

The waste management sector contributed around 7.05% of total GHG emissions in 2022 with a total emission of 4.9 $MtCO_2eq$, with the main drivers being methane emissions both from landfills and wastewater treatment processes. Without modern systems for waste processing, organic materials decompose anaerobically in landfills, leading to the release of methane. Shortcomings of proper waste segregation, recycling, and composting further exacerbate this issue.

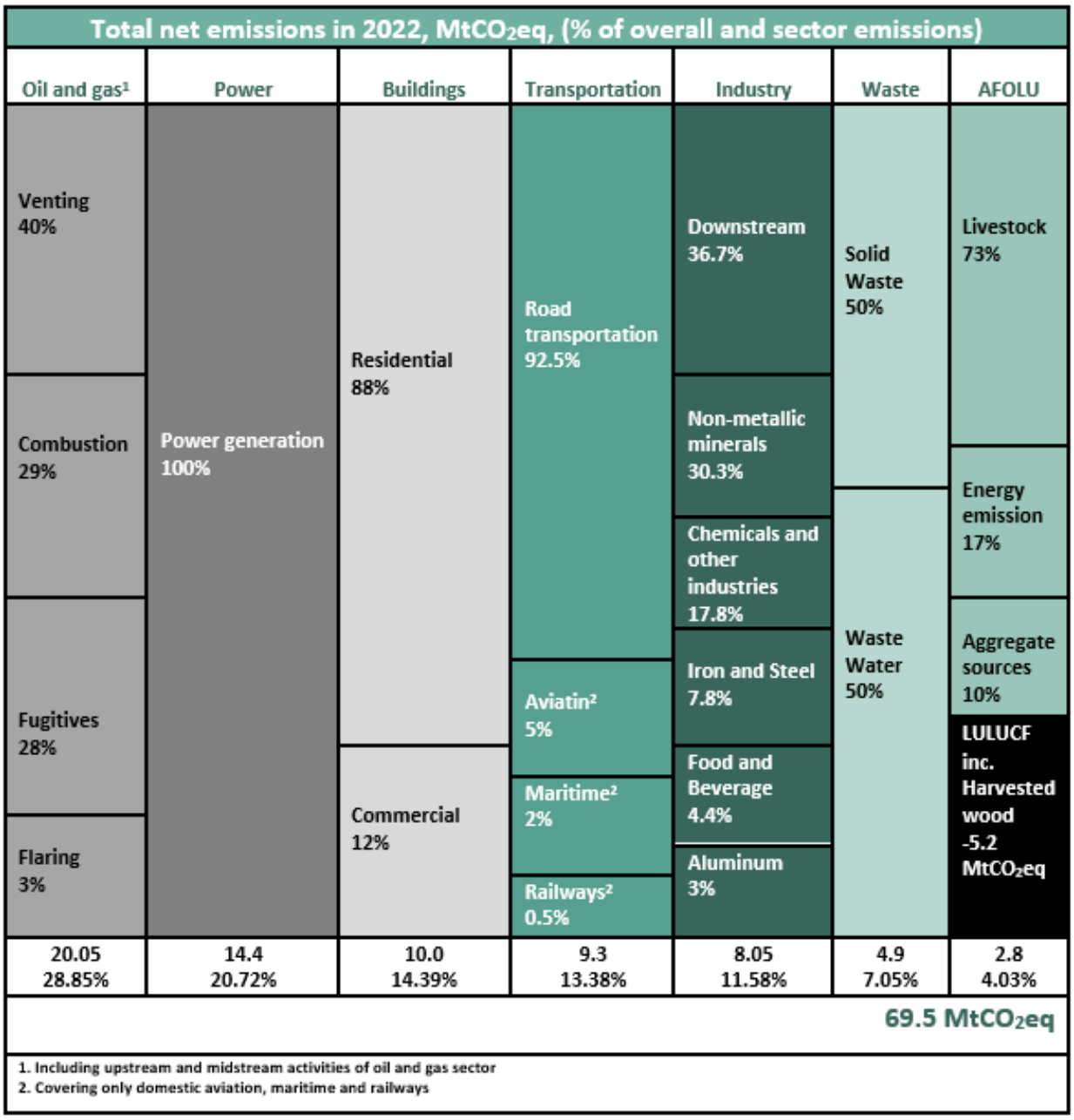
AGRICULTURE, FORESTRY AND OTHER LAND USE (AFOLU)

AFOLU contributed to about 4% of the net total GHG emissions in 2022, totaling to 2.8 $MtCO_2eq$ emissions, with the main drivers being enteric fermentation from livestock, manure management, non-mobile stationary equipment, and the use of nitrogenous fertilizers in agriculture. Emissions from this sector primarily consist of methane (CH_4) and nitrous oxide (N_2O), which have higher global warming potentials compared to CO_2.

Forestry and land use, covering roughly 12% of the country's land area, is pivotal, with activities such as afforestation, reforestation, and sustainable forest management enhancing CO_2 sequestration. Grasslands and pastures, which constitute around 28% of the country's land, store substantial carbon in plant biomass and soil, managed through rotational grazing and land restoration. Soil management measures should also consider chemical safety aspects.

The mentioned sectors and the respective distribution of GHG emissions across components of each sector are shown below *(Figure 1)*.

Figure 1. Total net emissions and their distribution across sectors as of 2022, $MtCO_2eq$



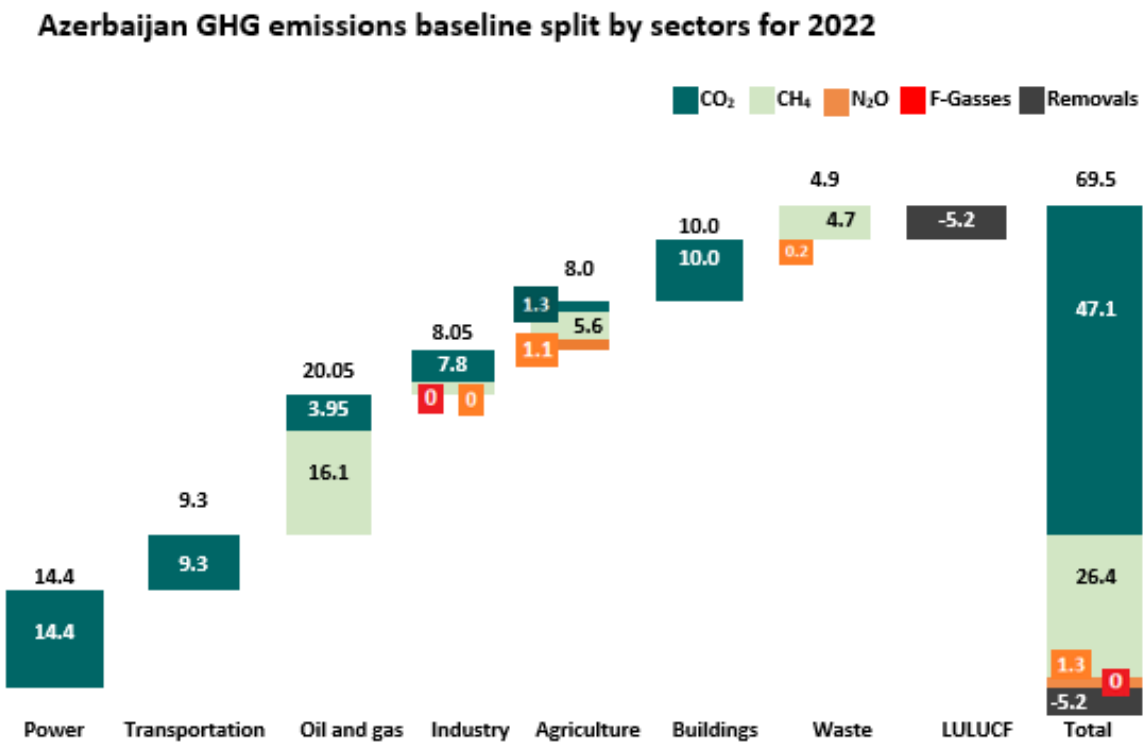
4. Targets, Decarbonization Pathways and Mitigation Plans Economic Landscape

4.1. Scope and coverage

LTS report includes an assessment of all GHGs emitted domestically. This covers Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), and industrial gases (F-gases), all of which are reported in CO_2 equivalents using the AR6 Global Warming Potential (GWP) normalization *(Figure 2)*. For the purpose of LTS, the following GHG emission scopes are considered:

- **Country level:** Emission volumes are reported only as total emissions, without a breakdown by scope.
- **Sector level:** Mitigation measures target both direct and indirect emissions (Scope 1 and Scope 2).

Figure 2. GHG emissions gas split for baseline year, $MtCO_2eq$



4.2. Overall Sectoral Targets

LTS outlines comprehensive decarbonization targets economy-wide, covering all domestic sectors contributing to GHG emissions. Across the sectors of power, buildings, oil and gas, transportation, industry, waste and AFOLU, five decarbonization themes, which are feasible in the country, were explored to define sectoral pathways.

