THE FIRST BIENNIAL TRANSPARENCY REPORT OF THE REPUBLIC OF AZERBAIJAN

TO THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE

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INTRODUCTION

The Paris Agreement of the UN Framework Convention on Climate Change (UNFCCC) is a legally binding international treaty on climate change. It was adopted by 196 countries on December 12, 2015, at the 21st Conference of the Parties held in Paris.

The main goal of the Paris Agreement is to limit global warming to below 2°C or, if possible, to 1.5° C compared to pre-industrial (1750) levels.

To achieve these long-term temperature goals, countries aim to achieve their peak GHG emissions as early as possible and reach a carbon-neutral economy by 2050.

The Paris Agreement, for the first time in the process of global climate change, as an international treaty, brings all nations together to make ambitious multilateral efforts for combating climate change and adapting to its effects. All UNFCCC member states have committed to report and review obligations under the Paris Agreement through the Convention, the Kyoto Protocol, and the Enhanced Transparency Framework (ETF) through the Measurement, Reporting, and Verification (MRV) system.

The Paris Agreement established the Enhanced Transparency Framework (ETF), a universal framework for all Parties to report on progress and support and to provide technical expertise of this information. According to the guidelines on the use of the MPGs (Modalities, Procedures and Guidelines for ETF) contained in the Decisions 18/CMA.1 and 5/CMA.3 of the Parties to the Paris Agreement, the member countries of the Paris Agreement shall submit the First Biennial Transparency Reports (BTRs) and the National Inventory Report (NIR) as an independent report no later than December 31, 2024.

The ETF requires from all Parties the National Inventory Reports (NIRs) and BTRs covering information on progress, mitigation policies and measures on Nationally Determined Contributions (NDCs), climate change impacts and levels of adaptation, finance, technology transfer, areas of improvement and capacity building.

In line with these commitments, as a developing country, the Republic of Azerbaijan, not included in the Annex I group of the UNFCCC, has developed its First BTR in order to ensure credibility and accountability of the global climate action and to create confidence that all countries will contribute to global efforts, as part of the review process of the ETF.

The Republic of Azerbaijan has joined the global mitigation initiative under the Paris Agreement since 2016. As a contribution to the Agreement, the country has set a target to reduce the amount of greenhouse gas emissions by 35% by 2030 compared to the baseline year of 1990. In 2023, Azerbaijan submitted its updated and augmented 2nd NDC to the UNFCCC secretariat. In the updated NDC, the country has targeted a 40% reduction in greenhouse gas emissions. Although Azerbaijan accounts for approximately 0.1% of the global carbon footprint, it is listed among the countries most affected by climate change.

In order to fulfill its obligations to the Convention, Azerbaijan prepared the following reports and submitted them to the Secretariat of the Convention in previous years:

- **2000 - First National Communication**
- **2010 - Second National Communication**
- **2015 - Third National Communication**
- **2016 - First Biennial Update Report**
- **2018 - Second Biennial Update Report**
- **2021 - Fourth National Communication**

In accordance with the requirements of the Enhanced Transparency Framework, the First Biennial Transparency Report of the Republic of Azerbaijan contains all relevant information - national characteristics for the country, national inventory report on GHG emissions and removals, information required to monitor progress in the implementation of NDC in accordance with Article 4 of the Paris Agreement, details on mitigation measures, climate change impact assessment and adaptation, about funding, technology transfer and capacity building support to developing parties in accordance with Articles 9, 10 and 11 of the Paris Agreement, as well as planned improvements in the needs for climate action.

As a developing country on the GHG inventory, Azerbaijan takes advantage of the flexibility of paragraphs 57-58 of the MPGs to present the GHG inventory of 1990 as the baseline or reference year and the last 3 reporting years (2020-2022) as an integral part of the BTR report. The GHG inventory was developed according to the calculation method described in the IPCC guidelines (2006), which provides the necessary indicators for the creation of consistent, comparable, complete, accurate and transparent inventories.

The basics of the report comprise the section on monitoring the fulfillment of the commitments undertaken by Azerbaijan under NDC. The results of the assessments provide detailed information on the outcomes achieved by reducing emissions. It transparently highlights the country's ongoing efforts to implement the objectives of the Convention.

Furthermore, the report includes details on adaptation targets, implemented mitigation measures, financial support, technology transfer and capacity building, including planned improvements in the field of needs for climate action.

The First BTR of the Republic of Azerbaijan has been developed with support from the Global Environment Fund (GEF) under the overall coordination of MENR with the participation of relevant state institutions (such as Economy, Energy, Digital Development and Transport, Agriculture, Ministries of Finance, State Statistics Committee, "Azerenergy", "Azerishig", "Tamiz Shahar", "Azersu" OJSC, SOCAR, etc.), academic, private and NGO sectors, as well as independent experts.

During the preparation of the report, there were held meetings and discussions with experts from the UNFCCC on the BTR components, the European Development Bank, the CBIT-GSP initiative managed by the UNEP Copenhagen Center on Climate Change and FAO experts to reduce uncertainties and fill gaps within the framework of the project implementation.

EXECUTIVE **SUMMARY**

Chapter I

National Inventory Report.

Chapter I includes National Inventory Document which contains information on GHG emissions and removals in Azerbaijan in 1990, 2020, 2021 and 2022 as prescribed in the Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement (Annex to Decision 18/CMA.1).

Since 1995, as a Party to UNFCCC, the Republic of Azerbaijan has undertaken to prepare, publish and regularly update national greenhouse gas emission inventories.

The purpose of developing such reports is to ensure transparency, consistency and comparability of inventories and to support the independent verification process.

Section 1 presents information on climate change and greenhouse gas emissions. It then describes national measures designed to support and ensure compliance with all reporting obligations related to atmospheric emissions and removals calculated in accordance with the IPCC 2006 guidelines pursuant to Decision 18/CMA.1 of the Parties to the Paris Agreement.

Section 1 provides a brief summary of the assessment of the key categories, and describes the current situation in the field of QA/QC. The section is summarized with sections on uncertainty and completeness analyses.

Additional information on recalculations to improve transparency, as well as information on improvements and changes to the final greenhouse gas inventory, is presented in Section 10.

Chapter II

Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement.

Chapter II presents essential information for tracking progress in implementing and achieving the nationally determined contributions (NDCs) under Article 4 of the Paris Agreement. This chapter outlines the Party’s unique national circumstances and institutional arrangements, describes the Party’s NDC commitments, and specifies the data and indicators used for monitoring progress. Additionally, it details the mitigation policies, measures, actions, and plans, that contribute to meeting NDC goals.

Chapter III

Climate Change Impacts and Adaptation under Article 7 of the Paris Agreement

Chapter 3 of this report addresses climate change impacts and adaptation under Article 7 of the Paris Agreement, providing a detailed overview of Azerbaijan's national circumstances, institutional arrangements, and legal frameworks that support adaptation actions. This chapter examines biogeophysical characteristics, demographics, economic conditions, infrastructure, and adaptive capacity, along with institutional roles across key ministries and agencies. It assesses observed and projected climate risks, including temperature and precipitation changes, climate-borne hazards, water scarcity, and sectoral vulnerabilities, with a focus on agriculture and the Caspian Sea. Adaptation priorities, such as water management and drought-resistant agriculture, are outlined alongside challenges, barriers, and integration of adaptation strategies into national policies. Monitoring and evaluation mechanisms, strategies for loss and damage prevention, and cooperation, good practices, and lessons learned in adaptation efforts are also discussed. This comprehensive framework aims to strengthen resilience and promote effective adaptation measures within the national context.

Chapter IV

Information on financial, technology development and transfer and capacity-building support provided and mobilized under Articles 9–11 of the Paris Agreement

Chapter 4 of this report provides an overview of the financial, technology development and transfer, and capacity-building support needed and received under Articles 9–11 of the Paris Agreement. This chapter includes details on the Party's priorities and strategies, highlighting specific areas within the nationally determined contributions (NDCs) under Article 4 that require support. It also outlines the assumptions, definitions, and methodologies used in assessing and reporting this support, thus offering a transparent basis for understanding the Party's needs and the support received to achieve its climate goals.

CHAPTER I

National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases

OVERVIEW

Since 1995, as a Party to UNFCCC, the Republic of Azerbaijan has undertaken to prepare, publish and regularly update national greenhouse gas emission inventories.

The purpose of developing such reports is to ensure transparency, consistency and comparability of inventories and to support the independent verification process.

Chapter 1 presents information on climate change and greenhouse gas emissions. It then describes national measures designed to support and ensure compliance with all reporting obligations related to atmospheric emissions and removals calculated in accordance with the IPCC 2006 guidelines pursuant to Decision 18/CMA.1 of the Parties to the Paris Agreement.

This section provides estimates for the IPCC categories, a brief summary of the assessment of the key categories, and describes the current situation in the field of QA/QC. The section is summarized with sections on uncertainty and completeness analyses.

Additional information on recalculations to improve transparency, as well as information on improvements and changes to the final greenhouse gas inventory, is presented in Section 1.10.

ES.1. BACKGROUND INFORMATION ON GHG INVENTORIES AND CLIMATE CHANGE

With the onset of industrialization, there have been major changes in the balance of the Earth's atmosphere as a result of human activities. This has manifested itself in many areas, causing global temperature increases. Glacier melting at record levels, sea level rise, land degradation, droughts, floods, and inundations, storms and tornadoes, a rapid increase in the number of heat wave days, various diseases, forest fires, destruction of biodiversity, increasing desertification, warming of the oceans, etc. are increasingly becoming the new norm and can be regarded as consequences of climate change.

The countries of the global community have 6 reports, interim reports, and 1.5-degree reports, issued by the IPCC, the scientific body of the UN Framework Convention on Climate Change. Based on these IPCC reports, it is still possible to prevent the growth of emissions to hold global warming below 2°C. However, the window of opportunity in this direction is narrowing; possibilities for limiting global temperature rise to 1.5°C are running out.

The IPCC's Sixth Assessment Report (IPCC, 2023) indicates how humans are affecting the Earth's climate, highlighting the increase in global concentrations of carbon dioxide (CO2) reaching 425 parts (425 ppm) per million, methane 1,866 ppm, and nitrous oxide (N2O) 332 ppb. The report also lists a number of new substances as GHG emissions, i.e., substances that do not exist in nature and are almost predominantly man-made, such as chlorofluorocarbons (CFCs), halons, perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3), which are released into the atmosphere.

In order to fulfill the obligations to the Convention, Azerbaijan has prepared and submitted 4 NC and 2 BUR reports to the secretariat of the Convention, including the national GHG inventory section.

Transparent reporting of the results of national greenhouse gas inventories is one of the key requirements of the Enhanced Transparency Framework (ETF) of the Paris Agreement. This process involves detailed planning of work on using quantitative and qualitative data to estimate the country's GHG emissions and removals in a transparent, accurate, comprehensive, comparable, and consistent manner. To ensure transparency and accountability under the Paris Agreement, the MPG has been developed, and this introduced new specific requirements for countries to report the results of national GHG inventory.

As per these guidelines, information on the results of the national greenhouse gas inventory system shall be included in a separate chapter (Chapter I) of the BTR, with supporting information detailed in the Annex. Additionally, all Parties are required to submit a National Inventory Report (NIR) consisting of the National Inventory Document and Common Reporting Tables (CRT) to the UNFCCC secretariat as part of the BTR climate reporting process.

Currently, most countries already have the necessary abilities to develop national GHG inventories obtained in the preparation of the previous NC and BUR. However, the obligation of countries to report in accordance with the required GHG inventory processes and new reporting formats is a key aspect of ensuring compliance with the transparency requirements set forth in Article 13 of the Paris Agreement.

According to Articles 4 and 12 of the UNFCCC and Article 13 of the Paris Agreement, all Parties to the Convention and the Paris Agreement shall submit national inventories of greenhouse gas emissions and removals. Taking into account these updated demands and challenges, Azerbaijan presents the Greenhouse Gas Inventory document, including the data on GHG emissions of 1990 as its base year and the last 3 reporting years (2020-2022), by using flexibility in the implementation of the provisions of the ETF in line with paragraph 2 of Article 13 of the Paris Agreement. Since the document failed to apply a higher-level method for the key category, the assessment of national GHG inventories was mainly conducted following the 2006 IPCC guidelines (Tier 1), in accordance with Articles 4 and 12 of the UNFCCC and Article 13 of the Paris Agreement, in order to increase transparency, consistency, and comparability, taking into account the national peculiarities of Azerbaijan and resource constraints (statistical data and staff shortages, institutional differences, etc.) to ensure the completeness and accuracy of the inventory.

Until 2015, although being a party to the UNFCCC and its Kyoto Protocol, Azerbaijan, as a developing country, took a number of mitigation measures (use of renewable energy sources, construction of new forest areas, use of climate-smart technologies, switching from fuel oil to gas in energy production, etc.), it had not officially taken any quantitative commitment to reduce emissions within the framework of the Convention.

On September 29, 2015, Azerbaijan submitted an NDC document to the UNFCCC secretariat, thereby officially declaring for the first time that it has taken voluntary quantitative commitments to reduce GHG emissions. Under this NDC, the country aims to reduce GHG emissions by 35% by 2030 compared to the 1990 base year as a contribution to global initiatives. In 2023, it prepared an updated NDC where the commitment to reduce GHG emissions was raised to 40%.

ES.2. SUMMARY OF TRENDS RELATED TO NATIONAL EMISSIONS AND REMOVALS

The process of inventorying GHG emissions in the Republic of Azerbaijan actually started in 1998. This occurred during the ratification of the UNFCCC by Azerbaijan in 1995 and the preparation of its First National Communication to the Secretariat of the Convention in 1998-2000. Since then, the country has developed four National Communication and two Biennial Update Reports, each containing a component of the national GHG inventory.

For the present report, there has been a re-inventory process. This involved a recalculation for 1990 and new inventory calculations for 2020-2022. The results of the inventory are given in Table 1. As can be seen from the table, the total national emissions in 2022, excluding LULUCF, are 74,704.73 kt CO_2- equivalent, representing a 15.7% decrease in comparison with the 88,600.25 kt CO2-equivalent observed in the base year of 1990. While emissions in 2022, including LULUCF, comprised 69,498.88 kt CO2-equivalent, representing a 17.85% decrease from the 84,600.35 kt CO_2-equivalent observed in the base year of 1990. As shown in Table 1, in the energy sector, which accounts for the largest share of emissions, GHG emissions are reduced by 24.86% compared to the base year 1990.

Industrial Processes and Product Use (IPPU) is the 2nd sector of the IPCC methodology. The GHG emissions of this sector originate mainly from the technological processes of enterprises, plants, and factories. As can be seen from Table 1, the emissions of the IPPU sector increased after 1990, and in 2022 this growth became 147%. As seen in Table 1 and Figure 1, the Agriculture sector, which ranks 2nd after the Energy sector in terms of its share in national emissions, had an increasing trend in emissions until 2016, and from 2017 onwards, the growth rate stopped and emissions started to reduce. As shown in the table, the Waste sector experienced 77,4% growth in 2022 compared to the base year of 1990, the main reason for which is the growth in population in the country and the corresponding increase in waste.

	1990	2020	2021	2022	1990-2022 difference, %
Energy	80,157.76	52,462.44	56,980.58	60,226.75	-24.86
IPPU	1,160.01	2,442.73	2,692.97	2,865.16	147
Agriculture	4,523	7,191.22	6,899.52	6,717.16	48.5
LULUCF[1]	-3,999.89	-5,478.9	-5,306.46	-5,432.19	35.8
Waste	2,759.53	4,909.23	5,178.94	4,895.66	77.4
Net emissions	**84,600.35**	**61,474.04**	**66,364.8**	**69,498.88**	-17.85
Total emissions	**88,600.25**	**67,005.62**	**71,752.01**	**74,704.73**	-15.7

Table 1. GHG emissions by sectors, kt CO_2 eq.

The share of the Republic of Azerbaijan in global warming has historically been very small. In 2022, the amount of the country's GHG emissions were estimated at 74,704.73 kt CO_2 equivalent, and net emissions, including removals, were estimated at 69,498.88 kt CO_2 equivalent, which comprises approximately 0.1% of the estimated global emissions in 2022.

Gas/ Year	1990	2020	2021	2022	1990-2022 difference, %
CO_2	57,088.29	41,926.71	44,346.33	46,695.8	-18.2
CH_4	30,402.4	23,310	25,906.44	26,610.92	-12.5
N_2O	1,110.35	1,767.55	1,497.25	1,399.2	26

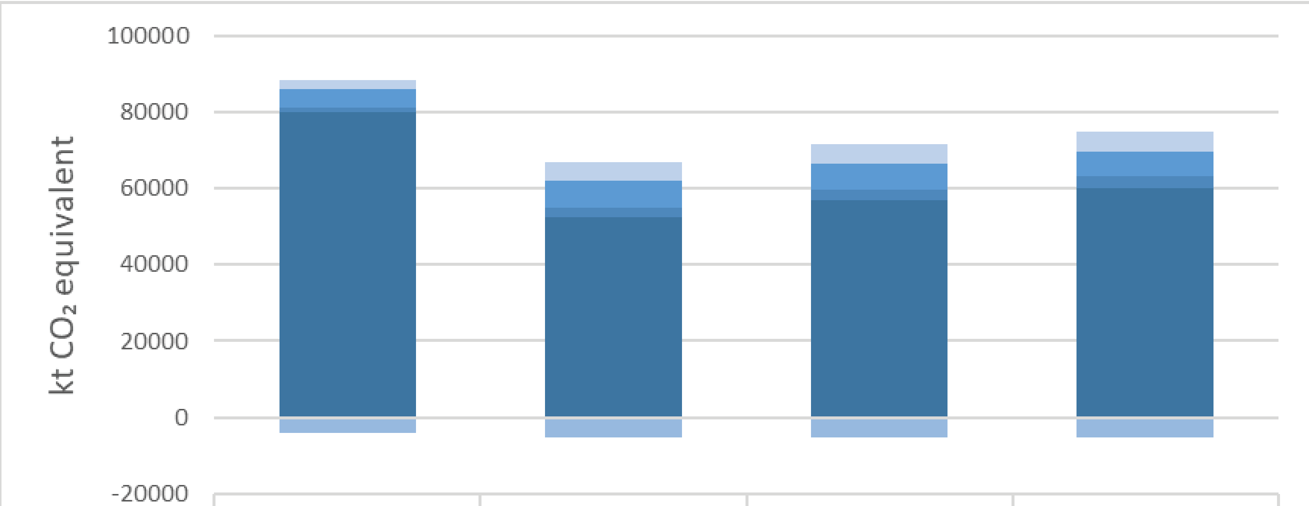
Table 2. GHG emissions by gases, kt CO_2 eq.

As can be seen from Table 2, carbon dioxide emissions continue to play an important role in total GHG emissions. Although CO_2 emissions reduced by 18.2% in 2022 compared to 1990. In 2022, compared to 1990, there was a 12.5% decrease in CH_4 and a 26% increase in N_2O.

[1] As data for the 1990 base year is unavailable, removals for the harvested wood products (HWP) category were not calculated.

ES.3. OVERVIEW OF SOURCE AND SINK CATEGORY EMISSION ESTIMATES AND TRENDS

Based on the GHG inventory conducted for 1990-2022, Azerbaijan achieved a 17.85% reduction in emissions, including removals, in 2022 compared to the base year (1990).



	1990	2020	2021	2022
Waste	2759.53	4909.23	5178.94	4895.66
LULUCF	-3999.89	-5478.9	-5306.46	-5432.19
Agriculture	4523	7191.22	6899.52	6717.16
IPPU	1160	2443	2693	2865
Energy	80158	52462.44	56980.58	60226.75

Figure 1. GHG emissions by sectors

As seen in Figure 1, despite 24.86% decrease compared to 1990, the Energy sector remains the primary source of emissions in 2022.

In 1991–1999, there was a noticeable reduction in GHG emissions. This reduction can be explained by the sudden rupture of the economic ties formed over 70 years between the countries of the former Soviet Union, a paralyzed state of production, and the deepening of the inflationary process, i.e., the economic crisis experienced. During 1991–1994, the Gross Domestic Product (GDP) in the country's economy declined by an average of 16.5% annually. The downward trend was particularly serious in industry: the industrial production volume fell by 10% in 1991, by 37% in 1992, and by 50% in 1993 compared to 1985. Although there were short-term fluctuations in GHG removals in the LULUCF sector during the 1990s, there is a tendency to increase the absorption of carbon from the atmosphere as a result of newly laid forest massifs and the planting of perennial agricultural crops.

Emissions from the energy sector are reduced by about 24.86% in 2022 compared to the base year.

There is an increase of 147% in IPPU emissions compared to 1990. The growth in industrial processes is explained by the development of new industries to ensure the sustainable development of our country.

Emissions in the agricultural sector increased by 48.5% compared to 1990. The growth in agriculture is attributed to the increase in the production of competitive agricultural and processing industry products, both in the domestic and foreign markets. It should be noted, however, that emissions in the country's agricultural sector have been steadily decreasing since 2017. (See Table 1).

The increase in the waste sector by 77.4% is explained by the increase in methane emissions caused by the decomposition process associated with the open disposal of waste in landfills, which is related to population growth.

Unless otherwise noted, all greenhouse gas emissions expressed in carbon dioxide equivalent have been calculated using the global warming potentials (GWP) provided in the IPCC Fifth Assessment Report.

ES.4. OTHER INFORMATION (e.g. INDIRECT GHGs, PRECURSOR GASES)

Inventories of precursor gases CO, NOx, NMVOCs (Non-Methane Volatile Organic Compounds), and SO_2 were calculated using the IPCC's revised 1996 methodology only under the First and Second NCs. Subsequent GHG inventory reports did not account for indirect GHG emissions. NMVOCs from the energy sector were calculated in the 4th National Data. Therefore, although Azerbaijan, as a developing country, did not provide information in its First BTR during the current reporting period due to resource shortage and time constraints, the relevant institutions of MENR are taking appropriate measures to ensure the conduction of inventory of the country's precursor gas emissions, a state body responsible for GHG inventory, and will provide relevant information on them in future BTR and NIR reports.

ES.5. KEY CATEGORY ANALYSIS

According to the 2006 IPCC guidelines, Parties to the UNFCCC, the Kyoto Protocol and the Paris Agreement are required to calculate and publish their GHG emissions data annually. These GHG emission reports shall be transparent and easy to understand; they shall be calculated consistently over the years since 1990; they shall be compared with the uniform estimates at the international level using established calculation methods; and completeness shall be ensured for all relevant emission sources and commitments in the reporting country. To facilitate the concentration of the numerous and detailed activities and resources required for this purpose into major inventory categories, the IPCC has introduced the term "key category". These methods include annual inventory analysis (Approach 1, Level Assessment), time series consistency analysis of inventory data (Approach 1, Trend Estimate), and data analysis of detailed inventory (Approach 2, Trend Uncertainty).

Key categories are those identified in the national inventory system because their emissions have a significant impact on total greenhouse gas emissions directly, either in terms of absolute emissions or as a contribution to the trend of emissions over time, or both. The key category analysis was conducted for all inventory categories (either with or without the LULUCF sector) according to the level/trend assessment of the 2006 IPCC Guidelines. It covers the key categories for the referred baseline year (1990) and the last reporting year 2022, using Approach 1, either with or without the LULUCF categories. More detailed information on the key categories is provided in the GHG inventory section.

ES.6. IMPROVEMENTS INTRODUCED

Improvements in the descriptions and calculation methodologies of the National Inventory Improvement Plan (NIIP) were implemented, taking into account proposals on reducing gaps in previous inventories. In accordance with paragraphs 14 and 15 of Article 13 of the Paris Agreement, financial and technical support was provided to Azerbaijan as a developing country within the framework of the Capacity-building Initiative for Transparency project (CBIT) in Azerbaijan in order to meet the requirements of the transparency mechanism of the Paris Agreement for the implementation of Article 13.

To promote continuous improvement, Azerbaijan, to the extent possible, has identified and regularly updated information on areas for improvement and included them in its reporting as part of the BTR. As a developing country needing flexibility in terms of capabilities, Azerbaijan considers it necessary to continue focusing and promoting areas for improvement in the GHG inventory. Chapter 10 of the report provides detailed information on the areas of improvement implemented and planned within the current GHG Inventory report.

1. NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS AND CROSS-CUTTING INFORMATION

1.1. Background information on GHG inventories and climate change

1.1.1. Background information about climate change

Climate changes consist of changes in average weather conditions and extreme events over a long period of time. Climate change can be attributed to the following causes:

• Solar activity, elements of the Earth's orbit, etc.
• Changes in the Earth's surface
• Changes in the energy balance of “the Earth's surface-atmosphere” system
• Changes in the balance of substances in the atmosphere (e.g., changes in the concentration of greenhouse gases).

Greenhouse gases, such as carbon dioxide, nitrogen oxides, methane, ozone, and water vapor (the most important natural greenhouse gas), are gases that trap heat in the Earth's atmosphere. These gases allow sunlight to pass through to the Earth's surface but absorb some of the infrared radiation that the Earth emits back into space, causing the planet to warm. This process is known as the greenhouse effect.

Without the natural greenhouse gases found in the atmosphere, life on our planet would not be possible. Earth's average temperature would be about -18°C instead of the current 15°C. This natural greenhouse effect is essential for supporting life on our planet. However, the increase in greenhouse gases due to human activities (the anthropogenic greenhouse effect) has intensified this natural warming, leading to climate change.

The IPCC's Sixth Assessment Report (IPCC, 2023) clearly confirmed that the Earth's climate is currently altering, with wide-ranging changes occurring throughout the planet's climate system since the middle of the last century.

The temperature of the lower atmosphere is rising, the oceans are warming, glaciers and permafrost are melting, glaciers are losing mass, and sea levels continue rising.
Extensive observations, models, and in-depth scientific research in the relevant sphere obviously demonstrate that human activities are the primary cause of these changes.

Significant examples of the observed climate changes include:

• By 2022, the average global surface temperature had increased by 1.15 °C compared to the baseline period of 1850–1990. (World Meteorological Organization). 2015-2022 were the eight warmest years in history. The hottest decade observed since the 19th century to date has been since 2010.
• From 1971 to 2010, over 90% of the extra energy was absorbed by the oceans. Since the 1970s, the upper water layers (approximately 0-700 m deep) have experienced greater warming due to human influence. Furthermore, the oceans are experiencing rising acidity levels along with rising temperatures.
• Between 2011 and 2020, the average annual sea ice coverage in the Arctic Sea dropped to its lowest level since 1850. Besides, late summer Arctic Ocean ice cover is smaller than it has been in the last 1,000 years. Also, glaciers globally have been rapidly shrinking since the 1950s and have undergone unprecedented shrinkage over the last 2,000 years.
• Another impact of global warming is the rise in average global land precipitation since 1950. And this trend has intensified significantly, particularly since the 1980s. One reason for this is that the atmosphere holds more and more moisture.
• Another consequence of global warming is the increased loss of water through evaporation, which is attributed to the general effects of transpiration, i.e., all evaporation from flora and fauna and open/unvegetated land and water areas.
• From 1901 to 2018, the global sea level rose by an average of 20 cm as a result of the continued melting of glaciers and the expansion of ocean water due to warming. In fact, sea levels have risen faster in the last 3,000 years since 1900 than in any previous century.

These planetary-scale changes will significantly alter the global climate system in the coming years and potentially have a major negative impact on ecological and social systems.

1.1.2. Climate change in national context

The climatic conditions of Azerbaijan are determined by the location of the territory at the junction of temperate and subtropical zones. Depending on the altitude of the area and the distance from the Caspian Sea, there are determined several types of climate in the country: dry subtropical, humid subtropical, temperate, and cold climates. Dry subtropical climate is characteristic of the Kura-Araz lowland and the Absheron peninsula, while humid subtropical climate is characteristic of the Talysh mountains and the Lankaran lowland. The temperate climate prevailing in the forest-covered slopes of the Greater and Lesser Caucasus is divided into dry, moderately hot, dry, moderately hot, humid, and moderately cold climate types.

Global circulation models used in the 4th National Communication submitted to the UNFCCC, based on the IPCC recommendations, different emission scenarios were determined for Azerbaijan together with the Turkish State Meteorological Service and the National Hydrometeorological Service of Azerbaijan.

According to the climate scenarios, the average annual temperatures in the country are expected to increase by 0.5–1.5 °C in 2020–2040. In the country in 2020–2040 (compared to 1971–2000), precipitation is forecast to decrease in some areas by up to 20% and to increase in some places by 30%. According to the MPI model, a 1-2°C average annual temperature increase is predicted throughout the country from 2041 to 2070. In the country, some areas are predicted to experience a 40% decrease in precipitation, while others may see a 10% increase from 2041 to 2070 compared to 1971–2000. According to the MPI model, the country is projected to experience an average annual temperature increase of 1°–2.5°C in the years 2071–2098. In 2071–2098 (compared to 1971–2000), the country is forecasted to see a 40% reduction in precipitation in many areas and a 30% rise in some other locations.

1.1.3. General information on conducting a GHG emissions inventory

The countries of the world are aware that the expected temperature shifts due to the increase of GHG emissions in the Earth's atmosphere will pose a threat to ecosystems and human civilization. Changes will occur relatively rapidly, and existing systems will not be able to adapt to the new climate conditions without experiencing damage. In this regard, Parties to the UNFCCC have agreed to submit annual inventories of greenhouse gases, which are the main cause of current climate change, to the Secretariat of the Convention from April 15 each year, and relevant decisions have been taken in this respect. Such inventories shall include data on emissions and removals for the base year (CO_2, N_2O, CH_4, HFC, PFC, SF_6 and NF_3) and all subsequent years beginning with the reporting year (1990). Developing countries are entitled to report at least 3 greenhouse gas emissions using the flexibility provisions of the MPGs.

The effectiveness and success of the Paris Agreement to reduce global greenhouse gas emissions, like the effectiveness and success of the Kyoto Protocol in this regard, depend on two main factors: first, whether the Parties will adhere to the rules of the Agreement and fulfill their commitments; and second, whether they will set more serious targets for more ambitious contributions to greenhouse gas emission reductions. In these matters, the reliability of emission data used for compliance control is of utmost importance. Thus, national accountability and subsequent international accountability for GHG emission inventories play a key role in addressing urgent global issues like climate change.

The Republic of Azerbaijan, which joined the UNFCCC in 1995, started the inventory of national GHG emissions in 1998. The inventory was prepared within the framework of the project “Initial National Communication of Azerbaijan”, implemented with financial support from the Global Environment Fund and technical assistance from the UN Development Program. The inventory process was then carried out according to the time series specified in the National Communication submitted by Azerbaijan to the UNFCCC.

In the 4th National Communication presented by Azerbaijan to the UNFCCC, the inventory process covered the years 1990-2016. In this project, the years 1990-2010 were recalculated, and the recalculation covered the years 2011-2016.

In the 3rd BUR report, the recalculation will cover the years 1990, 2000, 2010 and 2016, and the years 2017 to 2020 will be recalculated. The inventory of GHG emissions in the report is prepared according to the methodologies of the IPCC (2006).

During the inventory compilation, the inventory data presented in the country's National Communication were analyzed, the main sectors and categories were selected for NDC projects, and the change in emissions trend in 2020 compared to the base year 1990 was estimated according to the time series in the inventory.

During the inventory compilation, there was used information from the State Statistical Committee, Ministry of Ecology and Natural Resources as well as other relevant ministries, organizations, and companies. The inventory covered all sectors suggested by the IPCC. However, there are still information gaps and other uncertainties regarding certain sector categories. The share of the Republic of Azerbaijan in global warming has historically been very small. In 2022, the amount of GHG emissions in Azerbaijan was estimated at 74,704 kt CO_2 equivalent, and the net emissions, including absorption, were estimated at 69,498 kt CO_2 equivalent, which is about 0.1% of the global emissions estimated in 2022.

Per capita emissions in Azerbaijan in 2022 are estimated to be about 7.4 tons of CO_2 equivalent, and net zero emissions, including absorption, are estimated to be 6.9 tons of CO_2 equivalent.

1.2. A description of national circumstances and institutional arrangements

1.2.1. Geographic and climate profile

The area of the Republic of Azerbaijan, located in the South Caucasus, is 86.6 thousand km2. Coordinates of the country: 44 and 52 east longitude, 38 and 42 north latitude. The capital city of Baku is located on the 40th parallel. The total area is about 400 km from north to south and 500 km from west to east. According to the data as of January 1, 2022, forests make up 12.0% of the territory, while agricultural lands cover 55.2% (of which 27.9% are pastures).

Located at the crossroads of Europe and Asia, Azerbaijan has a unique geopolitical and geographical position and has maintained its importance in world economic and cultural relations since ancient times.

The Republic of Azerbaijan shares borders with 5 countries. The length of its borders is about 2,850 km. Our country borders Russia in the north (289 km), Georgia in the northwest (340 km), Armenia in the west (766 km), Türkiye in the southwest (11 km), and Iran in the south (618 km). The eastern part of our country is bordered by the Caspian Sea, spanning a distance of 825 km. Azerbaijan encompasses 9 out of the 11 climate types in the world and, thus, has a very rich nature. The Republic of Azerbaijan has a mild-hot semidesert and dry steppe climate, with dry summers in the middle and eastern parts of the Kura-Araz lowland, Gobustan, the Absheron peninsula and the Samur-Devachi lowland. A similar climate is observed along the northern slope of the Talish Mountains. The semidesert and dry steppe climate with dry winter covers a part of the Karabakh plain stretching westward from the downstream of Aghdash-Gargarchay, Ganja-Gazakh plain, Bozdag, Jeyranchol and the remote part of the Ajinohur foothills in the southwest. Since the average July temperature in this area exceeds 27°C, cotton cultivation, horticulture, viticulture and grain farming are predominant activities here. In the foothills and partly in the middle mountainous zone of the Lesser Caucasus, as well as along with the foothills of Ajinohur and in the Ganikh-Ayrichay valley, there prevails a mild, warm climate with dry winters. A cold climate with dry winters dominates

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1.2.2. Population and economic profile

According to data from the beginning of 2023, the population of the Republic of Azerbaijan comprises 10,127.1 thousand people. 52.9% of the population resides in cities. The highest population density is in the Absheron Peninsula, while the lowest is in the mid-mountainous and high-mountainous areas.

Population growth in Azerbaijan has historically been high. Over the past 125 years, the population has grown by over five times. The following Figure illustrates the population growth trends in Azerbaijan from 1990 to 2023.

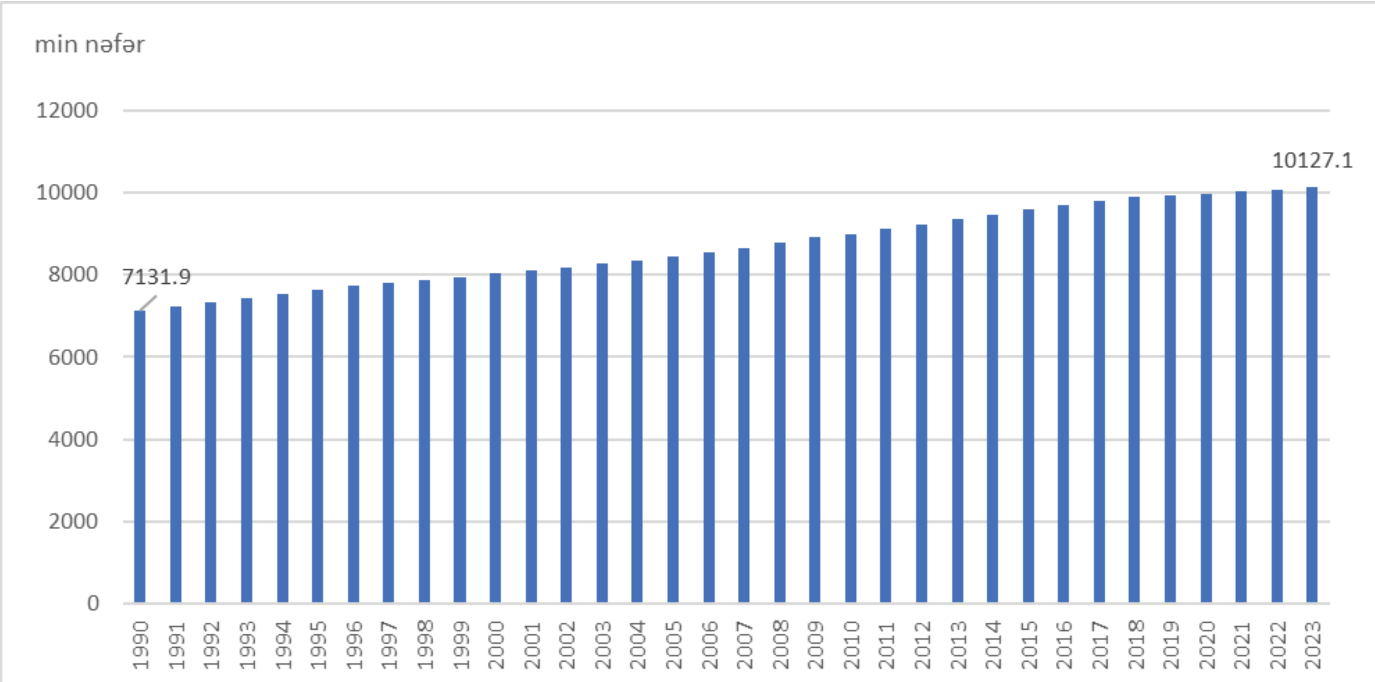


Figure 2. Dynamics of population changes in Azerbaijan from 1990 to 2023

As can be seen from the figure, the population has increased more than 1.4 times over the last 33 years. However, the growth rate has begun to decline in recent years. Population growth has led to an increase in demand for energy, housing, transportation and other resources, which has normally been one of the main reasons for the recent rise in GHG emissions in the country.

The country's industries encompass oil and gas extraction and processing, chemistry and petrochemicals, metallurgy, machine building, textiles, food processing, grain farming, cotton cultivation, viticulture, horticulture, tobacco growing, tea growing, vegetable farming and livestock farming.

Following independence in the early 1990s, one of the key objectives for the Republic of Azerbaijan was to develop a national economy based on market principles, in line with the needs of a sovereign country and effective integration into the modern global community. Although Azerbaijan went through a historically difficult period at the end of the last century, confidently embarking on the path of great development in socio-economic and cultural life it was recognized in the world as a country that ensured a stable, secure and modern standard of living. Great financial resources generated from economic growth have significantly contributed to macroeconomic stability and growth while also enhancing security capabilities.

In light of the sharp drop in oil prices and the slowdown in the economic growth rate in the country as a result of the economic crisis in the trading partner countries, institutional and structural challenges, deficits in the balance of payments and non-oil budget constraints and the processes taking place in the financial and banking sector there has arisen a necessity for transition to a new economic development approach in Azerbaijan starting from 2014.