1. **Electrification generated by Renewable Energy Sources (RES):** replacing fossil-fuel-based energy systems (such as gas-fired power plants, gas heating, or fuel-powered machines) with electricity produced from renewable energy sources.
2. **Low-emission fuels:** Substituting high-emission fuels consumption by switching to sustainable fuels, such as green methanol, sustainable aviation fuel (SAF).
3. **Hydrogen (clean, green):** Utilizing blue hydrogen, produced from natural gas with carbon emissions captured through CCUS, or green hydrogen, produced via electrolysis powered by renewable energy, as a low-emission feedstock or energy source. This reduces the carbon footprint in energy production and industrial processes.
4. **Operations Upgrade and Equipment Changes for Energy Efficiency:** Optimization of operational processes and replacing high-energy, high-emission intensive equipment with energy efficient, less emission intensive ones to reduce emissions.
5. **Carbon Capture Utilization and Storage (CCUS) or Direct Carbon Removal:** Capturing stream of CO_2 from point sources or to pull CO_2 straight from the ambient air to either utilize it for manufacturing or store permanently deep underground or upcycled into commercial products (such as concrete, urea etc.).

As a result of phased pathways' realization, GHG emissions are targeted to be reduced by 40% by 2035 and aiming to achieve Net-Zero in 2060. However, achieving Net-Zero will require a substantial investment, yet this transition is projected to increase economic activity through the creation of jobs, and thereby increase in GDP.

By 2035, the country aims to implement primarily low-cost, currently feasible solutions that include energy efficiency levers, methane reduction, transition to EV transportation, shift to RES and installation of heat pumps.

Attaining Net-Zero 2060 Vision is conditional upon several factors. As a developing country, Azerbaijan aims to balance economic growth, social well-being, and environmental sustainability, ensuring that decarbonization efforts align with long-term prosperity and sectoral advancement, while also safeguarding the competitiveness and resilience of small and medium-sized enterprises (SMEs) as part of a just and inclusive transition.

Access to enhanced financial resources will help to facilitate implementation speed and expansion of key mitigation initiatives, such as renewables, electric grid upgrades, retrofitting, and EV infrastructure, etc. Moreover, the availability of technology plays a key role in the decarbonization of the power, industry, and transportation sectors, particularly in relation to CCUS and alternative fuels for maritime.

There are also requirements for international technology transfer and advancements in the maturity of certain technologies, with focus on these technologies becoming more financially viable for at-scale adoption in the future. This includes various mitigation policies and measures such as SAF in the transportation sector and dietary alternatives for livestock in the AFOLU sector etc. taking into account the just transition principles.

Mitigation measures in agriculture and food-related sectors should be designed and implemented in a way that ensures food safety, plant health, animal health, agricultural productivity and sustainability, and does not create additional biological or chemical risks for humans, animals and the environment. Collectively, these sectoral targets reflect an ambitious commitment to a sustainable future, aiming to reduce emissions, enhance economic resilience, and ensure environmental sustainability.

Mitigating the impacts of climate change in cities through "green construction, "green building "approaches and healthy urban planning and design.

4.3. Sectoral Decarbonization Pathways and Mitigation Plans

Azerbaijan aims to ensure that decarbonization efforts align with long-term prosperity and sectoral advancement, balancing the country's economic growth, social well-being, and environmental sustainability. As such, the LTS acknowledges the vital role of conditional factors, such as access to financial resources (e.g., concessional loans, private sector investment), technology availability, transfer and increased maturity level, capacity-building support, and availability of absorptive capacity of forests and other ecosystems in shaping sectoral pathways and achieving ambitious climate goals.

Conditionality will be a variable factor across sectors depending on technical maturity, access to finance and domestic human capital capabilities. By incorporating such conditional factors across all relevant sectors, realistic and scalable sectoral decarbonization pathways are ensured. These pathways not only align national efforts with global climate finance mechanisms and international technological cooperation but also require substantial public and private sector investment and expertise. Achieving these goals will depend on strong collaboration with international partners, ensuring that efforts are synchronized as we transition toward a low-carbon economy.

Depending on the achievement of interim emission reduction goals set by NDCs, country's LTS and its target year might be further reconsidered.

To support decarbonization themes, four infrastructure upgrades have been identified: enhancements to the power transmission and distribution grids, expansion of EV charging infrastructure, oil-gas sector infrastructure enhancement for fugitive emissions reduction and the deployment of CCUS, CDR systems. Furthermore, to ensure successful implementation of these decarbonization pathways, six essential enabling conditions are also required: governance and monitoring, relevant regulations and policies, finance mechanisms, technology and innovation, capability building, risk assessment and a focus on enhanced inclusivity. For instance, climate food nexus requires that risk assessment mechanisms include potential impacts of decarbonization measures on food safety, feed safety, plant health, animal health, zoonotic diseases, phytosanitary risks, soil chemical safety, and the safe use of plant protection products and agrochemicals, including laboratory control, monitoring and analytical verification systems.

4.3.1. Oil and Gas (Upstream and Midstream)

CONTEXT

In the context of LTS, the oil and gas sector encompass upstream (exploration and production) and midstream (transportation, storage, and distribution) parts of the value chain. The sector is a cornerstone of the nation's economy, contributing approximately 37% to the GDP.[4] The primary activities in the upstream sector include the exploration and extraction of oil, condensate, and natural gas, petrochemical- and petroleum-refining industries, and energy production facilities. Multiple companies conduct operations, including SOCAR, Azerbaijan's national oil company (NOC) and international oil companies (IOCs). They function as, both standalone and in the form of joint ventures and production-sharing agreements (PSAs) to operate large assets.

In 2022, the sector accounted for approximately 29% (20.05 $MtCO_2eq$) of the country's total emissions. Emissions are driven by methane from venting and fugitives, flaring, and CO_2 from fuel combustion *(Figure 3)*.

Figure 3. Oil and gas sector GHG emissions breakdown in 2022, $MtCO_2eq$



[4] The State Statistical Committee of the Republic of Azerbaijan

The main emission types in the oil and gas sector are CH_4 and CO_2 which drive the selection of bespoke decarbonization measures to abate each emission type. Measures that enhance energy efficiency and involve structural modifications to current operations are implemented to mitigate methane emissions. For reducing CO_2 emissions, strategies such as electrification and CCUS are employed, focusing on using lower-emission energy sources.

In line with its established commitments, the upstream oil and gas assets are on the way to achieve zero-routine flaring by 2030 (some amount of safety flaring will remain – to be tackled by venting reduction initiatives and offsetting). Further, the country's oil and gas sector will be decarbonized through a balanced transition, considering national energy security and economic development goals. The current strategy aims to implement emissions reduction measures to achieve at least 28% reduction of emissions by 2035, with a primary focus on methane abatement in upstream operations. This approach ensures compliance with the Paris Agreement commitments.

To achieve the targeted emissions reductions, the oil and gas sector will implement a comprehensive portfolio of decarbonization measures supported by appropriate technological solutions. Each measure is designed to address specific emission sources and reduction priorities, particularly methane and CO_2 emissions across upstream operations. The selected measures differ in terms of applicability, abatement potential, implementation complexity, and deployment timeline, enabling a balanced and phased transition toward the sector's long-term decarbonization commitments.

Most oil and gas players including SOCAR and BP, are signatories of the Oil and Gas Decarbonization Charter (OGDC), launched during COP28, 2023 In line with OGDC, oil and gas sector aims to achieve Zero-Routine flaring by 2030 and near-zero methane emissions in upstream segment by 2035 (SOCAR target), as well as to reach Net-Zero level in all operations by or before 2050.

ENERGY EFFICIENCY

Energy efficiency initiatives concentrate on reducing emissions by optimizing the fuel consumption of specific equipment types through targeted projects. These measures effectively lower methane and carbon dioxide emissions, offering an overall abatement potential of 1% relative to the baseline. Given their straightforward implementation and the resultant OpEx savings, these measures are anticipated to be adopted in the short term, with a projected timeline for completion by 2030.

LEAKAGE DETECTION AND REPAIR (LDAR)

Leakage Detection and Repair (LDAR) projects play a critical role in achieving the sector's methane abatement targets by addressing fugitive methane emissions resulting from equipment leaks and operational losses. These projects involve the systematic identification, monitoring, and repair of emission sources across upstream facilities. The abatement potential and implementation costs of LDAR measures depend on factors such as asset accessibility, infrastructure condition, and the scale of required repairs. Due to their high effectiveness in reducing methane emissions, LDAR initiatives are expected to contribute significantly to the overall decarbonization pathway, with an estimated abatement potential of approximately 23% relative to baseline emissions.

ENGINEERING SOLUTIONS (VENTING REDUCTION)

Engineering solutions aim to abate venting emissions, a controlled process of direct methane emissions into the atmosphere due to operational processes and specifications. Various engineering solutions are planned to eliminate gas usage, prevent equipment failure, and upgrade operational practices to avoid venting (also leading to safety flaring reduction).

RES ELECTRIFICATION AND SCOPE 2 REDUCTION

RES electrification and Scope 2 reduction initiatives target the decarbonization of combustion-related CO_2 emissions and are closely linked to advancements in the power sector. These measures involve the electrification of natural gas turbine-driven power, machine drives (e.g., gas turbine-driven pumps and compressors), and heat generation, utilizing a grid powered by renewable energy sources such as solar or wind. This approach addresses both direct (Scope 1) and indirect (Scope 2) CO_2 emissions.