As a result of the widespread application of modern technologies and the attraction of quality human capital in the leading sectors of the national economy, productivity has increased significantly, the economy has diversified rapidly and domestic production has been effectively integrated into the global value chain. During this period, the national economy grew by 15% and the gross domestic product (GDP) in the non-oil sector increased by 1.4 times. Compared to 2011, there has been achieved a 78.3% growth in non-oil and gas exports in 2021. In the last decade, the economy has effectively recovered from two worldwide financial crises, demonstrating resilience. Local production capacity and infrastructure support have been developed to strengthen the country's food security.

1.2.3. Development priorities and goals

Acceleration of economic growth, which relies on high, sustainable, inclusive and mainly private initiatives in order to continuously raise the level of national social welfare, ensuring the return of the population to the liberated territories constitute the ideological core of new development directions of Azerbaijan. All these goals and issues regarding climate change are addressed in the state documents adopted after the liberation of our territories from occupation as a result of the 44-day war. Thus, according to the document "Azerbaijan 2030: National Priorities for Socio-Economic Development" approved by the Decree of the President of the Republic of Azerbaijan dated 02.02.2021, the following five National Priorities for the socio-economic development of the country shall be implemented in the next decade:

1. steadily growing competitive economy;
2. a dynamic, inclusive society based on social justice;
3. a competitive human capital and a space for modern innovations;
4. the Great Return to the territories liberated from occupation;
5. country of clean environment and "green growth".

Including the item "Country of Clean Environment and Green Growth" in the list of national priorities proves the country's intention to contribute to the fulfillment of the commitments under the Paris Agreement and the mitigation of the effects of climate change in general. In general, the priorities plan aims to achieve goals such as prioritizing the application of eco-friendly technologies to mitigate the effects of global climate changes, reducing heat trapping gas emissions, increasing the possibilities of using alternative and renewable energy sources and ensuring energy efficiency.

1.2.4. Key priorities for reducing the effects of climate change

The document "Strategy for Socio-Economic Development of the Republic of Azerbaijan for 2022-2026", prepared on the basis of National Priorities, details a number of action directions in line with the Paris Agreement and gives a special place to measures on combating global climate change.

The Action Plan of the strategy contains, in particular, items on the inventory of heat trapping gas emissions and the development of the MRV system, the creation of an institutional framework based on the modern experience of the MRV system and the development of a national database considering the global climate change practice. The actions outlined in subsection 5.2.5 of National Priorities 5 in the Action Plan of the strategy include the following:

- Development of the inventory of GHG emissions and the Measurement, Reporting and Verification (MRV) system
- Creation of the National database on climate changes
- Development of the program "Nationally Appropriate Mitigation Actions".
- Development of the National Adaptation Plan for sectors more vulnerable to the effects of climate change
- Development of the National Plan for electromobility
- Stimulating the circulation of eco-friendly clean and safe vehicles (passenger cars, buses, etc.) and creating the necessary infrastructure
- Studying the potential in the field of hydrogen production and use and developing proposals for pilot projects in this field
- Investigation of the application of energy storage systems and making proposals
- Investigating and proposing the application of technologies of carbon capture, utilization and storage (CCUS) in the energy sector.

This Action Plan also includes energy efficiency, generating energy from waste, increasing green areas and expanding the use of renewable energy sources.

1.2.5. Other issues

The Republic of Azerbaijan, as a developing country, acknowledges that climate changes are a potential threat to all mankind, that neither developed nor developing countries are indemnified against climate change; thus, has taken a number of significant measures in this direction to prevent this global threat. In this sense, it is essential that the two critical components of the Paris Agreement - NDC and Long-Term Low Emission Development Strategies (LT-LEDCs) are interconnected and that resources are allocated efficiently to implement measures on the mitigation of climate change. The updated NDC envisages the implementation of short-term (until 2025) and medium-term (until 2030) actions, with a target of reducing GHG emissions by 40% compared to 1990. The goals of LT-LEDCs, in progress, are set for 2050.

To ensure the implementation of the Order of the President of the Republic of Azerbaijan dated May 3, 2021, the "Action Plan on the establishment of a "green energy" zone in the liberated territories of the Republic of Azerbaijan for 2022-2026" was approved by the order of the Cabinet of Ministers and the coordinating function on the Action Plan was assigned to the Ministry of Energy of the Republic of Azerbaijan. Additionally, there was prepared the “Concept of carbon neutrality of the territories liberated from occupation” by involving an international consulting company.

1.2.6. National GHG inventory and responsible organizations

After the Republic of Azerbaijan ratified the UN Framework Convention on Climate Change in 1995, one of the commitments undertaken to this convention is to establish an institutional framework for the assessment of anthropogenic GHG emissions and removals and to provide continuous reports to the Secretariat of the Convention.

The State Commission on Climate Change was established in 1997 to ensure the development of national strategic programs and projects related to the prevention of the negative effects of global and regional climate changes, including the inventory GHG emissions released into the atmosphere, monitoring of those gases, conduction of scientific research works that meet modern requirements in energy-intensive sectors of the economy, training personnel in this field and other commitments under this convention, as well as provision of scientific and technical assistance, financial resources and modern technologies.

Pursuant to Decision No. 18/CMA.1, the Paris Agreement invites all Parties to implement national institutional measures for the development of greenhouse gas emissions inventories. In this regard, MENR, as a national body, is the main governing body in Azerbaijan, which is responsible for climate change, regulating the use of natural resources and calculating emissions, as well as is the Designated National Authority (DNA) on the UNFCCC, CDM (Clean Development Mechanism) and NAMAs (Nationally Appropriate Mitigation Actions) of Azerbaijan..

National institutionalization serves the purposes of preparing the inventory of GHG emissions based on the principles of transparency, consistency, comparability, completeness and accuracy.

Recently, significant structural changes have been made in all fields of the country on the basis of international best practices.

On March 11, 2020, the President of the Republic of Azerbaijan implemented modifications and additions to the State Commission composition and approved the updated structure as below:

Chairman of the State Commission - Deputy Prime Minister of the Republic of Azerbaijan
Deputy Chairman of the State Commission - Minister of Ecology and Natural Resources of the Republic of Azerbaijan
Members of the State Commission:
Minister of Finance of the Republic of Azerbaijan
Minister of Economy of the Republic of Azerbaijan
Minister of Agriculture of the Republic of Azerbaijan
Minister of Health of the Republic of Azerbaijan
Minister of Science and Education of the Republic of Azerbaijan
Deputy Minister of Foreign Affairs of the Republic of Azerbaijan
Deputy Minister of Digital Development and Transport of the Republic of Azerbaijan
Deputy Minister of Energy of the Republic of Azerbaijan
Deputy Minister of Emergency Situations of the Republic of Azerbaijan
Chairman of Azerbaijan State Water Resources Agency
First Deputy Chairman of the State Committee on Urban Planning and Architecture of the Republic of Azerbaijan
Deputy Chairman of the State Statistical Committee of the Republic of Azerbaijan
President of the State Oil Company of the Republic of Azerbaijan
President of "Azerenergy" Open Joint Stock Company

The commission coordinates work between structures in line with their powers and activities and has a leading role on the planned and implemented work in the field of climate change.

The Center for Climate Change of the Hydrometeorological Service under MENR is responsible for all activities of National Communication and also for inventory of GHG emissions of Azerbaijan, preparation of National Communication reports and other analysis of national/sectoral GHG emissions estimates and capacity building. It should be noted with regret that other relevant government agencies have not yet established any institutional bodies that deal directly with GHG emissions inventory. It should be noted with regret that other relevant government agencies have not yet established any institutional bodies that deal directly with the inventory of GHG emissions

National institutionalization for the inventory of GHG emissions serves the purpose of developing GHG emissions cadaster in accordance with the principles of transparency, consistency, comparability, completeness and accuracy. Such compliance is achieved through continuous improvement of quality management and inventory, using the methodological guidelines of the 2006 IPCC Guidelines for national GHG emissions in close cooperation with relevant authorities. National inventory reports should be prepared according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 1, Chapter 1, Section 1.4) as provided

1.2.7. MRV system for national GHG inventory

Although not ideal in the country, the relevant institutional framework of the MRV system for national GHG inventory has been established and actually covers the main areas of the country.

The leading institutional organizations in the MRV system are MENR and SSC. Subordinate bodies of MENR such as the Forestry Development Service, Biodiversity Conservation Service, State Environmental Security Service, State Agency for Environmental Expertise and Regional Departments of Ecology and Natural Resources are the data sources for a number of sectors of the IPCC methodology. GHG emissions are calculated based on the data provided in their annual reports.

SSC, another umbrella organization, gathers information from departments, organizations and enterprises operating in all areas of activity of the country. GHG emissions are measured based on the data included in their annual reports. By comparing GHG emissions reported by both organizations, uncertainties are identified and emissions are determined by adjusting them accordingly.

Meanwhile, there is a pressing need to enhance coordination of this process. All public and private organizations shall provide statistical data on the country's socio-economic parameters, including information on environmental activities. In 2014, at the proposal of MENR, a section on GHG inventory is included in the annual official statistical form “Report on the protection of atmospheric air” No. 2-TP (air) in order to establish an MRV system for GHG inventory in the country to collect direct data from industrial enterprises. It should be noted that these reports are placed in the electronic portal created by SSC, submitted by enterprises in coordination with MENR and are reflected in the annual reviews of the SSC.

Enterprises that emit harmful substances and greenhouse gases into the atmosphere annually complete Form No. 2-TP (air), have this form approved by the State Environmental Security Service of ETSN and its Regional Departments of Ecology and Natural Resources and submit it to the SSC. On the other hand, the Climate Change Center of MENR calculates the amount of greenhouse gases using the aggregated data of all activity areas and reports it to the SSC. Those data are processed in the SSC and as a result, the agreed data is reflected in the Committee’s statistical data collection and presented to the public.

However, since there is no nationally recognized uniform methodological approach in this field, the degree of uncertainty in the collected data is estimated to be high. Besides, the lack of national procedural rules for verifying the information provided slows down the process of establishing a reliable MRV system. It should also be noted that the annual official statistical form “Report on the protection of atmospheric air” No. 2-TP (air) currently aims only to estimate emissions from stationary sources of industrial and energy sector enterprises.

It is known that the MRV system is a reliable tool for verifying the implementation status of GHG inventory and mitigation measures. Based on global practices, a single institution deals with the calculation of atmospheric emissions in both developed and certain developing countries and as a result of such coordinated activity, financial savings, improvement of accountability and expansion of coverage are achieved. This approach ensures the efficient use of resources and contributes to the fulfillment of other international obligations on environmental protection along with the UNFCCC.

The country is currently implementing appropriate measures to establish an online reporting system for public and private sector enterprises on GHG emissions.

To submit the report in the required form, it is important t to collect the necessary data on the GHG inventory and to estimate the emissions in a correct and transparent manner. Such an approach can be regarded as “good experience”. Calculation of GHG emissions, investigation and archiving of uncertainties is entrusted to the Climate Change Center of the National Hydrometeorological Department of MENR.

Proposed activities for preparing GHG inventory within the State Commission:

- Compilation of data collections by data providers
- Verifying data quality
- Creation of an inventory database
- Updating the inventory database
- Calculation of emissions from various sectors
- Development of QC/QA plan
- Determining the timeline for the inventory cycle
- Cooperation agreements with relevant ministries, agencies and private sector enterprises
- Coordination of timely delivery of input data
- Ensuring regular system improvements
- Improvement of inventory data archiving system.

The State Statistical Committee is proposed to be the body for providing most of the information required for GHG inventory.

The SSC currently collects a lot of data relevant to developing GHG inventory. However, some information is not collected or does not adhere to the format necessary to conduct the inventory according to the 2006 IPCC guidelines.

Thus, it will be necessary to modify the data collection templates and, in this sense, improving the skills of SSC employees involved in data collection is of utmost importance. Taking into account the fact that data is already collected by the SSC from various ministries, building work on this existing system would be much more efficient than creating a new data collection system in the future. All departments involved in the data collection by the SSC shall comply with quality control procedures. There shall be developed a quality control plan, which is to be binding for all departments. All inventory-related information shall be verified and approved. The presence of well-trained QA/QC personnel in each of the existing departments is one of the crucial issues.

Since the development of the SSC's potential is expected to take some time, in the short-term strategy, data for the preparation of inventory can be collected based on the agreements with relevant ministries until the SSC's potential is developed.

Having a system based on a strong legal instrument, such as the adoption of relevant decisions by law or order of the Cabinet of Ministers, is of exceptional importance in ensuring the regular sequence and continuity of the data collection process.

1.2.8. INVENTORY PREPARATION PROCESS

Before starting the inventory process, the working group for every sector and the experts of sub-working groups at the relevant bodies for subsectors established by the National Competent Authority (MENR) according to the 2006 IPCC Guidelines are notified and if required, new experts are involved or replaced. In addition to experts from relevant government agencies, the private sector, scientific institutions, independent experts and relevant NGOs are also involved in the preparation of GHG emission inventory.

The work of these established working groups is coordinated by the Climate Change Centre of MENR and other specialized units, each in charge of a specific issue, are also involved in this process. MENR regularly convenes meetings of the working groups. Furthermore, if needed, the relevant members of the working group meet to discuss specific issues and take any necessary internal measures.

In case of necessity, information on emissions produced by the National Authority will be made available to the public.

As can be seen, the inventory preparation process follows a regular schedule. Closely linked to these measures are the greenhouse gas inventory process, the preparation of National Inventory Documents and the implementation of quality assurance and quality control are closely associated with these measures.

The GHG inventory calculations also contain data on the planned improvements for the respective source and absorption categories. In this regard, all major institutions and organizations were involved in the preparation process of emission inventories. All related organizations report to the SSC, which acts as the primary data collector. Furthermore, ministries and other organizations involved shall take necessary measures to eliminate information gaps within their areas of responsibility. After completing the inventory process of GHG emissions, the relevant report shall be submitted by MENR to the Cabinet of Ministers of the Republic of Azerbaijan. In accordance with the requirements of internal state procedures, the Cabinet of Ministers will send the document to the pertinent authorities for their opinions and proposals. The document is re-submitted to CM after its improvement by MENR on the basis of the feedback and suggestions received. Based on the analysis of the document, the CM gives an instruction to present it to the UNFCCC and the document is submitted to the UNFCCC secretariat by MENR as the National Authority in accordance with the applicable regulations.

The following sub-processes are accepted as primary activities:

- Regular review and provision of incoming data flow from data providers
- Improving the institutionalization of the National System;
- Implementing improvements in inventory planning and inventory preparation;
- Defining key categories (using Tier 1 according to 2006 IPCC, Chapter 4.3.1, Volume 1);
- Improvement of national institutional mechanisms.

The report on institutionalization of GHG emissions is based on the existing data flows and provides appropriate measures to ensure long-term data availability.

In case of non-provision of continuous information, appropriate commitments or cooperation agreements shall be obtained. If there are any uncertainties (doubts), the relevant legal provisions on data protection shall be reviewed and appropriate measures shall be taken.

1.2.9. ARCHIVING OF INFORMATION

Archiving also plays a key role in sustainability by ensuring transparency of national inventories while facilitating the development of subsequent inventories. All National communications, inventory calculations, interim and final reports used in the preparation of BURs are submitted to the Climate Change Center of MENR in hard copy and in electronic form and stored there in both electronic and hard copy forms to serve as a database. It is worth mentioning that that inventory data of all sectors are archived separately to facilitate the process. The center is responsible for collecting data from the relevant state structures within the framework of coordination of GHG emissions inventory, for obtaining relevant opinions and proposals on the prepared GHG inventory reports, as well as archiving of information. In general, there is carried out archiving of information used in the preparation of the inventory, including relevant outcomes and required interpretations. At the end of each reporting period, the inventory description is archived and transmitted to the server to create a data bank. Besides, the text modules submitted by the responsible experts are validated and archived together with the pertinent QA/QC checklists. Most documents are saved (stored) in both draft and final versions.

Archived data is stored in folders with the year of inventory for easy access.

1.3. BRIEF GENERAL DESCRIPTION OF METHODOLOGIES (INCLUDING TIERS USED) AND DATA SOURCES USED

UNFCCC Parties shall implement and maintain National Inventory Reports, including institutional, legal and procedural measures that can support the regular assessment, compilation, timely preparation and submission of their national GHG inventory reports. Such adjustments may change over time depending on the national circumstances of the Parties.

All Parties are encouraged to use the 2006 IPCC Guidelines and any subsequent versions or improvements to these 2006 IPCC Guidelines as agreed by the Paris Agreement when preparing their national GHG inventory report.

With regard to the use of nationally appropriate methodologies, the IPCCs note that a Party should use nationally appropriate methodologies if they better reflect its national circumstances and are in line with these IPCC guidelines. In such cases, Parties should prioritize all key categories where good practices are available for future improvements, while remaining transparent and interpreting the national methodology, data and/or parameters selected.

Each party shall make every effort to use the recommended method for the key categories. In cases, where a Party fails to apply a higher level method for a particular key category due to lack of resources, it may use the Level 1 approach and shall expressly document the reason of incompliance of the applied methodology with the relevant IPCC guidelines.

The process of GHG inventory in Azerbaijan was first conducted in 1998-2000 within the framework of the project "Initial National Communication of Azerbaijan Republic under the UN Framework Convention on Climate Change" and covered the years 1990 to 1994. Afterward, the inventory process was carried out in the further communications. The data for the current inventory period were prepared based on the document "Guidelines for the preparation of National Communication" for countries not included in "Annex-1" in paragraph III of Resolution 17/CP.8 adopted at the 17th Conference of the Parties to the UNFCCC. Moreover, the opinions of the Technical Expert Group on the verification of the Second BUR were taken into account when preparing this report.

In 2014, the Ministry of Ecology and Natural Resources (MENR) proposed adding a section on the GHG inventory to the annual official statistical form "Report on the protection of atmospheric air" No. 2-TP (air) to obtain data directly from industrial enterprises in order to improve the country's MRV system for the GHG inventory. The mentioned reports are submitted to the SSC online once a year by industrial enterprises upon agreement with MENR.

In the calculation of emissions, along with the data provided by the SSC, the report took into account the data submitted by the Ministry of Energy, the Ministry of Digital Development and Transport, the Ministry of Agriculture, SOCAR, AZERENERGY OJSC, "Azerbaijan Railways" CJSC and a number of other organizations and enterprises, which allowed to eliminate many uncertainties. In the table below, there are given the national low heat capacities for the fuel types used in the calculations. The mentioned coefficients were determined based on the analysis conducted by the Institute of Petrochemical Processes of the National Academy of Sciences of Azerbaijan and are included in the annual statistical collection (yearbook) "Energy of Azerbaijan".

Energy products	National Lower Heating Value (TC/kt) – NCV (TJ/kt)	Energy products	National Lower Heating Value (TC/kt) – NCV (TJ/kt)
Crude oil	43.094	Sub-Bituminous coal	18.9 (D,İDDEQ)
Motor gasoline	43.197	Coke oven coke	28.2 (D,İDDEQ)
Aviation gasoline	43.375	Petroleum coke	31.556
Jet kerosene	43.174	LPG	47.425
Gas/Diesel oil	42.656	Lubricants	40.193
White spirit	43.430	Refinery Gas	49.5 (D,İDDEQ)
Naphtha	41.005	Refinery Feedstocks	43.0 (D,İDDEQ)
Other kerosene	43.057	Other petroleum products	42.496
Residual fuel oil	42.480	Natural gas (dry)	38.938
Oil bitum	40.948	Municipal Wastes (non-biomass fraction)	6.0

Table 3. National heat (generation) capacities (TJ/kt)

It is worth mentioning that the report as a whole was prepared pursuant to the Tier 1 approach mentioned in the 2006 IPCC Guidelines and there were used generalized emission factors in the calculations for countries not included in “Annex-1”.