OFFSETTING PROGRAM

While last-mile emissions in oil and gas are difficult to abate (including safety flaring), they can be offset via nature-based solutions or direct air capture (DAC) technologies. Offsets are just one of all available measures to achieve Net-Zero and complement emissions reduction measures.

ROADMAP OF ACTIONS

Achieving long-term mitigation efforts will necessitate the maturation of technologies and securing appropriate funding. The roadmap for the oil and gas sector is sequential, beginning with short-term methane abatement to meet OGDC commitments, followed by the implementation of decarbonization measures for CO_2 emissions. Energy efficiency levers are the first initiatives to be implemented for sector decarbonization and are projected to be completed before 2030. The subsequent actions focus on methane abatement to achieve the mid-term targets by 2035, which include engineering solutions to reduce venting. Moreover, achieving Net-Zero by 2060 will require the maturation of RES technologies and advancements in LDAR to eliminate fugitives from difficult-to-access equipment, and sufficient investment to drive these projects.

Table 1. Oil and gas sector planned mitigation measures

Themes	Planned measures
Planned measures by 2035	
Energy efficiency	• Improve energy efficiency in operations to reduce combustion-related emissions
LDAR	• Identify and fix leaks in equipment and pipelines to prevent fugitive emissions
Engineering solutions	• Implement comprehensive initiatives to reduce methane emissions from venting through operational upgrades and improved technologies (partially abating safety flaring)
RES electrification and Scope 2 reduction	• Replace purchased electricity (Scope 2 emissions) with renewable energy produced by the company
Routine Flaring	• Under the OGDC obligations, SOCAR plans to reduce regular flaring to zero by 2030.
Planned measures by 2060	
LDAR	• Identify and fix leaks in equipment and pipelines to prevent fugitive emissions in remaining assets
RES electrification	• Convert equipment to use electricity and ensure this electricity is sourced from renewable energy
Offsetting program	• Develop programs to offset emissions (including safety flaring) through investments in projects that reduce or absorb GHGs, such as reforestation or renewable energy projects

Transitioning to Net-Zero by 2060 in the oil and gas sector will require financial support, with the largest portion allocated to methane-reduction solutions and captured gas re-route pipeline infrastructure to fulfill the OGDC's targets.

Transferring methane-measurement technologies to the country, such as satellite technologies, infrared cameras, and methane-abatement technologies, and access to funding and capability building, will be vital to unlocking sectoral decarbonization. Additionally, developing renewable energy sources in the power sector and grid upgrades will be essential for achieving Net-Zero by addressing CO_2 emissions from combustion. To tackle last-mile solutions, international partnerships, technological advancements like DAC, capability building through upskilling and reskilling, and scalable nature-based solutions for offsetting will be critical.

4.3.2. Power

CONTEXT

The power sector plays a crucial role in the country's economic framework by supplying reliable and uninterrupted energy to residential and commercial consumers, and major sectors including oil and gas, agriculture, and industry sector (e.g., metals and non-metallic minerals).

The sector has made significant progress in reducing emissions over the last two decades by shifting from fuel oil to natural gas. Additionally, unlike many other countries, Azerbaijan does not use coal for power generation, resulting in a relatively lower carbon footprint per kWh produced. Given that the power sector primarily relies on natural gas[5] as its energy source, it emerges as the country's largest contributor to GHG emissions, emitting 14.4 $MtCO_2eq$ in 2022, 20.7% of total emissions. There is significant potential to enhance efficiency and expand the use of sustainable energy sources such as renewable energy to reduce GHG emissions.

[5] Including natural gas consumption for both power and district heat generation.

TRANSMISSION AND DISTRIBUTION (T&D) UPGRADES

A critical lever in the country's energy transition is upgrading the grid infrastructure to remove the current limitations to meet growing electricity demand and enable renewable energy generation. T&D modernization will focus on reinforcing high-voltage transmission lines, constructing new substations, and upgrading existing ones with advanced automation and digital control systems. Similarly, the distribution network will also be improved by upgrading transformers, enhancing automation, and implementing smart grid technologies. These upgrades will enable higher integration of renewable energy sources into the national grid on top of BAU plans, allowing for a more significant contribution from solar and wind power. As decentralized energy generation and EV adoption grows, the distribution network will be key in managing these complexities by efficiently handling electricity flow ensuring the system remains reliable and flexible. Additionally, operational improvements to the distribution network can potentially reduce technical losses by 1-2% via further optimizing electricity generation and reducing the sector's total emissions.

RENEWABLE POWER CAPACITY

Another important lever for decarbonization involves expanding renewable energy generation capacity to maximize electricity production from clean energy sources. Thus, the technical capacity of the country onshore renewable energy is over than 135GW, offshore renewable energy is 157 GW. The economic potential of RES is estimated at 27 GW, including 3GW of wind energy, 23 GW of solar energy, 380 MW of bioenergy potential, 520 MW of mountain rivers. According to national plans, around 2 GW of renewable capacity is expected to be commissioned by 2027, primarily intended to support domestic electricity demand. Currently, onshore wind is more economically feasible and, following solar, is prioritized for development. Offshore wind will be considered as a subsequent option if technological advancements and market conditions improve its economic viability over time. Meanwhile, in the subsequent phase, during 2028–2030, the country plans to add approximately 4 GW of additional renewable capacity, of which only about 1 GW is expected to serve domestic consumption, while the remaining capacity is largely associated with planned electricity export projects. Furthermore, as stated publicly by HE the President of Azerbaijan, the country aims to reach around 6–8 GW of green energy capacity by approximately 2032, with a significant portion of this generation expected to be oriented toward electricity export.

LONG-DURATION ENERGY STORAGE BATTERIES (LDES)

To ensure a sustainable energy supply, LDES batteries will need to be installed. These batteries will store excess energy produced from renewable sources, ensuring a stable and reliable power supply. According to the information of "Azerenergy" OJSC, 250MW capacity storage has been installed. By enhancing renewable energy integration, this measure will enable increase in the share of renewable generation, supporting a more consistent renewable energy system by 2060 and contributing to an emissions abatement.

UNLOCKING OF HYDROGEN

Hydrogen is poised to play a critical role in decarbonization efforts, offering a cleaner energy solution for the power sector. The COP29 Hydrogen Declaration calls on national governments and stakeholders to commit to scaling up renewable, clean/zero-emission, and low-carbon hydrogen production and deployment to achieve near-zero GHG emissions, particularly in hard-to-abate sectors. Emphasizing international collaboration, financial and technical assistance, and advancing global standards, the pledge supports just transitions, capacity building, and R&D investments, aligning with the Paris Agreement and leveraging outcomes from recent climate conferences. Additionally, Hydrogen Action initiative will unlock the global market potential for clean hydrogen and its derivatives by establishing guiding principles and priorities to address

regulatory, technological, financing, and standardization barriers.

Leveraging the country's natural gas resources, clean hydrogen – produced via Steam Methane Reforming (SMR) with integrated CCS – is currently the most feasible option, delivering decarbonization benefits more quickly than other hydrogen types. The planned CCS infrastructure for CCGT plants can also support blue hydrogen production, capturing up to 85% of CO_2 emissions generated in the process. This enables blue hydrogen to function as a low-carbon fuel, enhancing both energy security and grid stability. In parallel, green hydrogen production is expected to support specific industries, while any excess renewable generation can further bolster green hydrogen output, aiding long-term decarbonization goals.

ROADMAP OF ACTIONS

Through 2060, long-term mitigation efforts in the power sector will require the development and implementation of regulations and policies, programs, and investments in key abatement levers. To adopt low-carbon technologies and solutions that will aid in emissions reduction in the Power sector, a detailed action's roadmap has been prepared including key milestones, targets, and timelines.

The transition to cleaner energy is expected to begin with accelerated efforts to expand solar and onshore wind power generation. Simultaneously, the Transmission and Distribution (T&D) system will be upgraded to meet rising electricity demand and support greater renewable integration. These actions will be followed by the development of CCS infrastructure paired with CCGT plants that will also assist with blue hydrogen production, and the introduction of advanced storage battery technologies to assist with the intermittent nature of renewable energy. These measures will be scaled over time, with an emphasis on renewables and storage technologies *(Table 2)*.