It should be noted that the software provided by the IPCC for the GHG emission inventory (IPCC inventory software Ver.2.64) does not support the calculation of precursors and indirect emissions, which causes considerable troubles in the reporting process.

1.4. BRIEF DESCRIPTION OF KEY CATEGORIES

The Modalities, Procedures and Guidelines (MPG) for the Framework for Transparency in Action and Support, referred to in Article 13 of the Paris Agreement (Resolution 18/CMA.1 Annex), require Parties to identify key categories of GHG emissions according to the 2006 IPCC methodology.

A key category is defined in the IPCC 2006 Guidelines (Volume 1, Chapter 4) (IPCC 2006) as an emissions source that is prioritized within the national inventory system because it has a significant influence on total, trend or uncertainties of total greenhouse gas emissions. A key category analysis is performed for all inventory categories (including and excluding LULUCF) according to the 2006 IPCC Guidelines which sets out two approaches for performing a KCA; Approach 1 and Approach 2.

Approach 1 of the key category analysis comprises of a level and trend assessment of key categories. The level assessment of emissions evaluates each category's contribution to the total GHG emissions or removals in a single year. The analysis should always be performed both with and without Land Use, Land-Use Change, and Forestry (LULUCF). According to the 2006 IPCC guidelines, both results should be taken into account in determining the key categories. The second component of the Approach 1 method is the Trend assessment. It assesses how each category contributes to the overall trend in emissions over a period of time.

Approach 2 of the key category analysis additionally considers uncertainty estimates along with the level and trend assessment of significance to determine key categories. Results of Approach 2 are additional to Approach 1 and should be presented separately.

The key categories have been defined in the GHG inventory of Azerbaijan by applying the two Approach 1 procedures, Level (for the base year, 1990 and for the last year reported, 2022) and Trend (for the last year reported, 2022, as compared to the base year, 1990).

According to the IPCC 2006 methodology, the emissions of the key categories should make up 95% of the total emissions generated in the country. However, developing countries that need flexibility in their capacity under this provision have the flexibility to define key categories using a threshold of no less than 85% percent instead of the 95 percent threshold specified in the IPCC guidelines. Due to the lack of resources and time in Azerbaijan, the 95% figure was replaced by 85% by applying the "Flexibility" provision as outlined in paragraph 25 of the MPGs.

For defined key categories, Parties are required to use highly detailed calculation methods (Tier 2 or higher). If the direct use of such methods is impossible for any reason (for example, lack of performance data, etc.), then the Parties are required to prove that the methods applied at the national level achieve at least comparable accuracy as a result of the calculation. Such evidence, as well as the key category analysis carried out as a whole, should be recorded in the annual national inventory report.

Results of the key category analysis

For the current analysis, the Approach 1 method identified 13 categories as key categories. All of these were identified by both trend and level analysis, as key categories.

Currently, a Tier 1 method is used to estimate emissions from all key categories. Improvements are planned to ensure it is possible to report using Tier 2 methodology for key categories in the next submission. The key category analysis will be used to guide the priority in the improvement programme.

In previous national Data reports and BUR documents, the key categories included those categories that accounted for 95% of the total GHG emissions of the cumulative trend country inventory. By applying the "Flexibility" rule, the categories that make up 85% of the current report were accepted as the key categories. Therefore, there are differences in the most recent KCA with the previous assessment which was presented in the Fourth National Communication, and only performed excluding LULUCF.

The following key category have been added in the current key category analysis.

- 4A1 Forest land remaining Forest land

The following key categories have been eliminated.

- 3C7 Rice cultivation (CH_4)
- 2F1 Refrigeration and Air Conditioning (HFCs/ PFCs)
- 3A2 Manure Management (N_2O)
- 1A3a Civil Aviation
- 2A1 Cement Production

CRT Category code	CRT Category	Gas	L-1990-Excl-LULUCF	L-1990-LULUCF	L-2022-Excl-LULUCF	L-2022-LULUCF	T-Excl-LULUCF	T-LULUCF	Final Combined Rank
1.B.2.b	Natural Gas	CH_4	1	1	2	2	3	3	1
1.A.1	Energy Industries - Liquid Fuels	CO_2	4	4			2	2	2
1.A.1	Energy Industries - Gaseous Fuels	CO_2	3	3	1	1	6	6	3
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	2	2	8	9	1	1	4
1.A.4	Other Sectors - Gaseous Fuels	CO_2	5	5	3	3	4	4	5
1.A.3.b	Road Transportation - Liquid Fuels	CO_2	6	6	4	4	5	5	6
1.B.2.a	Oil	CO_2			6	6	7	7	7
3.A	Enteric Fermentation	CH_4			5	5	9	9	8
1.A.4	Other Sectors - Liquid Fuels	CO_2	7	7			8	8	9
4.A.1	Forest land Remaining Forest land	CO_2		8		7			9
1.B.2.a	Oil	CH_4	8	9	7	8			11
5.A	Solid Waste Disposal	CH_4			9	10	10		12
5.D	Wastewater Treatment and Discharge	CH_4				11			13

Table 4. Emission and absorption levels of key categories, level and trend assessment (Approach 1)

The following codes describe the analysis of six different key categories:

1. *L-1990-Excl-LULUCF = Level for 1990 excluding LULUCF*
2. *L-1990-LULUCF = level for 1990 including LULUCF*
3. *L-2022-Excl-LULUCF = Level for 2022 excluding LULUCF*
4. *L-2022-LULUCF = Level for 2022 including LULUCF*
5. *T-Excl-LULUCF = LULUCF exclusion trend by being*
6. *T-LULUCF = LULUCF included trend for 1990 with*

Further detail on each of the identified key categories is given below.

1.B.2.b Fugitive Emissions from Natural Gas (CH4) – Emissions from this category are high across the time series; ranked first in the level assessment in 1990 and 2nd place in 2022. When combined with its 3rd place ranking in the trend assessment, its final combined rank marks emissions from this category as the most significant of all the key categories.

In 1990, the turmoil in the oil and gas industry related to the political situation in the country worsened the environmental condition of this field. Exploration, drilling, and disposal of decommissioned wells have increased ethane leaks. After the situation in the country improved, increased attention to the environmental situation created conditions for reducing GHG emissions in this category. At that time, a number of environmental projects were implemented. Among them, the biggest projects were the collection of natural gas in the Guneshli and Neft stones fields and making it available to the population. With the implementation of these two projects, 530 mln. m3 of gas has started to be collected.

1.A.1 Energy Industry, gas and liquid fuels (CO2) - In 1990, natural gas-fired sources of this category ranked 3rd and liquid fuel-fired sources ranked 4th in terms of GHG emissions. At that time, thermal power plants and heating plants were operating in this category. TPPs used fuel oil, which is a liquid fuel, and heating centers mainly used gas and, in some cases, fuel oil. Starting from 2012, the use of gas began to increase, while the use of fuel oil began to decrease. Already in 2022, the use of fuel oil had dropped to 3%. The increase in the demand for electricity has led to the expansion of this field, which for the gaseous fuels, has led to its rise to the 1st place in the ranking in the level assessment in 2022.

According to the trend level, this category is ranked 7th for natural gas (gaseous fuels) and 2nd for the liquid fuels, driven by the reduction in use of fuel oil across the time series.

1.A.2 Industry and construction (CO2) - In 1990, the key category ranked 2nd. Enterprises belonging to this category were later completely destroyed. By the end of the 1990s, the category's emissions had dropped by 80%. Such a situation brought the category to the 9th place in the level assessment in 2022.

According to the trend level, the category without LULUCF and with LULUCF is ranked 1st due to the significance of the change in emissions between 1990 and 2022.

1.A.4 Other sectors, gas and liquid fuels (CO2) – This sector includes fuel combustion for commercial and institutional buildings, including residential, agriculture, forestry and fisheries. Mainly gas is used within this category, although there are also mobile sources of the sector, which sometimes use liquid fuel. Emissions from both gaseous fuels and liquid fuels in this category were considered a key category in the level assessment (1990). For the trend between 1990 and 2022, only the emissions from gaseous fuels were significant. In the level assessment for 2022 the emissions from gaseous fuels were significant.

1.B.2.a Fugitive emissions from oil and natural gas systems - Volatile emissions of CH_4 released into the atmosphere in 1990 from the category of oil production ranked 9th in the list of key categories according to the level assessment including and excluding LULUCF, respectively. In 2022, emissions of CO_2 gas from this category, are also considered significant in the level assessment, at the 7th rank both with and without LULUCF. CH_4, on the other hand, has risen to the 5th rank in terms of emissions in both cases, i.e. without LULUCF and with LULUCF.

According to the trend level, this category ranked 4th for the CH_4 emissions and 8th for the CO_2 emissions.

1.A.3.b Road transport (CO2) has attracted great interest. Thus, in 1990, this category ranked 6th in the level assessment both with and without LULUCF in terms of CO2 emissions, and in 2022, without LULUCF and with LULUCF, this category rose to the 4th rank in the 2022 level assessment. According to the trend assessment, it ranks 6th both with and without LULUCF.

3.A Enteric Fermentation In the 1990 level assessment emissions from enteric fermentation were not ranked. In the 2022 level assessment emissions from enteric fermentation were ranked 6th. It ranks 10th with and without LULUCF according to trend evaluation.

4.A.1 Forest were included in the list of key categories assessed including LULUCF in the level assessment of 1990 and 2022. It ranked 8th in both assessments.

5.A Solid waste disposal category is included in the key category list in 2022 due to GHG emissions. This category was 9th in the order taken without LULUCF and 10th with LULUCF.

5.D Wastewater Treatment and Discharge. In the 2022 level assessment excluding LULUCF, Wastewater Treatment and Discharge was ranked 11th.

1990 - Including LULUCF

CODE	Category	Gas	Emission	Level	Total	Rank
1.B.2.b	Natural Gas	CH_4	20466.22	0.22	0.22	**1**
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	14714.53	0.16	0.37	**2**
1.A.1	Energy Industries - Gaseous Fuels	CO_2	12558.27	0.13	0.51	**3**
1.A.1	Energy Industries - Liquid Fuels	CO_2	10414.35	0.11	0.62	**4**
1.A.4	Other Sectors - Gaseous Fuels	CO_2	6722.63	0.07	0.69	**5**
1.A.3.b	Road Transportation - Liquid Fuels	CO_2	4820.40	0.05	0.74	**6**
1.A.4	Other Sectors - Liquid Fuels	CO_2	3743.85	0.04	0.78	**7**
3.B.1.a	Forest land Remaining Forest land	CO_2	3693.18	0.04	0.82	**8**
1.B.2.a	Oil	CH4	3468.86	0.04	0.86	**9**

1990 Excluding LULUCF

CODE	Category	Gas	Emission	Level	Total	Rank
1.B.2.b	Natural Gas	CH_4	20466.22	0.22	0.22	**1**
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	14714.53	0.16	0.37	**2**
1.A.1	Energy Industries - Gaseous Fuels	CO_2	12558.27	0.13	0.51	**3**
1.A.1	Energy Industries - Liquid Fuels	CO_2	10414.35	0.11	0.62	**4**
1.A.4	Other Sectors - Gaseous Fuels	CO_2	6722.63	0.07	0.69	**5**
1.A.3.b	Road Transportation - Liquid Fuels	CO_2	4820.40	0.05	0.74	**6**
1.A.4	Other Sectors - Liquid Fuels	CO_2	3743.85	0.04	0.78	**7**
3.B.1.a	Forest land Remaining Forest land	CO_2	3693.18	0.04	0.82	**8**
1.B.2.a	Oil	CH4	3468.86	0.04	0.86	**9**

2022 - Including LULUCF

CODE	Category	Gas	Emission	Level	Total	Rank
1.A.1	Energy Industries - Gaseous Fuels	CO_2	15828.85	0.20	0.20	**1**
1.B.2.b	Natural Gas	CH_4	12683.36	0.16	0.35	**2**
1.A.4	Other Sectors - Gaseous Fuels	CO_2	10371.92	0.13	0.48	**3**
1.A.3.b	Road Transportation - Liquid Fuels	CO_2	8334.14	0.10	0.59	**4**
3.A	Enteric Fermentation	CH_4	5102.67	0.06	0.65	**5**
4.A.1	Forest land Remaining Forest land	CO_2	3567.47	0.04	0.69	**6**
1.B.2.a	Oil	CO_2	3942.00	0.05	0.74	**7**
1.B.2.a	Oil	CH_4	3405.38	0.04	0.79	**8**
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	2494.11	0.03	0.82	**9**
5.A	Solid Waste Disposal	CH_4	2470.43	0.03	0.848	**10**
5.D	Wastewater Treatment and Discharge	CH_4	2243.2	0.028	0.875	**11**

2022 - Excluding LULUCF

CODE	Category	Gas	Emission	Level	Total	Rank
1.A.1	Energy Industries - Gaseous Fuels	CO_2	15828.85	0.21	0.21	**1**
1.B.2.b	Natural Gas	CH_4	12683.36	0.17	0.38	**2**
1.A.4	Other Sectors - Gaseous Fuels	CO_2	10371.92	0.14	0.52	**3**
1.A.3.b	Road Transportation - Liquid Fuels	CO_2	8334.14	0.11	0.63	**4**
3.A	Enteric Fermentation	CH_4	5102.67	0.07	0.70	**5**
1.B.2.a	Oil	CO_2	3942.00	0.05	0.75	**6**
1.B.2.a	Oil	CH_4	3405.38	0.05	0.80	**7**
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	2494.11	0.03	0.83	**8**
5.A	Solid Waste Disposal	CH_4	2470.43	0.03	0.86	**9**

Table 5. Detailed analysis of the key categories (with and without LULUCF)

1.5. BRIEF GENERAL DESCRIPTION OF QA/QC PLAN AND IMPLEMENTATION

The 2006 IPCC GHG inventory guidelines state that one of the key issues in the inventory process is the successful implementation of QA/QC. An overview of the quality targets for GHG emissions inventory is provided mainly in the indicators derived from the 2006 IPCC Guidelines (Volume 1, Chapter 6). Furthermore, individual operational objectives for quality assurance and quality control for different categories are set based on the comparison of the requirements of the 2006 IPCC Guidelines, the results of an independent inventory control and the assessments.

Azerbaijan applied flexibility for reporting of QA/QC plan. In accordance with the 2006 IPCC Guidelines (Volume 1, Chapter 6) and paragraph 19 of the Reporting Guidelines (24/CP.19), the QA/QC measures required for reporting emissions are planned to be summarized in a QA/QC plan in the future. Such a QA/QC plan shall serve the main purpose of the organization, planning and monitoring of QA/QC measures. To achieve these goals, measures for ensuring transparent and effective control on the implementation and monitoring of actions are referred to specific roles and specific categories in the quality control and quality assurance plan. As part of quality assurance, quality assurance measures shall also be implemented on the work schedule.

In this context, quality controls are not actually defined as controls, but as quality objectives (data quality objectives according to the 2006 IPCC, Volume 1, Chapter 6.5). However, it is necessary to either confirm compliance with the objectives or justify non-compliance. All Parties shall develop a QA/QC inventory plan in accordance with the IPCC Guidelines, including information on the inventor organization responsible for the implementation of QA/QC. Information about this is given in the Improvement section of the report and subsection 1.9 on areas of flexibility.

Starting from 2018, i.e. from the 2nd BUR, Azerbaijan began to prepare the GHG emissions inventory based on the 2006 IPCC methodology. Reports issued before 2018 (1st, 2nd, 3rd NCs and BUR 1) referred to the 1996 IPCC guidelines.

Azerbaijan's checklists have been reviewed annually for updates and revised or expanded as needed. Like the checklists, the QA/QC tasks are constantly being improved. QA/QC checklists are tools for verifying the compliance with international requirements and they allow inventory quality control by initiating quality assurance measures as outlined in Article 13 of the Paris Agreement on National Guidelines.

The majority of data needed for the inventory process was sourced from the data of the SSC. It is worth noting that since 2007 the SSC has established its work on the basis of the standards of the International Energy Agency (IEA). Clarifications and elimination or reduction of uncertainties are addressed through requests submitted by MENR to ministries, agencies, companies and enterprises. Moreover, if information is not obtained from the specified sources, the necessary information will be searched on the relevant websites.

In order to verify the quality of reports prepared on GHG, independent experts who are usually not directly participated in inventory process were involved. An extensive review of data by an independent team of experts took place which supported the BTR preparation, checked the numbers and have identified a number of improvement for the future improvement of the GHG Inventory.

The inventory results for the Energy sector for the years 1990 and 2020-2022 were compared to IEA calculation sources as part of the QA/QC measures implemented. (See: Section 3. Energy).

Some measures are described in the inventory report related to the data collection by the SSC on QA/QC. The inventory report does not contain details on quality control procedures performed at other stages of inventory. The SSC has its own data verification procedures as part of the statistical data generation process.

The provisions of Chapter 6 of Volume 1 of the 2006 IPCC Guidelines will be taken as a base when preparing the QA/QC plan.

To support the GHG inventory process there is required a legal document (law, regulation or other). In Azerbaijan, a QA/QC plan is in the process of preparation, which contains specific measures, duties and responsibilities and timelines. The national procedures for establishing the legal framework, including minimum requirements for quality control and assurance in preparing the GHG Inventory, are currently in progress. After the adoption of the relevant national law on GHG inventory and relevant regulatory rules, an appropriate plan on key elements of the inventory such as QA/QC will be prepared and detailed information will be provided in the next transparency reports. The delay in the preparation of the QA/QC plan is mainly explained by objective reasons such as the lack of human resources for GHG inventory, the lack of national legislation in this field, failure in establishing appropriate institutional structures in the relevant sectors, etc. In cases where necessary information is needed, the decision of the State Commission on Climate Change serves as the legal basis for the GHG inventory.

QC activities include assessment of the common methods such as data collection and verification of their calculation accuracy, emission/absorption assessment, measurements, uncertainty assessments and using approved standardized procedures for archiving information and reporting.

The prepared legal documents will address the entire inventory process (legal, institutional and procedural). There is limited information on national inventory systems, the duties and responsibilities of various stakeholders and the initial legal framework for the GHG inventory.

As strongly recommended in the efficient inventory experiment conducted, a higher-level QA/QC procedure was applied in the key categories of resources, methodological selection and recalculation operations were performed. These procedures covered the years 1990, 2020-2022, energy, industry, agriculture, LULUCF and waste industry.

In reports prepared using the Tier 1 approach, inventory indicators were compared with the results of emission estimations calculated using the IPCC methodology coefficients and further with reports issued by the IEA.

One of the positive practices for ensuring completeness in the inventory process is to precisely define whether GHG emissions are included in any sector and whether they are not double-counted.

There were also some difficulties in ensuring completeness. Thus, there is lack of data on GHG emissions. For instance, due to the cessation of using ozone-depleting substances and resuming of the use of their alternatives after 2005 and for some other reasons, information on those gases was not provided in the inventory. However, certain information about the F-gas emissions is included in the report.

For the official review and approval of the GHG inventory in Azerbaijan, supplementary measures are taken in addition to the ones executed in the implementation process. After summarizing the final results of the national inventory by MENR as an NCA, it is submitted to the Cabinet of Ministers to be sent to the relevant authorities for providing their feedbacks (opinions) and proposals. This intra-state procedure can be called a kind, but also indirect part of the QA/QC process. After receiving feedbacks and proposals from relevant organizations, the Cabinet of Ministers sends them back to the MENR for their submittal to the UNFCCC.