Table 2. Power sector planned mitigation measures

Themes	Planned measures
Planned measures by 2035	
Transmission and Distribution (T&D) upgrades and energy efficiency	• Implement upgrades to the power transmission and distribution network to accommodate growing electricity demand, and to enable increased renewable integration • Implement grid control mechanisms to minimize technical losses in electricity supply (nationwide expansion of SCADA, ADMS, DMS, GIS and other digital management systems)
Renewable's expansion	• Renewables generation share, primarily driven from solar and onshore wind power • Expand solar power capacity • Expand onshore wind power generation capacity
Themes	**Planned measures**
Planned measures by 2060	

Transmission and Distribution (T&D) upgrades and energy efficiency	• Continue to implement upgrades to the power transmission and distribution network to accommodate growing electricity demand, and to enable increased renewable integration • Continue to implement grid control mechanisms to minimize technical losses in electricity supply
Renewables expansion	• Increase generation share driven from solar and onshore wind power expansion coupled with storage batteries • Expand solar power capacity • Expand onshore wind power generation capacity (Offshore wind also has potential to support renewables expansion, and, possibly, replace certain onshore wind plans when its technical and economic feasibility materializes with technology advancement) • Scale up storage batteries • Development of technical capacities for distributed renewable generation and active consumers
Production of clean Hydrogen	• Expand clean hydrogen production, create local demand for clean hydrogen. Assess the potential contribution of green hydrogen to domestic energy transition particularly in hard-to-abate sectors, while supporting the expansion of renewable energy capacity required for its production. In parallel, promote the development and materialization of green hydrogen export projects to position the country as a potential supplier in emerging international hydrogen markets.

The potential of renewable energy sources, specifically solar and onshore wind can be expanded further by developing more cost-effective, and sustainable energy solutions, driven by cost competitiveness, market dynamics, and technological innovations. Additionally, the vast offshore wind potential could represent the advanced phase of renewable energy development, particularly when it achieves cost parity with onshore wind.

The country's strategic goal of exporting green energy, including both electrons and molecules, is closely aligned with its domestic decarbonization efforts. This strategy is contingent on large-scale deployment of offshore wind capacity, electrolyzers, and other infrastructure development and upgrades. While the strategy supports global decarbonization goals, it also enhances Azerbaijan's energy landscape by integrating more renewable energy and reducing the reliance on fossil fuels. As the variable renewable energy solutions outlined in the decarbonization pathways are expected to generate more electricity compared to local demand, the surplus will be directed to export markets, further supported by the introduction of battery storage facilities, contributing to regional decarbonization efforts.

Achieving Net-Zero by 2060 will require substantial investments, with the majority of

capital expenditure (CapEx) directed towards installing battery storages and developing wind power plants. Additionally, investments will be necessary in upgrading grid infrastructure and expanding solar energy capacity. Despite the high initial costs, these investments are expected to result in operational expenditure (OpEx) savings by shifting from more expensive gas-fired power plants to more cost-effective renewable energy sources, lowering the marginal costs of electricity production.

4.3.3. Buildings

CONTEXT

The buildings sector is central to meeting the population's energy needs and supporting various economic activities. It encompasses a wide range of structures, from residential apartments to commercial buildings. Specifically, the sector comprises approximately 2.1 million residential dwellings, accommodating over 10.1 million residents and 0.5 million commercial, institutional, and industrial buildings.

Natural gas is the primary energy source for heating and cooking. In 2022, the residential segment consumed approximately 4.0 bcm of natural gas, while the commercial, institutional, and industrial segments used approximately 0.5 bcm, leading to total GHG emissions of 9.7 $MtCO_2eq$. This consumption makes building buildings the second highest-emitting sector in the country in 2022, constituting 14% of overall emissions.

Space heating is the primary source of buildings sector emissions in all segments, with 72% (7.2 $MtCO_2eq$) of total emissions from residential dwellings and 10% (1.0 $MtCO_2eq$) from commercial, institutional, and industrial buildings. Water heating is the second biggest source of emissions in all segments, with 13% (1.3 $MtCO_2eq$) of emissions from residential dwellings and 2% (0.2 $MtCO_2eq$) from water heating for commercial, institutional, and industrial segments. Cooking represents 3% of the sector's emissions, amounting to 0.3 $MtCO_2eq$ *(Figure 4)*.

Figure 4. Buildings sector GHG emissions breakdown in 2022, $MtCO_2eq$



ELECTRIFICATION OF EQUIPMENT POWERED BY NATURAL GAS

Electric heat pumps

The primary decarbonization lever for buildings is switching to electric air-to-water heat pumps. All buildings are expected to be equipped with electric air-to-water heat pumps by 2060 which will also be powered by renewable energy. Electric heat pumps are approximately three times more efficient than traditional natural gas-powered heating systems because they transfer heat rather than generate it through combustion. Therefore, even though overall electricity consumption increases, a net reduction in emissions can be achieved. Furthermore, this technology has adjacent benefits that create additional impact for the buildings sector by reducing water consumed in heating due to the technology's working principle, thus significantly reducing reliance on natural gas.

Electric stoves

Installing electric stoves in all buildings by 2060, which are expected to use renewable energy, will abate GHG emissions stemming from natural gas used for cooking. Unlike gas stoves that use high-emission fuels, electric stoves use electrical resistance to generate heat, which is then transferred to cookware, making them more efficient. This method reduces the need for natural gas in cooking, thus playing an important role in decarbonizing the buildings sector.

INCREASING ENERGY EFFICIENCY

Insulation

To increase the energy efficiency of heating and cooling systems, adequate insulation is required. Considering Azerbaijan's old building stock from the Soviet era and their respective sub-optimal standards, installing high-performance insulation materials to meet high energy efficiency standards will be needed to meet decarbonization. By 2060, all existing and new buildings are expected to have optimal insulation. This will be accomplished by installing high-performance insulation materials, such as advanced thermal insulation and double-glazed windows. Improved insulation is expected to lower heating and cooling energy demand, substantially contributing to Net-Zero emissions.

LED lighting

Switching to LED lighting reduces electricity consumption compared to traditional incandescent bulbs. Their more energy-efficient technology utilizes less energy and produces less heat, leading to lower electricity consumption.

High-efficiency appliances

Promoting the use of appliances that adhere to global energy efficiency standards, such as refrigerators, washing machines, and dishwashers, is estimated to lower electricity consumption. These appliances are designed to use less electricity and water, helping to reduce utility costs and environmental impact.

High-efficiency air conditioning (AC)

Installing high-efficiency AC systems can improve cooling performance while consuming less energy. These systems are developed to meet global energy efficiency standards, thus reducing electricity use.

By implementing these measures, Azerbaijan aims to transition its building sector to Net-Zero emissions by 2060, significantly contributing to climate goals in NDC 3.0. Three of these measures – electric heat pumps, electric stoves, and insulation - will directly impact the emissions produced by the buildings sector. The other three mitigation levers – LED lighting, high-efficiency appliances, and higher-efficiency AC – are related to energy efficiency in electricity consumption, and their impact is considered under the power sector.

Achieving Net-Zero by 2060 will require the investments in the short and medium term, along with development and implementation of regulations, policies, and programs. This roadmap of actions with clear mitigation measures, milestones, targets, and timelines will be essential for setting a clear path to focus efforts and investments needed to reduce emissions.

Four key actions are expected to be implemented to achieve Net-Zero in the buildings sector: (1) switching to electric heat pumps, (2) transitioning to electric stoves in residential buildings, (3) installing high-performance insulation materials (such as advanced thermal insulation and double-glazed windows), and (4) adopting LED lighting and high-efficiency appliances and AC.

Achieving Net-Zero emissions by 2060 will require substantial capital investments to install electric heat pumps, electric stoves, advanced insulation, LED lighting, and high-efficiency appliances and AC in existing and new buildings. Due to high upfront costs, high-performance insulation materials and heat pumps are expected to require the largest investment. This investment will also need to be complemented by the expansion of renewable power generation to ensure green energy is used after the electrification of buildings is completed *(Table 3)*.

Table 3. Building sector planned mitigation measures

Themes	Levers	Planned measures
Planned measures by 2035		
Electrification of equipment powered by natural gas	Electric heat pumps	• Transition to electric heat pumps in existing residential and commercial buildings • Establish guidelines for all new buildings to have electric heat pumps • Support the use of renewable electricity to power heat pumps • Incentivize installation of electric heat pumps in urban and rural areas
	Electric stove	• Transition to electric stoves in residential buildings • Support the use of renewable electricity to power electric stoves • Incentivize installation of electric stoves in urban and rural areas
Increasing energy efficiency	Insulation	• Install adequate insulation to existing residential and commercial buildings • Set high insulation standards for new buildings • Offer incentives for insulation upgrades in residential and commercial, institutional, and industrial buildings
	Led lighting	• Promote the replacement of traditional lighting with energy-efficient LED bulbs in existing buildings • Establish guidelines for mandatory LED lighting in new construction projects • Encourage public awareness campaigns on the benefits of LED lighting for energy savings, lower utility bills, and reduced emissions
Increasing energy efficiency	High-efficiency appliances	• Promote the use of appliances that meet global energy efficiency standards in existing buildings • Establish guidelines and incentives to ensure high-efficiency appliances are used in new buildings • Provide incentives for replacing outdated appliances with more efficient models • Increase awareness of the cost and environmental benefits of energy-efficient appliances
	High-efficiency air conditioning	• Encourage the use of high-efficiency AC systems in existing buildings • Establish energy efficiency requirements for AC systems in new constructions • Provide incentives for replacing outdated AC units with more efficient models
Planned measures by 2060		
Electrification of equipment powered by natural gas	Electric heat pumps	• Achieve a 100% electric heat pump share in all buildings • Continue with guidelines for all new buildings to have electric heat pumps