1.6. GENERAL UNCERTAINTY ASSESSMENT

Performing an uncertainty assessment, managing these uncertainties and taking measures to reduce them over time is recognized by the IPCC as an important element of inventory preparation and development. Azerbaijan recognizes the importance of performing an uncertainty analysis to provide clear insights into those categories in which emission estimates are most uncertain and plan to use the uncertainty assessment in conjunction with the key category analysis to prioritize the improvement plan to improve the accuracy of emission estimates. Azerbaijan has been unable to estimate a full set of quantified uncertainties for this BTR submission due to technical difficulties with the IPCC software, and therefore presents in this summary chapter, and within each sector chapter, a qualitative assessment of uncertainty. Quantitative assessments of uncertainty have been provided in some instances within individual sectors.

Azerbaijan, as a developing country that needs flexibility in terms of its capacity for this provision, has implemented flexibility to provide a qualitative discussion of uncertainty, at least for key categories, using the IPCC guidelines as referred to in paragraph 20 of the MPGs. The basis for implementing flexibility on uncertainties was capacity limitation, lack of resources and time limitation. It is planned that in the next BTR report, a quantitative assessment of uncertainties will be provided. For this purpose, a series of training sessions based on the 2006 IPCC guidelines is planned for experts from relevant institutions, coordinated by the Ministry of Ecology and Natural Resources.

Qualitative and some quantitative category specific uncertainty information is provided in the detailed category specific methods, data sources, and assumptions sections of chapters 3 to 7. In the IPPU sector the uncertainties were analyzed quantitatively in accordance with the IPCC 2006 Guidelines.

1.6.1. QUALITATIVE ASSESSMENT OF UNCERTAINTY BY INVENTORY SECTORS

Qualitative assessment of uncertainties in each inventory sector are summarized below.

1.6.1.1. ENERGY

Uncertainties in the energy sector are expected to be higher in 1990 compared to later years in the time series due to lower confidence in the activity data used as input to the energy balance. This contributes uncertainties in the trends for road transportation, energy production, fugitive wastes of the energy sector, cement production, cast iron and steel production of the Energy sector.

A comparison between the sectoral vs reference approach in emission estimation of carbon dioxide (CO_2), from fuel combustion is the recommended approach in the IPCC guidelines for identifying discrepancies and improving data quality in the energy sector. The comparison highlights some statistical discrepancies in national energy statistics, including the non-energy use of fuels and the aggregated application of emission factors. However, the differences between emission estimates from the two approaches have been decreasing over the years, indicating improvements in data quality.

Overall, the uncertainties in CO_2 emissions from fuel combustion in Azerbaijan's national inventory are considered to be relatively low because of the consistent quality of emission data derived from a limited number of processing facilities. The carbon content of oil and gas products from these facilities is relatively stable, leading to less variability in the estimates. However, the uncertainties in CH_4 and N_2O emissions are higher due to the less predictable nature and the higher dependence on country specific information on combustion conditions when compared to CO_2, which is more straightforward to estimate due to its direct link to fuel carbon content.

1.6.1.2. IPPU

As there are few categories in Azerbaijan's industrial production and product use sector, and national data is available from the State Statistical Committee (SSC), it was possible to quantify uncertainty for this sector. Further qualitative assessment is provided below.

IPCC category	Gas	Uncertainty of the activity data	Uncertainty of the emission factor	Combined Uncertainty
		%	%	%
2.A.1. Cement production	CO_2	35%	7%	36%
2.A.2. Lime production	CO_2	10%	8%	13%
2.A.3. Glass production	CO_2	10%	60%	61%
2.B.8. Petrochemical and carbon black production	CO_2	20%	60%	63%
2.B.8. Petrochemical and carbon black production	CH_4	20%	60%	63%
2.C.1. Iron and steel production	CO_2	10%	25%	27%
2.C.2. Ferroalloys production	CO_2	10%	38%	39%
2.C.2. Ferroalloys production	CH_4	10%	38%	39%
2.C.3. Aluminium production	CO_2	10%	10%	14%
2.C.3. Aluminum production	PFC	10%	380%	380%
2.D.1. Lubricant use	CO_2	5%	50%	50%

Table 6. Uncertainties of the IPPU sector

In general, uncertainty within the IPPU sector is driven by the use of tier 1 default emission factors from the IPCC 2006 guidelines due to a lack of information on facility specific technologies or raw input material composition. The accuracy of statistical data provided by SSC is expected to have improved since 2007 which allows for reduced level of uncertainty in the calculation of emissions for many of the statistics-based categories. However, uncertainties could be reduced with improved information from facilities and better access to historical information which was lost with the break-up of the Soviet Union.

2A Mineral Industry: Moderate uncertainties exist within the Mineral Industries emission estimates driven through the use of national production statistics and Tier 1 default emission factors from the IPCC guidelines. A lack of information across all mineral industries on the composition of raw input materials and technologies installed at facilities, and how this may vary across the time series, contribute to uncertainty and limit the ability to move to higher tier methodologies. Specifically, uncertainty within the glass production estimates is expected to be significant due to the trend shown in the activity data. Glass production statistics show that production in 2022 was 8% of the production in 1990. It is considered that this was due to Azerbaijan's integration into the Soviet Union's centralized industrial system in 1990. Azerbaijan's glass factories were part of a large network supplying glass to various regions within the USSR. After the collapse of the Soviet Union in 1991, the country faced economic challenges, leading to a decline in industrial output, including glass production. However, as this follows a different trend to other mineral industries, further verification of the activity data is required before reducing the uncertainty estimate. Comparison with the fuel combustion data included within the energy balance for cement production shows an increasing trend across the time series, and therefore the two data sets need to be further compared and verified.

Default factors have been taken from the IPCC guidelines for the estimation of uncertainty.

2B Chemical Industry: Uncertainty within the petrochemical industry emissions included within chemical industries are moderate due to the possibility of double counting of emissions with the energy sector. Consequently, an uncertainty of ± % is assumed. Further investigation is required into this potential double count to reduce the uncertainty. Default factors have been taken from the IPCC guidelines for the estimation of uncertainty.

2C Metal Industry: Uncertainties within this sector are of similar magnitude to the mineral industries due to the lack of information about technology within facilities and the use of national production data. In iron and steel categories, as well as in aluminium category, switching to higher tier methods will help improving more accurate estimation of uncertainties in the metal industry.

In metal production plants, the replacement of old Soviet equipment and the transition to new technologies in the latter years of the time series leads to high uncertainties in the coefficients used from the IPCC guidelines. Further information is required on the technology installed on plants to move to higher tiers and reduce uncertainty. Default factors have been taken from the IPCC guidelines for the estimation of uncertainty.

2F Refrigeration and air conditioning: For BTR1, uncertainties related to emissions of this category have not been assessed. HFCs were not imported into the country in the base year of 1990. On the other hand, since the information for this category is considered a confidential from the commercial point of view, uncertainty was not calculated. This brings high uncertainty to the overall emission estimates for the IPPU sector.

1.6.1.3. AFOLU

Within Agriculture, the uncertainty rates related to the activity data are low as data for livestock population is collected by the State Statistical Committee, which covers a substantial number of farms and, accordingly, a significant portion of the livestock population.

The only gap, and the corresponding impact on the overall uncertainty assessment, may result from the fact that emissions from certain livestock categories were not estimated due to the lack of default data on manure management systems.

The uncertainty related to the amounts of fertilizers applied to agricultural soils are the most uncertain, as they were taken from an international source (FAOSTAT). This leads to high uncertainties in the estimation of N_2O. Uncertainty related to the emission factors utilized can be taken from the IPCC default ranges as Tier 1 methodologies are used to estimate emissions.

In the LULUCF sector the main uncertainties are stemming from the assessment of the country's territory according to the territorial division given in the IPCC methodology. Four area types out six are given in the statistical data of the State Statistical Committee. The available area types are Forest land, Cropland, Grassland and Wetlands. In the other two area types, namely, Settlements and Other lands, a higher level of uncertainties takes place. For these area types, experts used interpolation and extrapolation methods.

Within LULUCF, the uncertainty rates associated with the activity data on biomass stock, biomass increment rate, and wood removals are considered relatively high since the data were obtained from international sources. However, the uncertainty rates related to forest land, cropland and settlement areas were classified within a medium uncertainty range, as the data were sourced from national providers. The uncertainty rates for various underlying parameters and emission factors correspond to those reported in the 2006 IPCC Guidelines, as the IPCC software with default data was used to estimate the emissions.

1.6.1.4. WASTE

In general, uncertainty is high within the waste sector due to a lack of data on waste generation and composition within the country. Assumptions are therefore made based on population data.

5A Solid Waste Disposal: The IPCC guidelines state that "the quality of CH_4 emission estimates is directly related to the quality and availability of the waste generation, composition and management data used to derive these estimates" and that "estimates-based default activity data will have the highest uncertainties". In Azerbaijan, the emission estimates for solid waste disposal are based on waste generated per capita. Uncertainty associated with the emissions could therefore be more than a factor of two (Table 3.5, Chapter 3: Solid Waste Disposal, IPCC Guidelines 2006). Default values are also used for all aspects of the estimation of emissions in accordance with the FOD method, and therefore high uncertainty is associated with the assumptions taken on the waste composition, degradable organic carbon (DOC) content and methane correction factor (MCF). Further uncertainty is introduced by the assumptions made on the utilization of different types of waste disposal sites i.e. managed, unmanaged and unspecified

5C1 Waste Incineration: There is a high level of uncertainty related to the separation of biogenic and fossil carbon fractions in waste related to emission estimation in waste incineration due to the lack of information on waste composition. Therefore, default values have been used in all parameters for the estimation of emissions from this sector. The activity data is estimated to have an uncertainty of ± 5 %.

5D Wastewater Treatment and Discharge: Uncertainty in the emission estimates for domestic wastewater are introduced through assumptions made on the degradable organic component per capita and protein consumption per capita. For industrial wastewater, uncertainty is also introduced both in the activity data (industrial production), the maximum CH_4 producing capacity and the methane correction factor (MCF). Whilst expert judgement is required to fully quantify the uncertainty resulting through the combinational effects of the assumptions made, the IPCC guidelines suggest that uncertainty could be ± 30% based on the emission factor, and ± 25% on the activity data.

1.7. GENERAL ASSESSMENT OF COMPLETENESS

The Paris Agreement MPGs require that national inventories are assessed by inventory compilers to determine the level of completeness of reported sources. In the national inventory report of GHG emissions, sources and sinks which are included in the IPCC guidelines but are not estimated by a party shall be clearly indicated, with reasons given for their omission. When filling out the reporting tables, notation keys shall be used where data are not available and the reasons for excluding emissions from sources and specific sector categories, subcategories, or gases should be indicated. Once emissions or removals have been estimated for a category and if they continue to occur, each Party shall report them in subsequent submissions.

The impact of completeness should be considered in other analyses of the GHG inventory. For example, if the GHG inventory is incomplete, neither the approach 1 and approach 2 for key category analysis will provide fully accurate results. The key category analysis can be completed without full completeness of the inventory, but some key categories may remain unidentified in this instance. In such cases, potential categories that have not yet been quantified should be determined using expert judgment and identified through qualitative assessment.

Information on completeness (including information on non-reported categories or any methodological or data gaps in the inventory)

In accordance with Decision18/CMA.1 (Article 31) of the Parties to the Paris Agreement, each Party shall use notation keys where numerical data are not available when completing common reporting tables, indicating the reasons why emissions from sources and removals by sinks and associated data for specific sectors, categories and subcategories or gases are not reported. These notation keys include:

(a) *"NO"* (not occurring) for categories or processes, including recovery, under a particular source or sink category that do not occur within a Party;
(b) *"NE"* (not estimated) for activity data and/or emissions by sources and removals by sinks of GHGs that have not been estimated but for which a corresponding activity may occur within a Party;
(c) *"NA"* (not applicable) for activities under a given source/sink category that do occur within the Party but do not result in emissions or removals of a specific gas;
(d) *"IE"* (included elsewhere) for emissions by sources and removals by sinks of GHGs estimated but included elsewhere in the inventory instead of under the expected source/sink category;
(e) *"C"* (confidential) for emissions by sources and removals by sinks of GHGs where the reporting would involve the disclosure of confidential information.

Also according to the 5th paragraph of the Annex to Resolution 18/CMA.1 (5 CMA/3), the developing countries that need flexibility in the light of their capacities use the new notation key "FX" (flexibility) in the relevant common reporting tables or common tabular formats, providing an explanation of how the specific flexibility provision has been applied in the corresponding documentation box.

In this inventory document, emissions for some categories have not been estimated; hence, are reported as "NE (not estimated)" in the CRTs.

Description of insignificant categories
Each Party may use the notation key "NE" (not estimated) when the estimates would be deemed insignificant. For developing parties that need flexibility in the light of their capacities with respect to this provision can define emissions as 'insignificant' if the likely level is below 0.1 per cent of the national total GHG emissions, excluding LULUCF, and 1,000 kt CO_2 eq, whichever is lower. The total national aggregate of estimated emissions for all gases from categories considered insignificant, in this case, shall remain below 0.2 per cent of the national total GHG emissions, excluding LULUCF.

In Azerbaijan's current inventory report, the last year of which is 2022, the country's total emissions comprised 74,704.73 kt CO_2-equivalent. 0.1% of those emissions makes nearly 74.7 kt. Therefore, the total amount of emissions from sources included in the "insignificant" category in Azerbaijan shall not exceed 74.7 kt. The list of source categories, whose emissions included in that category are considered insignificant based on the conducted quantitative and qualitative assessments and are mainly reported as "NE", is given in Table 8.

Table 7. below provides information on the country's total emissions for the base year (1990) and the last reporting year (2022).

	1990	2022
National total (excluding LULUCF)	88,600.25	74,704.73
Significance threshold (0.1%)	88.6	74.7
Threshold for total national aggregate of estimated emissions (0.2 %)	177.2	149.4

Table 7. Indicators of total emission and "Significance" thresholds, kt CO_2 eq.

It has not been possible in most cases to calculate the expected emissions from categories which have not been estimated in the GHG inventory. Table 8. below lists the categories which are 'NE' and indicates whether these are likely to reach the threshold of significance (0.1% of the national total). The categories which are not estimated, but are expected to exceed the threshold of significance are prioritized in the improvement plan.

CRF code	IPCC code	CRF Name	Expected or estimated emissions (kt CO_2 eq)*	Note
2.A.4.a	2.A.4.a	Ceramics	162	National statistics provided by SSC do not provide the activity data required to estimate emissions from the ceramic industry. A high level estimate has been performed by scaling data from a neighbouring country using GDP.
2.D.2	2.D.2	Paraffin Wax Use	0.45	Estimation of emissions from this sector may currently lead to double counting of emissions with the energy sector, and therefore further information on the energy/non-energy use split in national energy statistics is required. A high level estimate has been performed scaling data using GDP from a neighbouring country.
2.D.3	2.D.3	Solvent Use	27	No data available on asphalt production and use or solvent use. Indirect greenhouse gas (NMVOC) not estimated as part of the inventory. High level estimate provided for domestic solvent use (EMEP/EEA Guidebook) calculated using population to demonstrate insignificance.
2F	2F	Refrigeration and Air Conditioning; Foam Blowing Agents, Fire protection	482	Refrigeration and Air Conditioning (2F1); Foam Blowing Agents (2F2), Fire protection (2F3). Activity data available for this sector was not utilised for emission calculation as it is was considered to be highly uncertain. This is partly caused by issues of commercial confidentiality within the data set. This category is likely to be significant. Data not available to disaggregate between end use. High level estimate performed based on scaling emissions from neighbouring country using GDP.
2.F.4	2.F.4	Aerosols	-	No data available, and no regional data was available to make a high level estimate
2.F.5	2.F.5	Solvents	-	No data available, and no regional data was available to make a high level estimate
2.G.1	2.G.1	Electrical Equipment	2.0	No data available at national level. High level estimate provided by scaling data from a neighbouring country using GDP.
2.G.3	2.G.3	N_2O from Product Uses	12.5	No data available at national level. High level estimate provided by scaling data from a neighbouring country using GDP.
2.H.2	2.H.2	Food and Beverages Industry	-	National statistics do not provide the activity data required to estimate emissions from food production and no default emission factors are available in the guidebook to scale emissions based on neighbouring countries.
3.A	3.A.1.i	Enteric Fermentation - Chickens - CH_4	2.50	National statistics do not provide the activity data required to estimate emissions. The estimates have been completed using assumed allocation on MMS and the IPCC default factors

3.B(b)	3.A.2	Direct N_2O from Manure Management – Chickens, Sheep, Goats, Camels, Horses, Mules and Asses	16.64	National statistics do not provide the activity data required to estimate emissions. The estimates have been completed using assumed allocation on MMS and the IPCC default factors
3.D.1.b 3.D.1.c 3.D.1.e	3.C.4	Direct N_2O from managed soils (manure applied, PPR, mineralisation)	386.47	National statistics do not provide the activity data required to estimate emissions. The estimates have been completed using assumed allocation on MMS and the IPCC default factors. In addition, the changes in carbon stock calculated in the LULUCF sector were considered
3.D.2	3.C.6	Indirect N_2O from managed soils (manure applied, PPR, mineralisation)	115.17	National statistics do not provide the activity data required to estimate emissions. The estimates have been completed using assumed allocation on MMS and the IPCC default factors. In addition, the changes in carbon stock calculated in the LULUCF sector were considered
3.D.1.f	3.C.8	Organic soils and drainage/rewe tting	-	It is planned to address these considerations through the updated land representation and report associated emissions/removals for organic soils and drainage/rewetting activities if occurring.
4(II)	3.B.6.a	Other land remaining other land	-	The data on areas of flooded land remaining flooded land are not available for the current submission.
5.B	4.B	Biological Treatment of Solid Waste	3.0	The annual amount of municipal solid waste treated at anaerobic digestion at biogas facilities was not estimated owing to lack of resources and disaggregated data. The collection of disaggregated information for this activity data will be added to the improvement plan. A high level estimate has been calculated scaling neighbouring country data using population.
5.C.2	4.C.2	Open burning of waste	0.43	Open burning of solid waste is prohibited by law (Environmental Protection Law of Azerbaijan (Law No. 678-IQ) and emissions are not estimated. A high level estimate has been calculated scaling neighbouring country data using population.
5.D.2	4.D.2	Industrial Wastewater Treatment and Discharge - N_2O	-	It is noted that methodologies to estimate N_2O from industrial wastewater are available in the 2019 Refinement to the 2006 IPCC Guidelines, however such methodologies have not yet been assessed for inclusion in the Azerbaijan inventory.

Table 8. Not estimated categories within the GHG Inventory with estimated expected emissions where available

The records for combustion-related activities (1.A) from the area of energy are assumed to be complete within the inventory as the Energy balance includes data on all energy products entering, leaving and used within the territory. Therefore no categories have been identified within Energy as 'not estimated', instead improvement efforts are required to allow emissions to be further disaggregated within the sector. For example, within 1A2 Manufacturing Industry and Construction the available data do not allow disaggregation in full accordance with the requirements of the UNFCCC, such as for heat and energy production of industrial electric and thermal plants which cannot be disaggregated entirely to specific sectors. This is additionally relevant for Road Transport, where calculations are based on the energy balance and therefore road transport totals and have been allocated to passenger cars with all other subcategories (motorcycles, light trucks, heavy trucks, buses, etc) as "IE" included under Passenger Cars. Since there is no information on the type and amount of fuel used by different types of transport in Azerbaijan, the information provided by the General TJ of the SSC on the fuel sold was used and no disaggregation into further sub-categories is possible.

1.8. METRICS

GHGs vary in their ability to absorb energy (referred to as "radiation efficiency") and their duration of existence in the atmosphere (known as "lifetime"). In the light of these differences, the Global Warming Potential (GWP) was developed, where the radiation efficiency of one metric ton of GHG is compared to one ton of CO_2 over a specific period of time, usually 100 years. This allows us to estimate the global warming effects of different gases. A higher GWP indicates that a given gas has a more significant warming effect on Earth than CO_2 over a certain period of time.

Thus, GWP is the ratio of the time-integrated radiation force emerging from instantaneous release of 1 kg substance to 1 kg reference gas. The reference gas used is CO_2, so the emissions measured in GWP are expressed in units of CO_2 equivalent.

In Azerbaijan's national GHG inventory, the latest GWPs for the 100-year period, i.e. data from the IPCC Fifth Assessment Report were used.

1.9. SUMMARY OF APPLIED FLEXIBILITIES

In accordance with paragraph 2 of Article 13 of the Paris Agreement, in the implementation of the provisions of Article 13 in the ETF, flexibility is provided to developing country Parties that need it in the light of their capacities, and, if necessary, the Parties shall ensure it and reflect such flexibility in their reports.

According to Article 13(2) of the PA, MPGs provide flexibility capacities for developing countries that need it.

In terms of the application of the flexibility provided for in the provisions of MPGs, developing Parties that need it shall determine their position. The developing country shall clearly indicate the provision to which the flexibility applies, briefly clarify the capacity constraints, noting that some constraints may be related to several provisions and submit estimated timeframes for improvements to address these constraints. When a developing country Party applies the flexibility provided for in the MPGs, the technical expert review teams will not consider the Party's decision to use such flexibility or whether the Party is able to implement that particular provision without flexibility.

Azerbaijan has developed a summary of data on the specific flexibility provisions applied, indicating the capacity constraints associated with the application of flexibility in the provisions and time frames defined for improvements related to these constraints (Table 9).

Areas covered by provisions where flexibility is applied in the report	Capacity constraints related to the application of flexibility	Improvements envisaged for the country by areas	Information on the implementation of improvements
1. Para 57 and 58 (Consistency of time series and recalculations) Azerbaijan, as a developing country, presents the GHG inventory of only 1990 as a base or reference year and the last 3 reporting years (2020-2022) as part of the BTR report using the opportunities created by clauses 57 and 58 of the MPG on GHG inventory.	Owing to limited time constraints, lack of national capacities and of information on the use of the 2006 IPCC methodology guidelines in specific sectors, as well as limitations in resources and language barriers faced by local stakeholders (primarily in the agriculture sector) regarding the application of existing methodologies.	Currently, domestic procedures aimed at enhancing legislation on GHG inventory are being implemented in the country. In this context, a series of training sessions on the IPCC 2006 Guidelines is planned, involving all relevant institutions.	The improvements are planned for the next BTR cycles, in accordance with 2006 IPCC and UNFCCC Guidelines, an inventory will be conducted for more years between 1990 and 2022. Meantime, in order to overcome the language barrier, it is planned to translate the relevant country-specific sections of the 2006 IPCC Guidelines into the Azerbaijani language.
2. Para 34 (QA/QC plan) Azerbaijan applies flexibility under Paragraph 34 due to current limitations in developing a comprehensive QA/QC plan. The country focuses on the main elements of the IPCC guidelines within available resources and expertise while prioritizing immediate needs.	Capacity constraints include limited technical expertise, insufficient resources for detailed category-specific QC, and challenges in organizing external expert peer reviews. These limitations hinder the full implementation of the QA/QC plan as per IPCC guidelines.	The “Inventory of heat trapping gases and development of Measurement, Reporting and Verification (MRV) system”, as well as the implementation of the corresponding paragraphs in the Action Plan of the State Commission on Climate Change are envisaged in the 1st paragraph of the action direction 5.2.5 of the document “Socio-economic development strategy of the Republic of Azerbaijan for 2022-2026”.	For third BTR cycle, Azerbaijan aims to enhance QC procedures by 2025 through capacity-building initiatives, including staff training and resource allocation, to implement a more robust QA/QC system, in line with the IPCC guidelines and international standards.
3. Para 29 (Uncertainty assessments) Azerbaijan applies flexibility under Paragraph 29 to focus on a qualitative discussion of uncertainty for key categories due to limited resources and data availability. This approach allows the country to address the most significant categories while working towards improving its ability to provide quantitative uncertainty estimates.	Capacity constraints include limited access to detailed data and analytical tools necessary for quantitative uncertainty estimation (e.g. the uncertainty analysis calculator in the IPCC software contains bugs, displays errors, and is not yet considered finalized). These limitations make it challenging to meet the full requirements, so the country prioritizes qualitative assessments for key categories.	Azerbaijan aims to enhance its capacity for quantitative uncertainty estimation. This includes improving data quality, expanding analytical capabilities, and training personnel to eventually meet all IPCC guidelines comprehensively.	The improvements are planned for the next BTR cycles, when analytical tools are available.

4. Para 25 (Key category analysis) Azerbaijan applies flexibility under Paragraph 25 by using a lower threshold of 85% instead of 95% to identify key categories. This approach allows the country to focus on fewer, more critical categories due to limited resources and capacity, prioritizing improvements where most impactful.	**Capacity constraints include limited data quality and analytical resources, making it challenging to apply the 95% threshold for key category analysis. Using an 85% threshold helps manage these constraints while directing resources to priority areas.**	**Azerbaijan plans to improve its key category analysis to align with the 95% threshold by 2030. This will involve enhancing data quality, increasing analytical capabilities, and investing in resources to better meet IPCC guidelines.**	**The improvements are planned for the next BTR cycles, when analytical tools are available.**
5. Para 35 (QC procedures) Azerbaijan applies flexibility under Paragraph 35 due to limited capacity for comprehensive implementation of general and category-specific QC procedures. Current efforts focus on basic QC procedures in line with available resources, prioritizing key categories and areas with significant methodological changes or data revisions.	Capacity constraints include limited technical expertise, insufficient resources for detailed category-specific QC, and challenges in organizing external expert peer reviews. These limitations hinder the full implementation of the QA/QC plan as per IPCC guidelines.	Azerbaijan aims to enhance QC procedures by 2025 through capacity-building initiatives, including staff training and resource allocation, to implement a more robust QA/QC system, standards.	
6. Para 48 (Reporting of F-gases) In line with Paragraph 48 of Decision 18/CMA.1, Azerbaijan applies flexibility in reporting HFCs, PFCs, SF6, and NF3 due to limited capacity and data availability. The country currently focuses on reporting CO2, CH4, and N2O, which are more significant to its national emissions inventory. The inclusion of the additional four gases is constrained by a lack of reliable data, technical expertise, and resources.	Insufficient statistical data required for GHG emissions inventory, inconsistencies between statistical data collection rules and requirements of the 2006 IPCC Guidelines, lack of resources in relevant sectors and time constraints are the primary obstacles. Azerbaijan faces capacity constraints in reporting HFCs, PFCs, SF6, and NF3 due to limited technical expertise, insufficient data collection systems, and resource shortages.	Azerbaijan aims to enhance its capacity to report on HFCs, PFCs, SF6, and NF3 by 2026. Ongoing efforts include legislative improvements, capacity-building initiatives, and training on the IPCC 2006 Guidelines. These actions are expected to gradually expand the scope of the GHG inventory, enabling full compliance with reporting requirements in the coming years.	The State Commission on Climate Change has developed an Action Plan for the implementation of these improvements. These improvements are expected to be finalized in future BTR cycles.
7. Para 32 (Insignificance threshold) Azerbaijan applies flexibility under Paragraph 32 to simplify reporting for categories with minimal emissions. The country uses a higher insignificance threshold (0.1% of national total GHG emissions or 1,000 kt CO2 eq) due to limited data accuracy and resources, allowing for practical	Capacity constraints include limited access to detailed data and lack of analytical tools, making it challenging to precisely estimate emissions to the lower threshold. Using a higher threshold helps manage these limitations while ensuring the focus	Azerbaijan aims to align with the lower insignificance threshold. This involves improving data collection, finding suitable analytical tools, and reporting practices to better meet IPCC guidelines and enhance overall inventory accuracy.	The improvements are planned for the next BTR cycles.

Table 9. Areas where flexibility is applied in the National inventory on the anthropogenic emissions and absorptions of greenhouse gases

2. TRENDS IN GREENHOUSE GAS EMISSIONS AND REMOVALS

OVERVIEW

This chapter provides an analysis of the trends in greenhouse gas (GHG) emissions and removals, with a focus on both historical patterns and recent developments across key sectors.

Structure Overview

- Section 2.1. includes an overarching analysis of total GHG emissions and removals at the national level, highlighting key patterns over time.
- Sections 2.1.1 to 2.1.5 delve into sector-specific analyses, following the sectoral classifications mandated by the Common Reporting Tables (CRT). The sectors include:
  - *Energy*
  - *Industrial Processes and Product Use (IPPU)*
  - *Agriculture*
  - *Land Use, Land-Use Change, and Forestry (LULUCF)*
  - *Waste*

Each sectoral section is organized into two main subsections:

1. *Historical Trend Analysis:*

This subsection examines long-term trends in GHG emissions and removals across key categories. The analysis follows the classification system provided by the Intergovernmental Panel on Climate Change (IPCC), indicating how sectoral activities have evolved since the 1990 baseline. This historical perspective helps understand the development of the sectors, identifying key turning points, and structural shifts.

2. *Current Trend Analysis:*

The current trend analysis focuses on developments during the latest reporting cycle, covering the three reporting years. This section follows the CRT sectoral categories, as mandated by the MPG. It highlights recent fluctuations in emissions and removals, as well as the emerging trends in each sector.

The inclusion of both historical IPCC classifications and CRT-based reporting ensures that both historical and current trends are presented coherently, facilitating a more detailed understanding of sectoral developments enabling continuity with earlier inventories.

2.1. DESCRIPTION OF TRENDS IN EMISSIONS AND REMOVALS BY SECTORS AND GASES

Since 1990 wide economic and environmental changes have taken place in Azerbaijan. Although Azerbaijan has made progress in certain areas (such as reducing energy intensity and improvements in the sustainable management of croplands), challenges remain, particularly in sectors like the oil and gas industry, transportation, waste management, and sustainable use of grasslands. Despite the rapid development of the non-oil sector, the country's dependence on oil and gas continues to shape its overall emissions profile.

The collapse of the Soviet Union in the early 1990s led to a sharp decline in Azerbaijan's industrial and energy sectors, resulting in a significant reduction in emissions. However, as Azerbaijan's economy rebounded in the 2000s thanks to oil and gas exports, emissions began to rise again, particularly in sectors such as transportation and waste.

As a country rich in oil, Azerbaijan's economy is highly dependent on hydrocarbon extraction. Emissions from oil and gas activities (including venting, flaring, and fugitive emissions) have remained relatively high due to the scale of production activities. Although emissions have slightly decreased since 1990 due to improved technologies, this sector continues to be the primary source of Azerbaijan's GHG emissions.

The rapid development of cities, especially Baku, in recent years (2020-2022) has led to an increase in emissions from transportation, waste, and energy consumption.

In the post-Soviet period, significant emissions from enteric fermentation and manure management have been released due to the increase in livestock in Azerbaijan. Meanwhile, whilst sustainable land management practices have helped improve carbon sequestration in cropland, overgrazing and poor land management practices have led to setbacks in grasslands, turning them from a source of carbon absorption into a significant source of carbon emissions.

On the other hand, efforts to improve land management in croplands have significantly enhanced their carbon sequestration capacity, making a positive contribution to the LULUCF sector. However, the transformation of grasslands from a carbon sink into a source of emissions highlights the challenges in sustainably managing natural resources.

	1990	2020	2021	2022	1990-2022 difference, %
Energy	80,157.76	52,462.44	56,980.58	60,226.75	-24.86
IPPU	1,160.01	2,442.73	2,692.97	2,865.16	147
Agriculture	4,523	7,191.22	6,899.52	6,717.16	48.5
LULUCF[2]	-3,999.89	-5,478.9	-5,306.46	-5,432.19	35.8
Waste	2,759.53	4,909.23	5,178.94	4,895.66	77.4
Net emissions	**84,600.35**	**61,474.04**	**66,364.8**	**69,498.88**	-17.85
Total emissions	**88,600.25**	**67,005.62**	**71,752.01**	**74,704.73**	-15.7

Table 10. GHG emissions and removals by sectors, kt CO_2 eq.

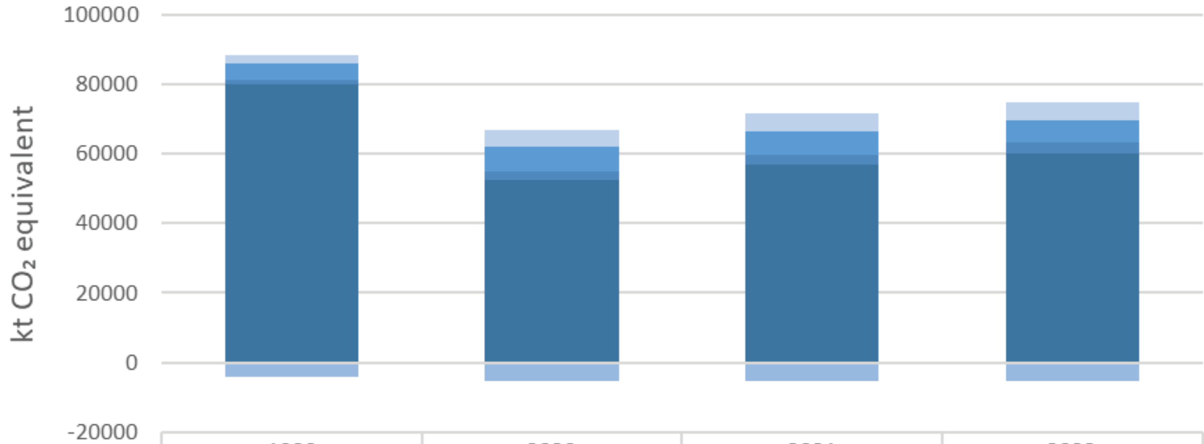
The contribution of the Republic of Azerbaijan to global warming has historically been very minimal. In 2022, the country's total GHG emissions amounted to 74,704.73 kt CO_2 equivalent, and with removals taken into account, net emissions were estimated at 69,498.88 kt CO_2 equivalent. This represents approximately 0.1% of the total emissions calculated worldwide for 2022.

Gas/ Year	1990	2020	2021	2022	1990-2022 difference, %
CO_2	57,088.29	41,926.71	44,346.33	46,695.8	-18.2
CH_4	30,402.4	23,310	25,906.44	26,610.92	-12.5
N_2O	1,110.35	1,767.55	1,497.25	1,399.2	26

Table 11. GHG emissions by gases, excluding LULUCF, kt CO_2 eq.

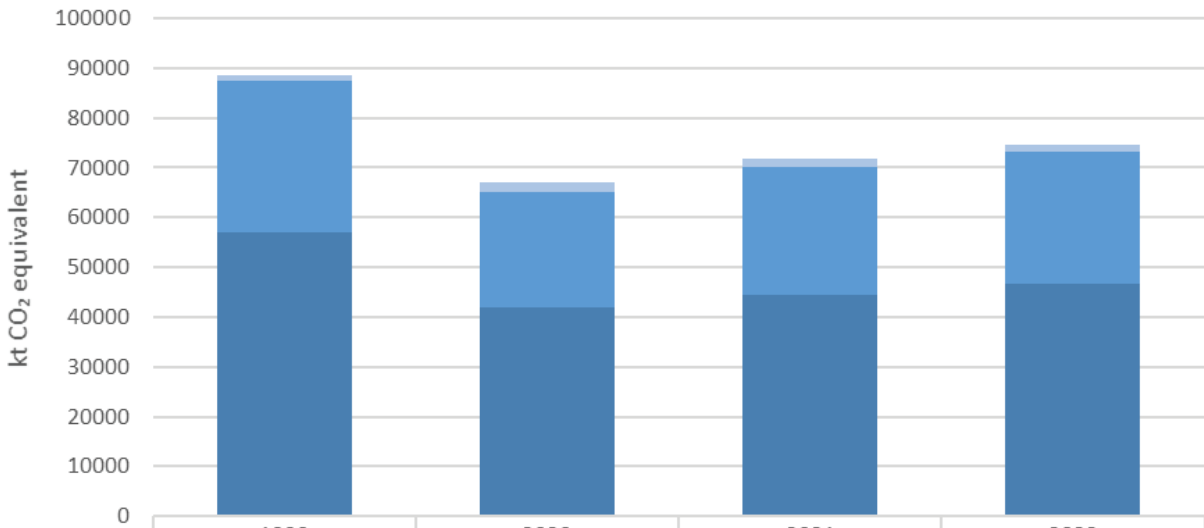
As seen in Table 11, carbon dioxide emissions continue to play a significant role in total GHG emissions. Although carbon dioxide emissions decreased by 18.2% in 2022 compared to 1990, it remains the primary emission source. In 2022, methane emissions decreased by 12.5%, and nitrous oxide (N_2O) emissions rose by 26% compared to 1990.

[2] As data for the 1990 base year is unavailable, removals for the harvested wood products (HWP) category were not calculated.



	1990	2020	2021	2022
Waste	2759.53	4909.23	5178.94	4895.66
LULUCF	-3999.89	-5478.9	-5306.46	-5432.19
Agriculture	4523	7191.22	6899.52	6717.16
IPPU	1160	2443	2693	2865
Energy	80158	52462.44	56980.58	60226.75

Figure 3. Total emissions by sectors, including LULUCF



	1990	2020	2021	2022
Total-N2O	1110.35	1767.55	1497.25	1399.2
Total-CH4	30402.4	23310	25906.44	26610.92
Total-CO2	57088.29	41926.71	44346.33	46695.8

Figure 4. Total emissions by gases, excluding LULUCF

Excluding LULUCF

- *1990: 88,600.25 kt CO_2 equivalent*
- *2022: 74,704.73 kt CO_2 equivalent*
- *Change: Decrease of 15.7%*

Including LULUCF

- *1990: 84,600.35 kt CO_2 equivalent*
- *2022: 69,498.88 kt CO_2 equivalent*
- *Change: Decrease of 17.85%*

Trend: The collapse of the Soviet Union in the early 1990s led to a sharp decline in Azerbaijan's industrial and energy sectors, which naturally resulted in a significant reduction in emissions. Although Azerbaijan has made progress in certain areas (such as reducing energy intensity and improving the management of arable lands), challenges remain in some sectors. However, as Azerbaijan's economy experienced a resurgence in the 2000s, driven by oil and gas exports and increased demand for energy products due to population growth, GHG emissions began to rise again, particularly in sectors such as transportation and waste. The rapid development of cities, especially Baku, in recent years (2020-2022) has also contributed to the increase in emissions from transportation, waste, and energy consumption.

As part of the current report, the inventory for the base year of 1990 has been recalculated. New inventory calculations were carried out for the years 2020-2022. The results of the inventory by sectors are presented in Figure 3. Trend analysis of the country's total GHG emissions during the reporting period shows that in 2022, including LULUCF, emissions amounted to 69,498.88 kt CO_2e, which represents a 17.85% decrease compared to the 84600,35 kt CO_2e observed in the base year of 1990.

Excluding LULUCF, emissions in 2022 amounted to 79544,26 kt CO_2e, which represents a 15.7% decrease compared to the 74,704.73 kt CO_2e observed in the base year of 1990. As shown in Figure 3, GHG emissions in the Energy sector, which holds the largest share of emissions, decreased by 24.86% in CO_2 equivalent compared to the 1990 base year.