	Electric stove	• Raise the share of electric stoves in all buildings to 100% • Continue with requirements for all new buildings to have electric stoves
Increasing energy efficiency	Insulation	• Ensure that 100% of existing buildings have adequate insulation • Maintain high insulation standards for new buildings
	Led lighting	• Increase share of LED lighting to 100% in all buildings
	High-efficiency appliances	• Achieve 100% high-efficiency appliances share in existing buildings • Promote replacing outdated appliances and upgrading of existing air conditioning systems through various incentive programs
	High-efficiency air conditioning	• Raise the share of high-efficiency AC to 100% in all buildings • Encourage the upgrade of existing AC through various incentive programs

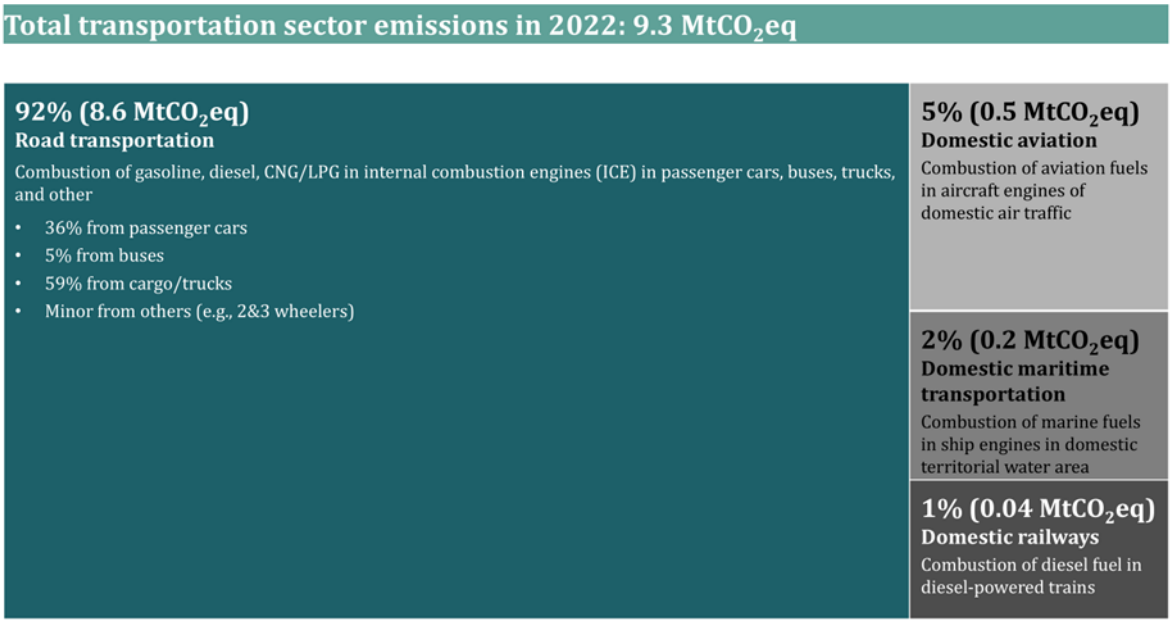
4.3.4. Transportation

CONTEXT

The transportation sector is a highly important element of the country's economy, contributing approximately 6% to the GDP. The well-developed transportation network includes roads, domestic railways, aviation, and maritime transportation.

In 2022, GHG emissions from transportation sector amounted to 9.3 $MtCO_2eq$, constituting 13% of the country's overall emissions. Among multiple segments within the sector, road transportation is the primary source of the mentioned emissions, accounting for 92% of sectoral emissions (8.6 $MtCO_2eq$). Domestic aviation accounted for 5% of the sector's emissions with 0.5 $MtCO_2eq$. In comparison, domestic maritime and railways contributed 2% and 1%, respectively, primarily due to the consumption of marine fuel in shipping and diesel in railway locomotives *(Figure 5)*.

Figure 5. Transportation sector GHG emissions breakdown in 2022, $MtCO_2eq$



A detailed plan that includes specific actions and measures for emission reduction is critical to achieving Net-Zero by 2060. The established target is to decarbonize the transportation sector, decreasing GHG emissions by 40% by 2035 and achieving Net-Zero by 2060.

Energy transition in the transportation sector will target 3 key objectives of: 1) reduction of distance (km) travelled by road transportation 2) reduction of emission intensity per kilometer travelled by enhancing efficiency of the current fleet and introduction of cleaner fuel sources 3) achieving an optimal modal shift by introducing new mobility solutions and increasing the share of public transportation.

STRUCTURAL AND OPERATIONAL UPGRADES

Shift freight to railways from road transportation

Increasing the use of railways for freight transportation over cargo trucks will reduce transportation GHG emissions by 2060. Rail transport is more energy-efficient and emits fewer pollutants compared to cargo trucks, particularly when powered by electricity from renewable sources. Freight trains can also accommodate larger volumes of goods per trip, thereby reducing the number of trips required and subsequently decreasing overall fuel consumption and emissions.

Increased public transportation usage

An increase in public transportation usage, such as metro systems and public buses, will reduce emissions from passenger cars. This will be achieved through modernizing infrastructure, introducing micro-mobility solutions, and enhancing public transportation's attractiveness and accessibility.

ELECTRIFICATION

Looking towards 2060, decarbonizing the transportation sector requires gradual phase-out of ICE vehicles, replacing them with EVs. Substantial investments in electric charging infrastructure and additional incentive mechanisms will be required to encourage this shift. The first wave of electrification is set to start with passenger cars and public transportation, while further electrification across all segments is planned by 2060 such as fully electrifying the rail infrastructure with electric trains.

Electrification measures will also be considered in airport operations, including the assessment of actions to gradually transition ground handling equipment and airport service vehicles to electric alternatives where operationally feasible.

ALTERNATIVE FUELS

Biofuel blending

During the transition period, until widespread adoption of key levers such as EV adoption, biofuel blending will be used to decrease GHG emissions. Blending biofuels in road transportation, aviation, and maritime fuels reduces the high-emission fuel component in the fuel mix through blending, thus lowering emissions.

Sustainable aviation fuel (SAF)

Although SAF can substantially reduce CO_2 emissions, additional last-mile solutions will be necessary to fully decarbonize the transportation sector.

Sustainable biofuels can contribute to reducing emissions in hard-to-decarbonize transport sectors such as aviation. In this regard, it is considered appropriate to explore the possibilities for the gradual adoption of Sustainable Aviation Fuel (SAF) in the aviation sector, taking into account international technological developments and fuel availability.

Maritime methanol

To decarbonize domestic maritime transportation, methanol and other alternative fuels are expected to replace marine fuel oil for coastal ships. This shift will be progressively implemented after 2035, reaching 100% adoption in 2060.

The mitigation efforts to be achieved by 2060 will require formulating and implementing policies, programs and investments in the short and medium term. The roadmap for transportation includes key milestones for adopting low-emission technologies and levers. This roadmap will be crucial in establishing a foundation and clear direction for scaling up levers and investments that are necessary to decrease transportation sector emissions.

The transition to Net-Zero is expected to begin with adopting EVs and developing the necessary EV infrastructure for passenger cars and buses, followed by trucks and other road transportation. A gradual but early shift of freight to railways and the expansion of public transport systems is also anticipated.

Decarbonization will continue with implementing advanced technologies, which will become cost efficient as technology matures. These technologies include the increased adoption of maritime methanol (blue or green) to replace maritime fuel, and SAF for the aviation segment. Finally, full electrification of railways and road transportation is expected to be completed by 2060 *(Table 4)*.

Table 4. Transportation sector planned mitigation measures

Pathways	Segment	Planned measures
Planned measures by 2035		
Structural and operational upgrades	Shifting freight to railways from road transportation	• Expand and increase the utilization of the railway network • Shift of freight truck transportation to railways
	Increased public transportation usage	• Expand and modernize the public transportation networks, including buses, trains, and metro • Incentivize structural change to increase the use of public transportation and micro-mobility solutions • Switch of passenger transportation activity to public transportation
Electrification	Passenger cars	• Plan the initial retirement of the ICE fleet • Increase the EV share in passenger car fleet Support the adoption of EVs through incentive programs
	Buses	• Increase the EV share in bus fleet
	Cargo / Trucks	• Expand the EV share of cargo / trucks vehicles fleet
Pathways	**Segment**	**Planned measures**
Electrification	Another road transportation	• Increase the EV share of other road transportation
	Railways	• Increase the EV share of the railways
Biofuels	Biofuel blending	• Adopt biofuel blending in road transportation and aviation
Planned measures by 2060		
Structural and operational upgrades	Shifting freight to railways from road transportation	• Shift of truck freight transportation activity to railways
	Increased public transportation usage	• Switch of passenger transportation activity to public transportation
Electrification	Passenger cars	• To increase the share of electric and other alternative energy-powered vehicles in the passenger car fleet up to 100%. • Promote EV adoption through various incentive programs • Plan the further phased retirement of ICE vehicles
	Buses	• To increase the share of buses used in urban (intra-district) passenger transport to 100%.

	Cargo / Trucks	• To increase the share of electric and other alternative energy-powered vehicles, including hybrid vehicles, in the freight transport fleet to 75%.
	Other road transportation	• Raise the proportion of EVs in other road transport categories to 100%
	Railways	• Achieve full electrification of the railway network
Biofuels	Maritime methanol	• Apply the use of methanol and other alternative fuels to the entire maritime fleet
	Sustainable aviation fuel (SAF)	• Introduce SAF to the whole aviation fleet

Decarbonizing the transportation sector requires significant amounts of CapEx, mainly for the road transportation segment. Additional CapEx will be needed for other types of infrastructure such as EV charging stations, and power grid upgrades (covered in the power sector) to meet increased electricity demand.

Regarding OpEx, savings are expected mainly from road transportation driven by improved efficiency and lower fuel consumption and maintenance costs compared to ICE vehicles across all road transportation segments.

By addressing key challenges and implementing decarbonization measures, transportation sector emissions will be significantly reduced, thus contributing to climate goals set out by NDC 3.0.

Measures to improve operational efficiency can also contribute to reducing emissions in air transport. The continuous modernization of the aircraft fleet, the enhancement of air traffic management systems, and the optimization of flight operations can help reduce fuel consumption and greenhouse gas emissions.

At the same time, the application of circular economy principles in the aviation sector-such as efficient resource use, waste reduction, and material reuse-can also support sustainable development goals. These approaches can help ensure the sector's continued role in economic development while maintaining its international and regional competitiveness.

4.3.5. Industry

CONTEXT

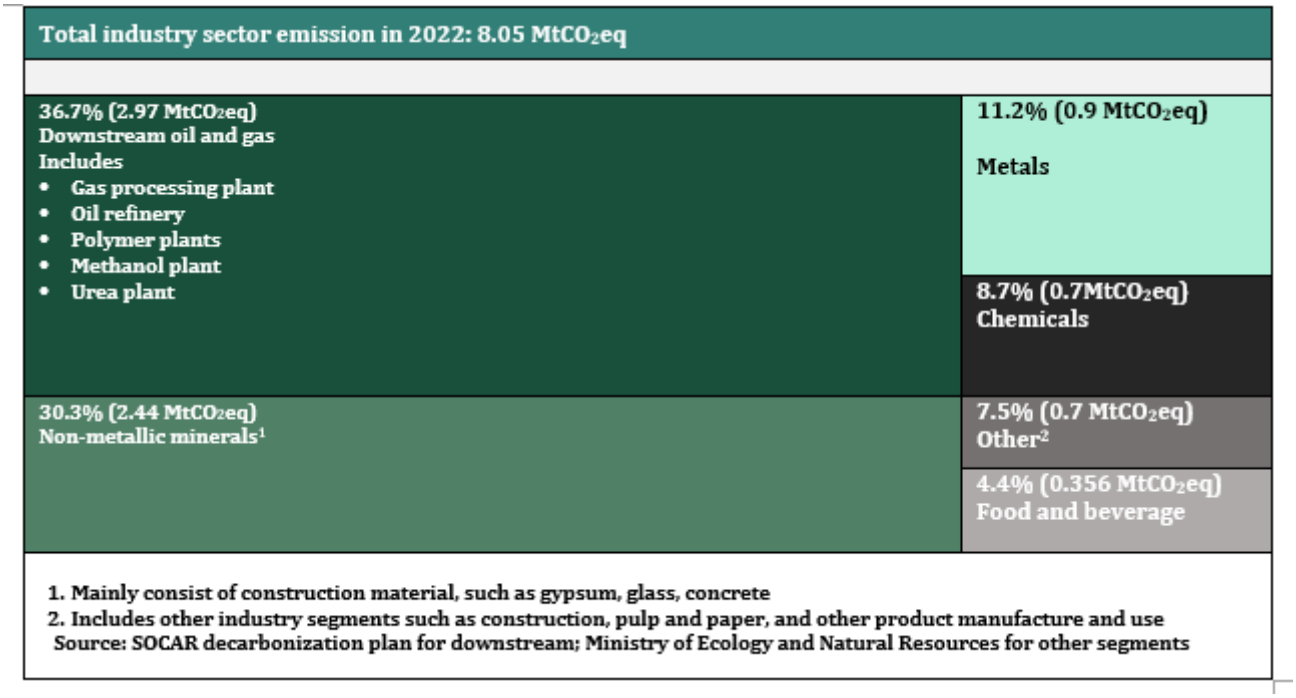
The industrial sector is an important source of economic growth and jobs, with multiple at-scale industrial companies, contributing up to 25% of the country's non-oil and gas GDP.[6] This contribution and growth have been driven by government policies as well as investments from the private sector and SOEs. This continued growth is projected to translate into higher GHG emissions, making decarbonization of this sector one of the main priorities in achieving national targets.

The main segments of this sector include SOCAR's downstream oil and gas business units, which primarily focus on refining and processing hydrocarbons, non-metallic minerals segment, primarily consisting of cement production companies, and metals segment, which includes gold extraction, aluminum production, and other upstream operations. Additionally, construction, and food and beverage segments also contribute significantly to the sector's emissions.

In 2022, the industrial sector generated 8.05 $MtCO_2eq$ of emissions, driven by the use of high-emission fuels in energy and raw materials across six segments. Downstream oil and gas products, as well as non-metallic minerals, are two major contributing segments, collectively responsible for 5.4 $MtCO_2eq$ in total sector emissions. Other contributors include metals, chemicals and food, beverage and other industry segments such as construction and construction materials which together account for an additional 2.55 MtCO2eq *(Figure 6)*.

It should be noted that the industrial sector is often considered hard-to-abate in terms of GHG emissions, primarily due to the high temperatures required for industrial processes. These processes often rely on hydrocarbons and produce gases from chemical reactions that may also contain fluorine.

Figure 6. Industry sector GHG emissions breakdown in 2022, $MtCO_2eq$



[6] The State Statistical Committee of the Republic of Azerbaijan

SECTORAL PATHWAYS

ENERGY EFFICIENCY

Energy efficiency across all industrial sectors is a key theme for unlocking maximum decarbonization potential. One such example can be seen in downstream oil and gas segment, with specific objectives based on detailed internal modeling conducted by SOCAR, focusing on energy efficiency across its downstream assets.

OPERATIONAL UPGRADES

Operational upgrades can significantly reduce emissions across various areas of the operations-driven industry sector. This includes activities such as detecting leaks in pipelines and optimizing processes to lower energy requirements for specific equipment. As the country's industrial sector continues to expand, focusing on operational upgrades will be crucial for both enhancing efficiency and achieving decarbonization goals.

In the metals segment, these upgrades would involve the complete replacement of carbon anodes with inert anode technologies for aluminum smelting by 2060, as the technology matures. In the downstream oil and gas segment, implementing Leak Detection and Repair (LDAR) programs will help mitigate methane leaks, while the production of biogas as an alternative fuel can further reduce emissions. Such upgrades, along with similar improvements across various segments, will be essential for minimizing emissions and enhancing overall operational efficiency.

ELECTRIFICATION

Extensive electrification is targeted across various sectors by 2060, with continuously expanding green energy generation goals. In the industrial sector, electrification will be a crucial driver of decarbonization. For instance, in the chemicals segment, gas boilers are set to be replaced with heat pumps and electric boilers, and similar transitions are anticipated in the food and beverage sector. In the metals segment, the digestion and calcination processes of alumina refining could be fully electrified by 2060. Other segments are also expected to gradually increase electrification.

CARBON CAPTURE, UTILIZATION, AND STORAGE (CCUS)

CCUS is expected to play a major role in decarbonizing the industrial sector, provided certain conditions are met. Enhancing CCUS capabilities and applicability through dedicated research and assessment in the country is considered to be a key measure by 2060. In the metals segment, the gradual adoption of Direct Reduced Iron-Electric Arc Furnace (DRI-EAF) technology with CCUS adoption as the technology matures, with the remaining continuing to use scrap-based Electric Arc Furnace (EAF) technology. In the non-metallic minerals segment, full emission reduction is expected to be achieved by installing CCUS technology on all cement kilns by 2060. Carbon capture technologies will also play a significant role in downstream oil and gas, targeting various emissions sources.

ROADMAP OF ACTIONS

To achieve country's 2060 target, the latter are broken down into milestones for intermediate years. By 2035, the focus will be on deploying mature technologies, with the exception of CCUS, which still needs to be demonstrated as feasible in the country. The scale of implementation varies by lever and full coverage is not anticipated before 2035.

Between 2035 and 2060, it is planned to deploy the technologies that have not yet fully matured as of the date of this report, along with further scaling up of all levers.

To reach the Net-Zero goal by 2060, it is essential to have a comprehensive emissions mitigation strategy that outlines specific actions and measures for reducing emissions *(Table 5)*.