The increase in livestock in Azerbaijan during the post-Soviet period has led to a significant rise in emissions from enteric fermentation and manure management, indicating that some attention has shifted towards agriculture. Meanwhile, while sustainable land management practices have helped improve carbon sequestration in croplands, excessive grazing and poor land management practices have transformed grasslands from a source of carbon absorption into a significant source of carbon emissions. On the other hand, efforts to improve land management in croplands have significantly enhanced their carbon sequestration capacity, making a positive contribution to the LULUCF sector. Another reason for the increase in emissions from the sector has been the growing demand for food products due to population growth.

As can be observed, this decrease is primarily related to the reduction of GHG emissions from the energy sector during the reporting period. However, significant increases in emissions have been observed in the Agriculture, LULUCF, and waste sectors. While emissions from the energy sector have overall decreased, it remains the sector contributing the most to total emissions.

Emissions from the IPPU sector arise from the technological processes of enterprises, factories, and plants. As shown in Figure 3, emissions in the IPPU sector have increased since 1990, with emissions increasing by 147% in 2022. As indicated in Figure 3 the AFOLU sector holds the second position in terms of share in national emissions after the energy sector, where a constant increasing trend in emissions was observed until 2016. Starting from 2017, the rate of increase halted and began to gradually decline. As shown in the table, a 77% increase in the waste sector was observed in 2022 compared to the base year of 1990, which is primarily due to population growth in the country and, accordingly, the increase in emissions from waste.

Although the country has made progress in reducing GHG emissions, particularly in the energy sector, increasing attention to the reduction of rising emissions in other sectors will be of significant importance.
As seen in Figure 3, carbon dioxide emissions continue to play a significant role in total GHG emissions. Although carbon dioxide emissions decreased by 18.2% in 2022 compared to 1990, it remains the primary emission source. In 2022, methane emissions decreased by 12.5%, and nitrous oxide (N_2O) emissions rose by 26% compared to 1990.

The results of the overall analysis of trends show that, based on the GHG inventory conducted for 1990-2022, Azerbaijan achieved a 17.85% reduction in emissions in 2022 compared to the base year (1990), considering absorptions. It should be noted that unless otherwise stated, all greenhouse gas emissions expressed in carbon dioxide equivalent were calculated using the global warming potentials (GWP) provided in the IPCC's 5th Assessment Report.

2.1.1. ENERGY SECTOR

2.1.1.1. HISTORICAL TREND IN ENERGY SECTOR

The energy sector encompasses all areas of human activity.

The central executive authority responsible for implementing state policy and regulation in the fuel-energy complex is the Ministry of Energy of the Republic of Azerbaijan. "Azerenerji" JSC is responsible for electricity production, while the State Oil Company of the Republic of Azerbaijan (SOCAR) oversees the oil and gas sector. The energy sector has the largest share of GHG emissions in Azerbaijan. So, according to the inventory results of 2022, its GHG emissions make up approximately 81% of the country's total emissions.

According to the IPCC (2006) methodology, the energy sector encompasses three key categories:

1. Fuel combustion (1.A.);
2. Fugitive emissions from fuel (1.B.);
3. Transportation and storage of carbon dioxide (1.C.).

Currently, in Azerbaijan, activities exist for two of these categories: “Fuel combustion” and “Fugitive emissions from fuels.” Although no activities are being conducted in the category of carbon dioxide transport and storage, there are favourable conditions for carbon capture and storage.

As seen in Figure 5 of the next section below, GHG emissions from the energy sector in 1990 were 80,158 kt CO_2 equivalent. In the most recent inventory year, 2022, this figure decreased by 24.86%, reaching 60,227 kt CO_2 equivalent.

The trend analysis results show that the reduction in GHG emissions from the Energy sector in the 1990s was mainly due to the significant decline in energy production in Azerbaijan following the collapse of the Soviet Union in 1991. The subsequent recovery of the economy, together with reforms in the energy sector, particularly improvements in energy efficiency in energy production, contributed to this reduction.

The trend analysis results show that the reduction in GHG emissions from the Energy sector in the 1990s was mainly due to the significant decline in energy production in Azerbaijan following the collapse of the Soviet Union in 1991. The subsequent recovery of the economy, together with reforms in the energy sector, particularly improvements in energy efficiency in energy production, contributed to this reduction.

1.A Fuel combustion category. This category of the energy sector includes the following subcategories:

1.A.1 Energy industry;

1.A.2 Industry and construction;

1.A.3 Transport;

Indicators	1990	2020	2021	2022	1990-2022 difference, %
1.A – Fuel combustion	55,037.05	35,460.30	37,693.59	40,181.24	-27
1.A.1 – Energy industry	23,017.51	15,898.75	16,954.42	16,683.68	-27.52
1.A.2 – Industry and construction	15,391.41	2,410.53	2,315.67	2,896.64	-81.18
1.A.3 – Transport	6,091.53	6,935.55	7,779.35	9,243.67	51.78
1.A.4 – Other sectors	10,536.60	10,215.46	10,644.16	11,357.25	7.8

Table 12. GHG emissions from fuel combustion, kt CO_2 eq.

This category takes into account the fuel use in thermal power plants associated with electricity production. The data from the open sources of the State Statistics Committee (SSC) has been used.

1.A.1 Energy industry. The energy industry includes oil and gas production, processing, distribution, electricity and heating. Oil production in Azerbaijan dates back to 1846, and electricity production to the end of the XIX century.

The energy industry includes the production of electric and thermal energy, oil refining, as well as solid fuel and other areas. The decrease in GHG emissions in the energy industry subcategory is related to the transition to modern technologies in the energy sector, improved energy efficiency, and most importantly, the shift from fuel oil to natural gas.

1.A.1.a.i Electricity generation

The first stage in the development of electric power engineering

The development of electric power engineering in Azerbaijan dates back to the 19th century. In 1897, for the first time, a 550 kW power plant was built in the oil region of Baku by the Nobel brothers. In 1901, Bibiheybat power plant, with a capacity of 2000 horsepower was commissioned and in 1902, in the Black City (now known as the White City), another 2000 hp power station was put into operation. In 1913, Baku produced 109,800 kWh of electricity, of which 95% was used by the oil industry and only 5% for the country's lighting.

The total capacity of two large power plants of the "Electric Power" Joint Stock Company, operating on the eve of the First World War was 45.7 MW. The capacity of the largest of these stations - the one in Black City - was 34.4 MW. In 1920, few power plants were nationalised. The nationalised energy enterprises included two thermal power plants in the Black City and the Bayil area and a distribution network with an output of 0.4-2.0kW. The commissioning of three turbo aggregates, 20 MW each, in Bayil and in the Black City, the reconstruction of existing power plants and the switching of power plants to gas-fired were intended for the complete electrification of oil extraction and refining in Baku.

In response to the development of the silk-weaving industry in Shaki, there was designed Shaki Hydroelectric Power Station, with a capacity of 1660 kW. In connection with the construction of a canning plant in Guba, a hydroelectric power station with the capacity of 1152 kW was built. Zurnabad and Gusar hydroelectric power stations were also built and put into operation. By 1935, the total capacity of power plants reached 176.6 MW, with a production of electricity up to 937,000 kWh. In the same year, the country's main energy department - currently "Azerenergy" - was established, with all energy enterprises operating in the country subordinated to it.

The drilling and exploitation of deep oil wells in the 1940s necessitated an increase in the power of the energy system and the commissioning of new power facilities. During these years, the State District Power Station named after Krasin (SDPS named after Krasin) in Bayil settlement and the Red Star Thermal Power Station (now known as Baku TPP No. 1 named after A. Bayramzada(eh)) were commissioned. By 1940, the capacity of all existing power plants in the country reached 250 MW, with electricity production rising to 1.7 billion kWh. And in 1941, Sumgayit Thermal Power Plant No. 1 was put into operation.

Transition to a system of purposeful use of water and energy resources in the republic begins with the construction of the Mingachevir Reservoir (water junction). In 1954, Mingachevir Hydroelectric Power Station (HPS) was commissioned. Three years later, Varvara HPS, included in this water reservoir's complex, started to operate. Located 14 km downstream and with a capacity of 16.5 MW, the station serves as a water consumption regulator on the water from the Mingachevir Hydroelectric Power Station. In April 2017, Varvara HPS was put back into operation after reconstruction.

The first phase of “Shimal” SDPS, with an installed capacity of 168.8 MW, was commissioned in 1954. In 1960, this power station saw the commissioning of the first open-type power unit for the first time in the USSR, with a capacity of 150 MW. In 1962, the 11th turbine section of Sumgayit Thermal Power Station No. 1 was put into operation, increasing its total capacity to 450 MW.

In 1959, the construction of Ali-Bayramli State District Power Station (now Shirvan Thermal Power Plant), of which major equipment was installed in the open air for the first time in Europe, began in Ali-Bayramli city. Commissioning of the first phase of the four-unit power station, with a capacity of 150 MW each, not only met Azerbaijan's demand for electricity but also enabled the transmission of 1.7 million kWh of electricity to the neighbouring South Caucasus republics in 1964-1965.

Around the same time, in response to the growing demand for heating and electricity in Sumgayit, construction of Sumgayit Thermal Energy Center No. 2 (Sumgait TEC No. 2) started. The first turbine section was put into operation in 1966 and the other in 1972, making the total installed capacity of the station 220 MW.

The second stage in the development of electric power engineering (1969-1991)

The foundation of the independent electricity system of Azerbaijan was laid in the 70s of the last century.
In 1970, in the territory of the Nakhchivan Autonomous Republic, the Araz Water Junction and two hydroelectric power stations, each with a capacity of 22 MW, were built and put into operation on the Araz River.
In 1971-1972, the Sumgayit Thermal Power Station No. 2 was expanded and two new turbine units with a total capacity of 110 MW were put into operation and the total capacity of the station was increased to 220 MW. In 1973-1974, the installation of two turbine units, each with a capacity of 50 MW, was completed at Thermal Power Station No. 1.

In 1976-1977, the Tartar Water Junction and Tartar Hydroelectric Power Station (Tartar HPS), with an installed capacity of 50 MW, were put into operation on the Tartar River.

By the end of the 1970s, the total installed capacity of electric power stations in the republic reached 2,882.4 MW, producing 15.4 billion kWh of electricity annually across the country.

However, Azerbaijan had to import $2.9-3.5 billion kWh of electricity annually from neighboring countries to meet its growing electricity demand. As a result, it was decided to build Shamkir Hydroelectric Power Station (Shamkir HPS) and Azerbaijan State District Power Station (Azerbaijan SDPS). Thus, Shamkir HPS, with an installed capacity of 380 MW, was constructed between 1981 and 1982. The construction of Azerbaijan SDPS began in 1974. The first power unit with a capacity of 300 MW was put into operation in 1981 and the last, the eighth one with the same capacity, in 1989. Currently, the installed capacity of the station is 2,400 MW. After the commissioning of Shamkir HPS and Azerbaijan SDPS, the total installed capacity of the energy system reached 5,000 MW.

In addition to the commissioning of power stations, power transmission line systems and substations were also constructed.

In 1976-1977, Sarsang Reservoir and a 50 MW hydropower station with the same name (Sarsang HPS) were commissioned on the Tartar River to improve agriculture, to create a reservoir for the irrigation of fertile soils, to improve the electric power supply of the region and to reduce losses in energy transmission in Karabakh region. In the 1980s, electric lines were laid in all residential areas of Azerbaijan. During this period, along with the construction of power plants, the power grid was also systematically developed and a stable power system was created in the country. In 1968-1971, Ali-Bayramli SDPS-Aghdam-Ganja-Aghstafa, with a capacity of 330 kV, and Ali-Bayramli SDPS-Yashma-Derbent high voltage power lines, as well as “Yashma”, “Ganja” and “Aghstafa” junction substations with respective capacities of 330, 110 and 20 kV were put into operation.

Construction of the Azerbaijan TPS opened a new stage in the development of the energy network of the country. The first and second Absheron Electric Transmission Line (ETL), Mukhranis-Vali ETL and the fourth and fifth Mingachevir ETLs, with a capacity of 500 kV, were built. In the 1980s, junction substations such as “Absheron”, with a capacity of 500, 330 and 220 kV, “Imishli” with 330, 110 and 10 kV capacities and “Hovsan”, “Nizami”, “Mushfig”, “Sangachal”, “Masalli”, “Aghsu” and “Babak”, all with capacities of 220, 110 and 10 kV were commissioned, as well as the third Ali-Bayramli Electric Transmission Lines, with a capacity of 330 kV, was put into operation.

Development of electric power engineering after gaining independence (the third stage after 1991)

The collapse of the Soviet Union affected power engineering system as well. However, strategic policies aimed at establishing mutually advantageous relations with the leading countries of the world has created opportunities for attracting foreign investments into the power engineering system, which have been and are being purposefully utilized to enhance the efficiency of the existing potential of Azerbaijan`s power system, to reconstruct the electric power engineering economy and develop new power sources.

A new stage of development in the energy system was started with the completion of the construction of Yenikend Water Reservoir and Hydroelectric Power Station, which was the continuation of the unfinished Shamkir Hydroelectric Power Station, begun in 1984. The station was put into commission in December 2000 thanks to a loan amounting $53.2 million allocated by the European Bank for Reconstruction and Development and hard work of the republic's power engineers and builders.

Thanks to a loan from Deutsche Landesbank of Germany, two modern steam-gas turbines, each with a capacity of 53 MW, were installed and commissioned at Baku Thermal Power Station No. 1.

Azerbaijan's national energy system has been closely linked with the energy systems of the Russian Federation, the Islamic Republic of Iran and Georgia, as well as Türkiye through Nakhchivan Autonomous Republic. This is also one of the major factors contributing to the further development of mutual relations between the countries and maintaining peace, stability and security in the region.

Decrees of the President of the Republic of Azerbaijan, Ilham Aliyev, on the “State Programme for the Development of the Fuel and Energy Complex of the Republic of Azerbaijan (2005-2015)” and “Additional Measures to Improve the Electricity Supply in the Republic of Azerbaijan” marked the beginning of a new era in the modern development stage of power engineering.

For the first time in the CIS, commissioning modern gas-turbine type Shimal-1 with a capacity of 400 MW along with the construction of eight modular power stations with a total capacity of 872.5 MW (including Nakhchivan AR) in various regions of the country, has initiated a new rise in the energy sector, thus, the installation of systemically important power transmission lines and substations has eliminated the disproportion in power supply for industrial centers. The modern Sumgayit steam-gas type power plant was put into commission in 2009, with a capacity of 525 MW, followed by the same type “Janub” PS in 2013, with a capacity of 780 MW. With a capacity of 400 MW, the Shimal-2 Power Station, which is located in Shuvalan settlement and play a significant role in improving the stability and quality of electricity supply in the Absheron peninsula, was put into operation on 5 September 2019.

Besides, on 11 February 2022, the Gobu Energy Hub - the 330/220/110 kV Gobu substation, with a load capacity of 1000 megawatts and the 385 MW Gobu Power Station were commissioned.

After the liberation of our lands in Karabakh and Eastern Zangezur in 2020, large-scale restoration and construction works for the revival of these territories have been started and are being successfully continued. Stations and substations were reconstructed and put into operation in the liberated territories. Thus, on February 14, 2021, in the Gulabird village of Lachin region, the small hydroelectric power plant "Gulabird", with a capacity of 8 MW, which had been completely rendered unusable during the occupation, was put into operation after restoration. Sugovushan Hydroelectric Power Stations (SHPS-1 with a capacity of 4.8 MW and SHPS-2 with a capacity of 3.0 MW) series with a total capacity of 7.8 MW was restored and put into operation in the Sugovushan settlement of Tartar on 3 October 2021. "Kalbajar -1" Small Hydroelectrik Power Station on the Lev River, with a capacity of 4.4 MW, was put into operation on 26 June 2022 after reconstruction. On 27 May 2023, digital junction substations 110/35/10 kV Lachin City with a capacity of 2x40 MVA and 110/35/10 kV Gorchu with a capacity of 2x25 MVA were put into operation. On 27 May 2023, "Meydan" with a capacity of 3.4 MW, "Gamishli" with a capacity of 6.3 MW, and on 25 August 2023, "Soyuqbulag" with a capacity of 5.3 MW, "Chirag-1" with a capacity of 8.3 MW, "Chirag-2" with a capacity of 3.6 MW were commissioned after reconstruction. Reconstruction of 3 small hydroelectric power stations with a total capacity of 28.5 MW ("Aghbulag" with a capacity of 14.25 MW, "Alkhasli" with a capacity of 6 MW, "Mishni" with a capacity of 8.25 MW) have been completed in Lachin region. On 25 August 2023, 6 MW "Alkhasli" and 8.25 MW "Mishni" small hydroelectric power stations were commissioned. The construction of 4 small hydroelectric power stations with a total capacity of 42 MW ("Shayifli", "Sarigishlag", "Zangilan" and "Jahangirbeyli" with a capacity of 10.5 MW each) has been completed in Zangilan. On 28 September 2023, Jahangirbeyli SHPS was put into operation.

On 4 May, 2023, within the establishment of the first stage of the Azerbaijan-Türkiye-Europe Energy Corridor project - 330/110/10 kV "Jabrayil" energy hub, "Jabrayil" substation with a capacity of 2x250 MVA was built and put into operation. As of 24 September 2023, there was built a new 0.3 km long line from 110/35/10 kV "Shusha" substation, with a capacity of 2x25 MVA, which was connected to the existing 110 kV "Gorus-Khankendi" electric power transmission line and commenced the transmission of power supply in the direction of the city of Khankendi. In addition, 110 kV substations of various capacities were built and put into operation in Fuzuli, Kalbajar, Jabrayil, Zangilan, Gubadli, Aghdam regions and Shusha.

Azerbaijan, which guarantees the safety of its electric power engineering, has been exporting electricity to neighboring countries since 2007. Thus, the growing role of Azerbaijan in the world energy market is increasing its geopolitical influence. In November 2011, Azerbaijan signed the "Memorandum of Understanding on Energy Cooperation between Azerbaijan and the European Union" and began to adapt this field to international standards. Measures are being taken to adapt the legislative base to the Directive and Regulation of the European Parliament related to the reforms to be carried out in the field of energy. In this regard, the laws of the Republic of Azerbaijan "On the efficient use of energy resources and energy efficiency" and "On the use of renewable energy sources in the electricity production" were adopted, as well as the Law of the Republic of Azerbaijan "On Electric Power Engineering", containing modern challenges in the field of electric power, was improved and re-adopted.

The reforms implemented in the field of electric power engineering in European countries since 1990 have ensured the de-monopolization of electricity and the creation of competitive conditions in the energy market, as a result of which there have been conditions for reducing electricity prices and losses and increasing the level of service.

Recent years have been rich in successes in increasing the stability of our electric power system and its development in a new context. With the commissioning of new power plants, the total installed capacity of our country has reached 8320.8 MW.

At present, the electric power system includes 22 thermal power plants with a total capacity of 6633.0 MW, 46 hydroelectric power plants with a total capacity of 1301.8 MW, 5 wind power plants with a total capacity of 66.5 MW, 9 solar power plants with a total capacity of 281.8, a bioenergy power plant with a capacity of 37 MW, 3 hybrid power plants with a total capacity of 0.7 MW.

The capacity of power plants on renewable energy sources, including hydroelectric power plants, is 1687.8 MW, accounting for about 20.3% of the total installed capacity.
At the same time, Azerbaijan is successfully implementing and developing its energy policy in the international arena. Azerbaijan is already one of the active members of a number of international organizations, which also include the European Union countries, such as OSCE, Eastern Partnership, Black Sea Economic Cooperation (BSEC) and GUAM.

The Republic of Azerbaijan has relations with Russia, Georgia, Iran and Türkiye among the neighbouring countries in the field of electric power engineering, and imports and exports of electricity are carried out with those countries. The electricity transmission capacity to Russia is around 350 MW and to Iran around 550 MW.