Table 5. Industry sector planned mitigation measures

Theme	Segment	Planned measures
Planned measures by 2035		
CCUS *(Pilot only)*	Downstream oil and gas	• Pilot CCUS applications to curb segment's emissions
Electrification	Chemicals	• Replacement of gas boilers, primarily using electric boilers
	Food and beverage	• Replacement of gas boilers, with most replacements coming from high-temperature heat pumps
	Other	• Gradually increase electrification level to through the replacement of gas boilers
Operational upgrades	Downstream oil and gas	• Apply LDAR technology to curb segment's emissions • Produce biogas as an alternative fuel to curb segment's emissions
Energy efficiency	Downstream oil and gas	• Reduction in emissions via energy efficiency levers
Planned measures by 2060		
Carbon capture, utilization, and storage (CCUS)	Metals	• Uptake of DRI-EAF with CCUS in steel production as technology matures, with the remaining production utilizing EAF using scrap steel as feedstock
	Non-metallic minerals	• Install CCUS technology on all kilns
	Downstream oil and gas	• Implement mass roll-out of CCUS technology across relevant assets
Electrification	Chemicals	• Fully phase out gas boilers, replacing them with heat pumps and electric boilers
	Food and beverage	• Fully phase out gas boilers, replacing them with heat pumps and electric boilers
	Metals	• Electrify digestion and calcination processes in alumina refining
	Downstream oil and gas	• Reduction in segment emissions via electrification of processes using renewable energy sources and scope 2 reductions
	Other	• Gradually increase electrification level to reach 100%
Operational upgrades	Metals	• Fully replace carbon anodes as inert anode technology matures in aluminum smelting
	Downstream oil and gas	• Expand applications of LDAR technology Expand production of biogas as an alternative fuel

Energy efficiency	Downstream oil and gas	• Reduction in segment's emissions through energy efficiency measures, as detailed in internal modeling conducted by SOCAR

Decarbonization of the industry sector requires additional CapEx, primarily expected after 2035 with the implementation of high-cost pathways and measures. Among these high-cost measures, the deployment of CCUS technologies will represent the largest share of required investment, playing a critical role in decarbonizing the non-metallic minerals, metals, and downstream oil and gas segments.

In addition to CapEx, OpEx of the industrial sectors is projected to increase compared to BAU. Decarbonization methods, such as the integration of CCUS, will introduce additional costs to operate industrial assets. The need for specialized inputs and maintenance of advanced technologies will further increase OpEx. Conversely, some decarbonization pathways, such as improved energy efficiency, are expected to provide long-term OpEx savings.

By committing to a decarbonized industrial future, the country will significantly reduce its GHG emissions, contribute to global climate mitigation efforts, create new economic opportunities, and align with international climate policies.

4.3.6. Agriculture, Forestry, and Other Land Use (AFOLU)

CONTEXT

The AFOLU sector focuses on the production of grains, fruits, vegetables, and various livestock products, including meat, dairy, and wool. It also encompasses land use, forestry, and soil management practices. As a sector, it is the country's largest employer providing jobs for 36% as of 2022.[7]

The agriculture sector emitted a total of 8.0 $MtCO_2eq$ *(Figure 7)* in 2022, with emissions stemming from livestock and crop production activities releasing CO_2, CH_4, and N_2O. Out of all emissions, CO_2 emissions are largely linked to energy use in farm machinery, particularly diesel consumption, while CH_4 and N_2O emissions mainly come from enteric fermentation in ruminant animals and the anaerobic decomposition of manure. Enteric fermentation and energy-related emissions are the largest contributors, accounting for 63%[8] and 17% of total sectoral emissions, respectively. Cattle and sheep are responsible for 67% and 27% of enteric fermentation emissions, underscoring their predominant role in agricultural emissions.

Measures aimed at reducing livestock-related emissions should be implemented without compromising animal health, productivity, biosecurity and the safety of food of animal origin. Particular attention should be given to risks related to zoonotic diseases and the safe use of feed additives.

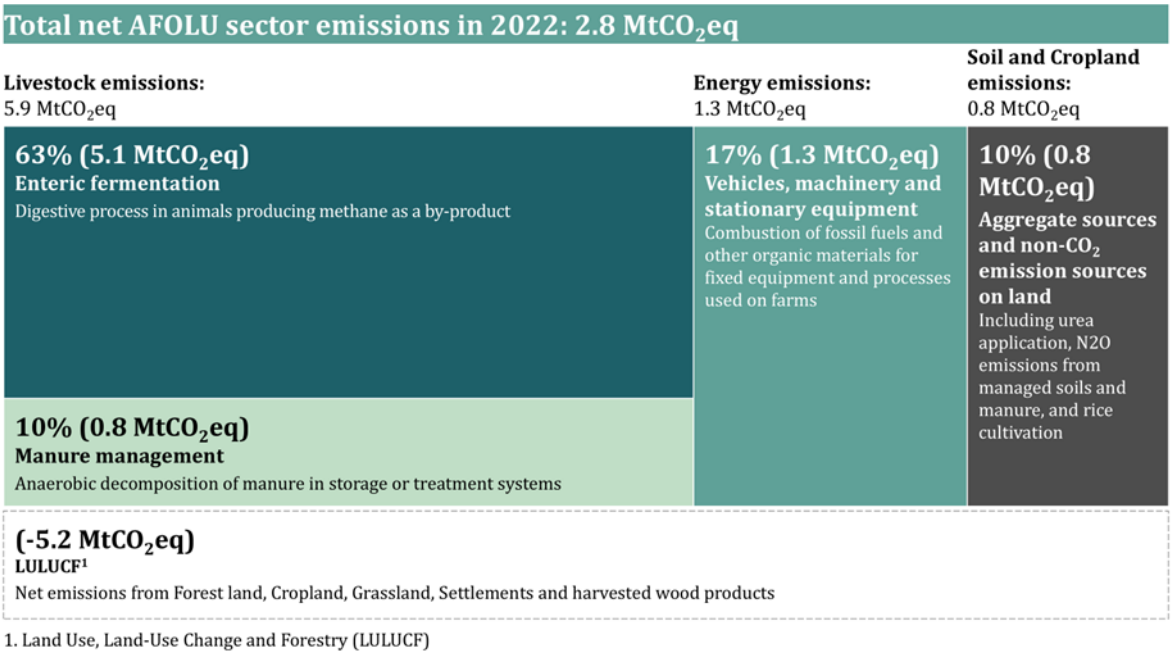
Alongside these emissions, the sector also has a stabilizing element in the form of the Land Use, Land-Use Change, and Forestry (LULUCF) sector, which acts as a carbon sequestration mechanism. In 2022, LULUCF contributed a net carbon sequestration of 5.2 $MtCO_2eq$, with forest land emission removals accounting for 3.6 $MtCO_2eq$ across 1.04 million hectares. This sequestration has been instrumental in offsetting the overall emissions impact of the agriculture sector. Together with LULUCF, the net emissions of the

[7] The State Statistical Committee of the Republic of Azerbaijan

[8] Upon a future census of the country's livestock and adjustments to the emission intensity estimates for the livestock sector, the total emissions figures may be subject to revision

AFOLU sector were 2.8 $MtCO_2eq$ in 2022 Figure7). Soil health monitoring should include not only carbon sequestration indicators, but also chemical safety parameters, including pesticide residues, agrochemical contamination and persistent organic pollutants. Issues related to obsolete pesticides and persistent organic pollutants (POPs) should be addressed through monitoring, risk assessment and environmentally sound management, in line with relevant international obligations.

Figure 7. AFOLU sector GHG emission breakdown in 2022, $MtCO_2eq$



1. Land Use, Land-Use Change and Forestry (LULUCF)

ELECTRIFICATION OF MACHINERY

Transitioning from diesel-powered agricultural machinery to electric alternatives represents a marked step toward reducing emissions. This transition will include both mobile and stationary equipment, such as water pumps, irrigation systems, grain handling and crop processing machinery, refrigeration systems for storing agricultural products, and other essential tools. However, the success of this transition will depend on building the infrastructure necessary to support the widespread use of EVs and machinery in agriculture.

METHANE REDUCTION

To address methane emissions from livestock, particularly from enteric fermentation and decomposition of manure, the focus will be on effective livestock management practices. Although most of the livestock in the country is free-range and not managed in feedlots, meaning the abatement potential is somewhat limited, efforts such as use of feed additives and dietary practices, as well as the development of medium- and large-scale composting facilities will also contribute to emission reductions from both enteric fermentation and decomposition of manure, respectively.

SMART AGRICULTURAL PRACTICES

Adopting more efficient agricultural techniques such as precision agriculture, reducing fertilizer overuse, and implementing no-tillage practices will further reduce emissions while enhancing sustainability across the sector. These practices will boost efficiency and lower the environmental footprint of the sector. Additionally, due to the country's mountainous landscape and the resulting challenges of soil erosion, establishing smart systems, including a detailed land information system, is seen as a critical step to enhance the effectiveness of these practices and improve long-term sustainability outcomes.

LULUCF

Expanding forest land is expected to play an important role in abating emissions within the AFOLU sector. As forest land continues to grow, it could bring total emissions within the sector to Net-Zero by 2060.

Decarbonization efforts in the AFOLU sector through 2060 will require the implementation of policies, programs and investments in the short and medium term. The roadmap of these efforts includes key milestones and timelines aimed at reducing greenhouse gas emissions through a variety of measures, including methane reduction, electrification of agricultural machinery, and forest land expansion.

Efforts are set to begin with the electrification of agricultural machinery transitioning from diesel-based equipment to electric alternatives. On the methane production side, reduced emissions from livestock will be achieved through feed optimization, manure composting, and feed additives. The successful implementation of these measures relies on ensuring they do not negatively impact agricultural productivity and food security.

Forest land expansion will also prove pivotal, whereby available lands will be used to increase carbon sequestration and meet forestation goals.

As these measures scale up over time, the sector will focus on further reducing methane emissions and achieving higher levels of electrification. By 2060, the sector aims to fully transition to electric machinery and maximize emissions abatement potential, contributing significantly to the country's sustainability goals *(Table 6).*

Reforestation and afforestation activities play important role in absorption of carbon dioxide within the AFOLU sector. As forest land continues to grow, it could contribute largely achieving Net-Zero target by 2060. The transition towards the 2060 Net-Zero objective should be implemented in a balanced and risk-based manner, ensuring that food safety, agricultural productivity, plant and animal health, and biological and chemical safety are not compromised.

Table 6. AFOLU sector planned mitigation measures

Themes	Planned measures
Planned measures by 2035	
Electrification of machinery	• Accelerate the shift from traditional ICE machinery to electric machinery
Methane reduction	• Introduce manure composting facilities
Forestry	• Leverage relevant lands to recover or convert to forest land
Planned measures by 2060	
Electrification of machinery	• Further accelerate the shift from traditional ICE machinery to electric machinery, and achieve full (100%) electrification, and full emission abatement from this subsector
Methane reduction	• Expand feed grain processing, have higher-fat diet, increase the concentrate-to-forage ratio and feed additives (3-NOP and asparaguses), and establish compost facilities in the rest of applicable agricultural farms

Forestry	• Increase the forest land share

4.3.7. Waste

CONTEXT

As the country's population and industrial activities continue to grow, managing waste presents an essential opportunity for environmental improvement. As of 2022, total generated municipal solid waste (MSW) and industrial waste amounted to 3.9 Mt, resulting in 395 kg of waste generated per capita. Additionally, approximately 260 million m^3 of wastewater was processed that year.

In 2022, waste sector was responsible for emitting 4.9 $MtCO_2eq$, accounting for approximately 7% of the country's total GHG emissions. Emissions from solid organic waste disposal at both managed and unmanaged sites constituted half of the sector's emissions, releasing 2.4 $MtCO_2eq$ during the anaerobic decomposition of organic materials. The wastewater treatment process generated 2.4 $MtCO_2eq$, primarily consisting of methane (CH_4) and nitrous oxide (N_2O), which are produced during anaerobic digestion and the nitrification-denitrification processes integral to wastewater treatment *(Figure 8)*.

In addition to waste treatment and disposal, incineration is another waste management method, producing less CO_2 than disposal at unmanaged sites. In 2022, waste incineration at the Balakhani solid waste incineration plant generated 231.4 GWh of electricity and emitted 0.01 $MtCO_2eq$ in GHG emissions, which is estimated to be approximately 84 $ktCO_2eq$ less than what would have been produced in open landfills. These emissions are incorporated into the power sector's emissions, as they are produced while generating power.

Additionally, CO_2 emissions from burning biomass materials, amounting to 0.5 $MtCO_2eq$, were excluded from the national total, as these biogenic emissions mainly come from the incineration of paper, food, and wood waste.

Figure 4. Waste sector GHG emissions breakdown in 2022



SECTORAL PATHWAYS

STRUCTURAL CHANGES

Structural changes in shifting behavior for more sustainable waste management practices, including reducing waste generation and waste segregation will drive the overall reduction of GHG emissions. Encouraging individuals and businesses to adopt green waste management methods by raising awareness about the environmental impact of improper waste disposal and collection is crucial for implementing structural changes.

ANAEROBIC DIGESTION (AD) PLANTS

AD plants play a pivotal role in the Net-Zero pathway by converting organic waste into biogas. Their implementation requires infrastructure, including waste collection, and sorting systems, and behavior shifts for increased collection rates. Given that AD plants have the potential to reduce methane emissions from organic waste, it is expected that greenhouse gas emissions from solid waste disposal can be mitigated using this approach.

WASTEWATER TREATMENT CENTERS

Establishing advanced wastewater treatment centers that utilize anaerobic processes will capture methane for energy use and significantly reduce wastewater GHG emissions. Achieving this requires upgrading existing wastewater treatment infrastructure and technological investments in anaerobic systems.

ROADMAP OF ACTIONS

The mitigation efforts in the waste sector by 2060, aimed at decarbonizing the sector, require the development and execution of policies, programs, and levers in the short and medium term. The roadmap includes establishing AD plants for solid waste and upgrading wastewater treatment plants to capture methane and reduce GHG emissions.

The first phase of the transition to Net-Zero requires increasing waste collection and sorting rates and developing infrastructural capacity. This phase will focus on deploying AD plants for collected solid waste and upgrading treatment centers for wastewater. Continuing into the second phase with advanced technologies, the deployment of these measures will increase, achieving 100% coverage for solid waste and wastewater activities. However, a hard-to-abate portion of solid waste will still need to be addressed.

Table 7 below outlines planned mitigation measures for managing solid waste disposal and wastewater treatment, including various initiatives and policy actions.

Table 7. Waste sector planned mitigation measures

Themes	Planned measures
Planned measures by 2035	
Anaerobic digestion (AD) plants	• Assess the feasibility and construction of AD plants near the intersection of waste landfills • Deploy AD plants for solid waste activity • Increase the share of waste sorting in total generated waste through incentives and awareness programs
Wastewater treatment centers	• Construct new wastewater treatment centers to increase capacity and improve the efficiency of wastewater processing • Deploy wastewater treatment centers
Planned measures by 2060	
Anaerobic digestion (AD) plants	• Further deploy AD plants to cover continuous operation and all collected solid waste activity
Wastewater treatment centers	• Further implement advanced technologies in wastewater treatment plants to improve efficiency and for all generated wastewater

5. Challenges for Implementing Net-Zero Plans

A successful Net-Zero transition requires several enabling conditions: mobilizing adequate and predictable finance, including climate finance; ensuring access to and deployment of advanced technologies; and strengthening institutional and human capacities.

Achieving Net-Zero by 2060 will require substantial investment across all sectors. Limited access to international finance may delay the implementation of necessary measures. Addressing this challenge will require a structured and diversified funding approach that leverages multiple financing instruments.

In this context, Azerbaijan is also exploring ways to mobilize investment to support these efforts. In line with sustainable socio-economic development priorities, this will involve a mix of international and domestic financing mechanisms, including Foreign Direct Investment (FDI), Public-Private Partnerships (PPPs), and Power Purchase Agreements (PPAs) etc.

Simultaneously, securing international support, including concessional finance and grants, is critical to support the transition to Net-Zero. The adoption of the New Collective Quantified Goal on climate finance at COP29 in Baku provides an important foundation, and its full delivery will be a key enabler for NDC implementation and the achievement of Net-Zero by 2060.

At the same time, widespread deployment of advanced low-carbon technologies is essential, particularly in the power, industry, and oil and gas sectors. These include solutions such as CCS/CCUS. Ensuring access to such technologies, including through transfer and equipment upgrades, will be critical. In parallel, R&D projects, education programs, and international collaborations will help benefit from technological innovations and adoption.

The deployment of these technologies also depends on a skilled workforce. Upskilling and reskilling in areas such as renewable energy, smart grids, and hydrogen will be necessary to support implementation. While efforts are underway, gaps in technical expertise could slow progress if not addressed.

The maturity of certain technologies, including cost effectiveness and the level of development for large-scale deployment, presents uncertainties that can lead to high costs, performance issues, and potential delays in implementation of decarbonization pathways. Specific technology maturity risks for Azerbaijan include the deployment of EVs and the installation of electric heat pumps, which require evolution in lifespan, efficiency, and cost-effectiveness for its increased penetration despite being commercially available in the market.

Meeting the objectives of this LTS will require mobilizing public and private finance at a scale well beyond current flows, and ensuring that this finance reaches activities that genuinely advance Azerbaijan's climate and environmental goals. The National Green Taxonomy (NGT), approved by the Cabinet of Ministers, provides the common classification and eligibility framework needed for this purpose. It will serve as the principal national reference for identifying, financing and monitoring green and low-emission activities, thereby improving the transparency, comparability and credibility of green finance and reducing the risk of greenwashing.

To ensure the NGT is used strategically to finance this LTS, the Government, including line ministries will pursue the following actions:

1.Establish the NGT as the common reference for classifying and screening green and transition investments across public policy and financial instruments.

2.Embed NGT alignment into public finance, including public investment appraisal, budget planning, state support and concessional schemes,

public procurement, and public-private partnerships.

3. Align sustainable debt instruments, including sovereign and corporate green bonds and green loans with NGT criteria.

Aligning public policy and financing mechanisms with the NGT in this way will help channel investment toward the modernization of the economy, the decarbonization of high-emitting sectors and the deployment of climate-resilient infrastructure, supporting delivery of Azerbaijan's NDC 3.0 target and the long-term net-zero goal of LTS.