The electricity transmission capacity of the 500 kV Samukh-Gardabani Overhead Power Transmission Line (OPTL), commissioned within the Azerbaijan-Georgia-Türkiye Energy Bridge project, is 650 MW.

There are 2 overhead power transmission lines between the energy systems of Azerbaijan and Georgia - 500 kV “Samukh-Gardabani” OPTL (electricity export from Georgia to Türkiye via transit) and 330 kV Aghstafa-Gardabani OPTL.

As part of the “Azerbaijan-Georgia-Turkey Energy Bridge Project”, Azerbaijan built the 500 kV Samukh-Gardabani OPTL, while Georgia completed the construction of the 500/400/220 kV “Akhaltsikhe” substation and the 400 kV OPTL connecting Georgia to Türkiye, which was put into operation at the end of 2013. Transmission of electricity through the 500 kV Samukh-Gardabani OPTL has commenced since February 2016.

According to the intergovernmental agreement “On cooperation in the field of power engineering” signed between the Republic of Azerbaijan and Georgia on 27.12.1997, the Agreement “On the parallel operation of the Georgian and Azerbaijani power systems” (05.08.1998) was concluded between the power systems of the Parties. This relationship between the power systems of Azerbaijan and Georgia is regulated on the basis of the Agreement on parallel operation concluded between the Parties by the decisions of the Joint Intergovernmental Commission on Economic Cooperation, Agreements on the purchase of electricity and on the transmission of electricity in case of emergency.

The energy systems of Azerbaijan and Russia have been connected through the two interstate OPTLs. These are 330 kV “Derbend” OPTL, which connects 330/110 kV “Khachmaz” (AR) and 330/110 kV “Derbend” (RF) substations and 110 kV “Yalama” OPTL connecting 110/35 kV “Yalama” (AR) and 110/35 kV “Bilici” (RF) substations. The energy system of Azerbaijan operates in a parallel mode with the Unified Energy System of Russia in a single synchronous zone. Mutual relations between the parties are carried out in accordance with the Intergovernmental Agreement on Cooperation in the Field of Electric Power Engineering between the Republic of Azerbaijan and the Russian Federation, dated 7 October 1995.

The relationship between the energy systems of the Republic of Azerbaijan and the Russian Federation are regulated on the basis of the Agreement on parallel operation concluded between the Parties by the decisions of the Joint Intergovernmental Commission on Economic Cooperation, agreements on the sale and purchase of electricity and on the transmission of electricity in case of emergency. Since December 2001, the import and export of electricity between the Parties has been of a purely commercial nature. The volume of electricity exported to the Russian Federation has been growing dynamically since 2007 and the energy system of Azerbaijan operates with a positive balance.

The energy exchange between the energy systems of the Republic of Azerbaijan and the Islamic Republic of Iran is carried out along five existing electric power transmission lines - the 330 kV "Mughan", 230 kV "Imishli" and 110 kV "Astara-Astara" power transmission lines, owned by "Azerenergy" OJSC and the 132 kV "Araz-Araz" and 132 kV "Julfa-Julfa" power transmission lines, owned by the State Energy Agency of Nakhchivan. The current exchange power of electricity is 600 MW.

According to the Contract "On exchange and transit of electricity" signed between "Azerenergy" OJSC (AR) and "Tavanir" (IRI) (24.01. 2001) by the commissioning of 230 kV "Parsabad" PTL starting from February 2001, the electricity transmitted from IRI to Nakhchivan AR is carried out only in the form of energy exchange.
There are three overhead power transmission lines (OPTLs) between the energy systems of Azerbaijan and Türkiye - the 154 kV "Igdir-Nakhchivan No. 1", the 154 kV "Igdir-Nakhchivan No. 2" and the 34.5 kV "Sadarak" OPTL).

The construction of the 140 MW (100+40) "Khudaferin" and "Giz Galasi" HPSs on the territory of Jabrayil region, located on the Araz River, are underway. Upon completion of the construction, it will be integrated into the energy system through the 330 kV network to be established.

The transformation of our country from an energy-importing country to an energy-exporting country is a clear result of the economic policy pursued in the energy industry.

In accordance with the targets set by the President of the Republic of Azerbaijan, measures are underway to increase the share of renewable energy in the installed capacity of electricity to 30% by 2030. On 29 December 2020, "Investment agreement", "Power Purchase Agreement" and "Transmission Connection Agreement" were signed regarding the construction of a wind power plant with an installed capacity of 240 MW between the Ministry of Energy, "Azerenergy" OJSC and "ACWA Power" company of the Kingdom of Saudi Arabia. And on 6 April 2021, "Investment agreement", "Power Purchase Agreement" and "Transmission Connection Agreement" were signed on the construction of 230 MW solar power station between the Ministry of Energy, "Azerenergy" OJSC and "Masdar" company of the United Arab Emirates, which was commissioned on 26 October 2023.

1.A.2 Industry and construction. This subcategory includes all enterprises and construction facilities. In connection with the collapse of the former state of Soviets, the activity in the field of enterprises and construction facilities has begun to weaken since the 1990s. This was due to the violation of economic relations between the countries of the Soviet Union, the absence of competitive production facilities in the country. Since the 2000s, with the revival of the oil and gas industry, the activities of this industry have also begun to revive. New companies and enterprises have begun to emerge. These industries are already equipped with modern equipment and competitively viable. Therefore, the amount of GHG from them into the atmosphere is small.

1.A.3 Transport. There are all types of transport in Azerbaijan. The transport sector, like other sectors, began to develop after the development of the oil and gas industry. After Azerbaijan liberated its lands, this area began to develop more rapidly. At present, 3 new airports have been built or is being completed in the Karabakh and East Zangazur economic regions. All three of them can contribute to the implementation of international flights. In addition, a new shipyard, various off-road vehicle plants and transport auxiliary enterprises are being built in the country.

Indicators	1990	2020	2021	2022	1990-2022 difference, %
1.A.3 - Transport	6,089.99	6,935.55	7,779.35	9,243.67	51.78
1.A.3.a.ii - Domestic Aviation	462.06	411.82	296.43	473.1	2.39
1.A.3.b - Road Transportation	5,367.78	6,384.58	7,286.74	8,545.22	59.19
1.A.3.c - Railways	124.54	6.98	6.59	39.08	-68.62
1.A.3.d.ii - Domestic Water-borne Navigation	100.76	124.16	183.53	179.69	78.33
1.A.3.e-Other Transportation	34.86	8.02	6.06	6.58	-81.12

Table 13. GHG emissions from transport, kt CO_2 eq.

1.A.4 Other sectors. The other sectors subcategory includes the following 3 directions:

1. Commercial / institutional;
2. Residential;
3. Agriculture, forestry and fishing.

Data on GHG emitted into the atmosphere from this subcategory is presented in the table below.

Indicators	1990	2020	2021	2022	1990-2022 difference %
1.A.4 - Other Sectors	10,508.23	10,215.46	10,644.16	11,357.25	8.08
1.A.4.a - Commercial/ Institutional	1,582.79	510.64	431.80	1,169.04	-26.14
1.A.4.b - Residential	5,642.80	8,360.51	8,850.87	8,867.85	57.15
1.A.4.c - Agriculture/Forestry/ Fishing/Fish Farms	3,282.64	1,344.31	1,361.48	1,320.35	-59.78
1.A.4.c.i - Stationary	2,947.23	1,285.37	1,310.01	1,304.47	-55.74
1.A.4.c.ii - Off-road Vehicles and Other Machinery	304.05	17.12	14.63	15.88	-94.78
1.A.4.c.iii - Fishing (mobile combustion)	31.36	41.82	36.84	NE	

Table 14. GHG emissions from other sectors subcategory, kt CO_2 eq.

Fugitive emissions from fuels

1.B.2 Oil and natural gas. This category arises mainly as a result of activities related to oil and natural gas. This includes exploration activities, extraction, processing, transportation, storage and distribution processes. As a result of all these processes, CO_2, N_2O and CH_4, which are the main GHG, are emitted into the atmosphere. This category is included in the list of key categories according to the level of emissions. CO_2 is emitted into the atmosphere as a result of the combustion process. And CO_2 that outbursts together with them during oil and gas production is called volatile emission.

There are three subcategories of the category:

1.B.2.a Oil;

1.B.2.b Natural gas;

1.B.2.c Ventilation and flaring.

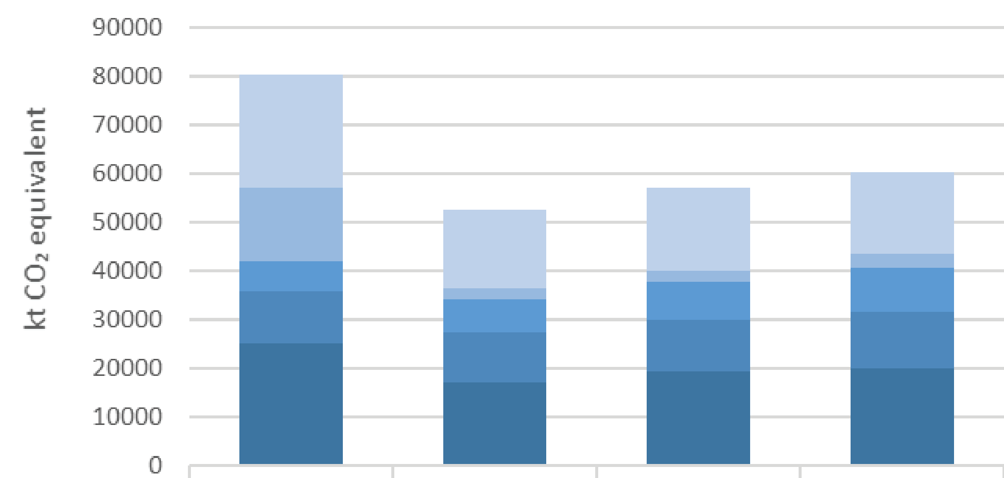
The amount of GHG emissions of the category is distributed over the time frame, unevenly, depending on the deposit. Therefore, the uncertainty of emissions of this category can reach up to 90%.

The emissions were calculated based on the Default emission factors in accordance with the IPCC (2006) methodology.

The calculations show that the amount of fugitive emissions from oil and gas activities in 2022 is about 20.2% less than in the reference year. CO_2 emitted into the atmosphere in the course oil production increased by up to 165%, while CH_4 in the course of gas production processes decreased by 38%. Due to the fact that the associated gas – methane, comes out together with the oil, and is burned by directing being directed to the flares CO_2 is obtained as a result of combustion. As a result, the decrease is due to the accumulation of the associated gas as much as possible.

Azerbaijan's Energy sector covers fuel combustion activities (1.A) and fugitive emissions (1.B). Since 1990, the country has seen a significant reduction in emissions, primarily due to the post-Soviet economic decline (see Figure 5).

2.1.1.2. CURRENT TREND IN ENERGY SECTOR



	1990	2020	2021	2022
1.A.1. Energy industries	23017.51	15898.75	16954.42	16683.68
1.A.2. Manufacturing industries and construction	15391.41	2410.53	2315.67	2896.64
1.A.3. Transport	6091.53	6935.55	7779.35	9243.67
1.A.5. Other	10536.6	10215.46	10644.16	11357.25
1.B. Fugitive emissions from fuels	25120.71	17002.15	19286.99	20045.51

Figure 5. Current Trend in Energy sector

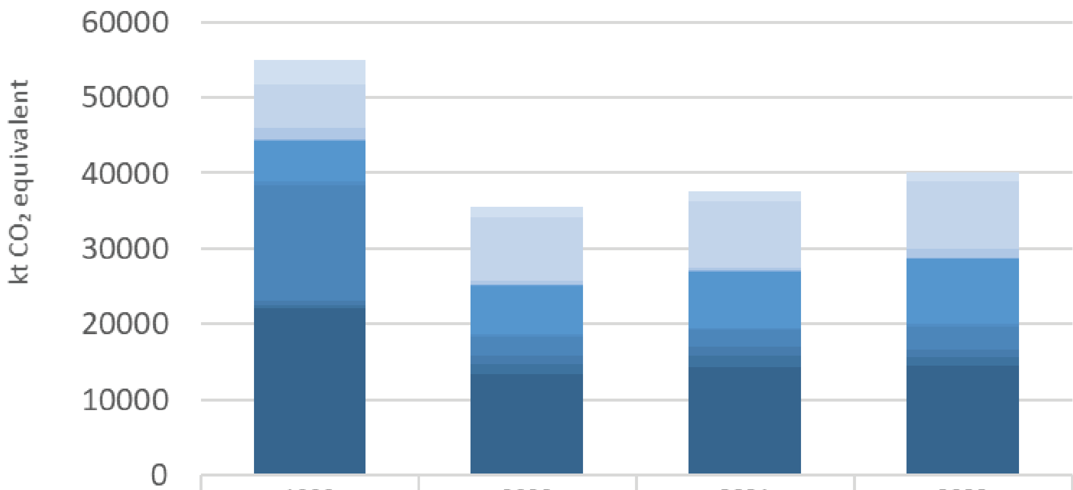
- **1990:** *80,157.76 kt CO_2 eq.*
- **2022:** *60,226.75 kt CO_2 eq.*
- **Change:** *Decrease of 24.86%.*

Trend: The reduction in emissions can primarily be attributed to the collapse of the Soviet Union in 1991, which led to a significant decline in energy production in Azerbaijan. The subsequent recovery of the economy, along with reforms in the energy sector, especially improvements in energy efficiency in energy production, played a key role. Investments in natural gas infrastructure also contributed, minimizing the share of fuel oil in the country's electricity production. During the reporting period, despite the increased demand for energy resources due to population growth, the widespread implementation of innovative technologies led to emission reductions in the sector..

The trend for 2020-2022 shows an increase in total emissions. However, the total emissions for 2022 are lower than those of the base year, comprising approximately 75.14%. A significant portion of total emissions comes from the fuel combustion category. In the latest inventory year, emissions from the fuel combustion category accounted for 73% of those in the base year.

2.1.1.2.1. FUEL COMBUSTION ACTIVITIES (1.A)

In fuel combustion activities (1.A), emissions from energy industries, particularly from public electricity and heat production, have decreased as the economy moved away from the highly inefficient Soviet-era infrastructure. However, since the early 2000s, economic growth and high energy demand have led to a continuous increase in emissions, particularly in the transport and residential sectors.



	1990	2020	2021	2022
1.A.4.c. Agriculture/forestry/fishing	3311	1344	1361	1320
1.A.4.b. Residential	5643	8361	8851	8868
1.A.4.a. Commercial/institutional	1583	511	432	1169
1.A.3.e. Other transportation	36	8	6	7
1.A.3.d. Domestic navigation	101	124	184	180
1.A.3.c. Railways	125	7	7	39
1.A.3.b. Road transportation	5368	6385	7287	8545
1.A.3.a. Domestic aviation	462	412	296	473
1.A.2. Manufacturing industries and construction	15391	2411	2316	2897
1.A.1.c. Manufacture of solid fuels and other energy industries	567	1232	1192	1112
1.A.1.b. Petroleum refining	384	1236	1425	1140
1.A.1.a. Public electricity and heat production	22066	13430	14338	14431

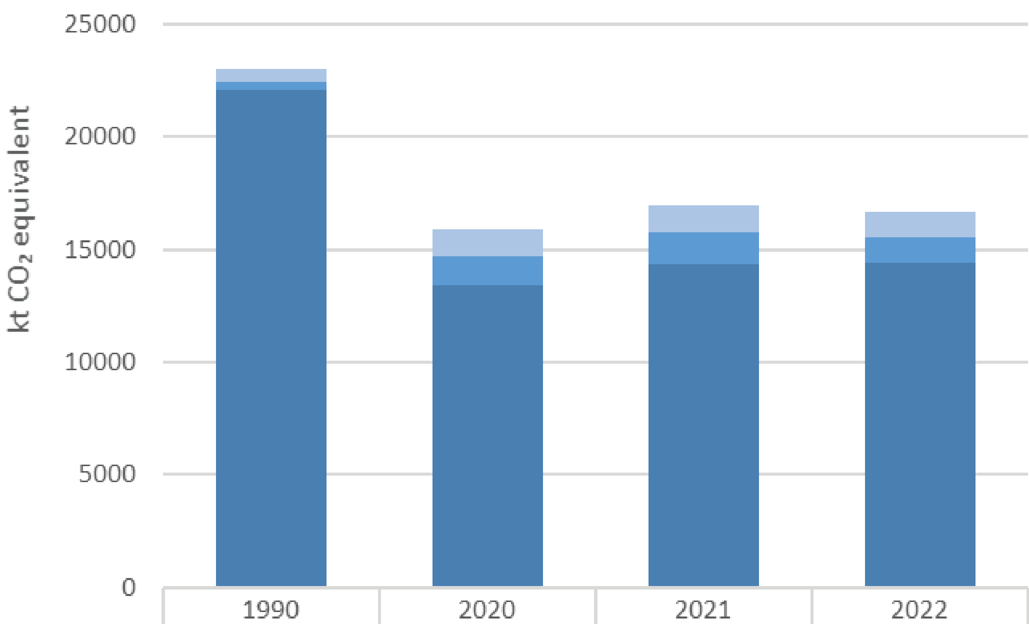
Figure 6. GHG emissions from fuel combustion

- **1990:** 55,037 kt CO_2 eq.
- **2022:** 40,181 kt CO_2 eq.
- **Change:** 27% reduction.

Trend: The reconstruction of industry and the modernization of industrial infrastructure during the post-Soviet period have contributed to the reduction of emissions from fuel combustion. Additionally, energy efficiency programs implemented by the Azerbaijani government, as well as efforts to reduce the carbon intensity of energy use in the industrial and commercial sectors, have led to a decrease in GHG emissions.

As seen in Figure 6, in the base year of 1990, emissions from fuel combustion activities amounted to 55,037 kt CO_2 equivalent, which decreased by 27% to 40,181 kt CO_2 equivalent in the most recent inventory year of 2022.

2.1.1.2.1.1. ENERGY INDUSTRIES (1.A.1)



	1990	2020	2021	2022
1.A.1.c.Manufacture of solid fuels and other energy industries	567.36	1232.34	1191.66	1112.1
1.A.1.b.Petroleum refining	383.95	1235.92	1424.99	1140.17
1.A.1.a.Public electricity and heat production	22066.2	13430.5	14337.77	14431.41

Figure 7. GHG emissions from Energy Industries

- **1990:** 23,018 kt CO_2 eq.
- **2022:** 16,684 kt CO_2 eq.
- **Change:** Down by 27%.

Trend: Azerbaijan has transitioned towards electricity generation primarily based on natural gas, reducing its reliance on more polluting fuels. This shift, combined with foreign investment in modernized energy infrastructure, has contributed to a gradual reduction in emissions.

The energy industry encompasses the production of electricity and heat, petroleum refining, as well as solid fuels and energy industries. In addition to CO_2, the sources in these sectors also emit CH_4 and N_2O gases into the atmosphere. The GHG emissions released into the atmosphere from the sectors of the energy industry are presented in Figure 7 above.As shown in Figure 7, emissions in the Energy Industry category (1.A.1) were 23,018 kt CO_2 equivalent in 1990, which decreased by 27% to 16,684 kt CO_2 equivalent in 2022.

The reduction of GHG emissions from the energy industry subcategory is linked to the transition to modern technologies in the energy sector, the enhancement of energy efficiency, and, most importantly, the shift from heavy fuel oil to natural gas.

2.1.1.2.1.1.1. PUBLIC ELECTRICITY AND HEAT PRODUCTION (1.A.1.A)

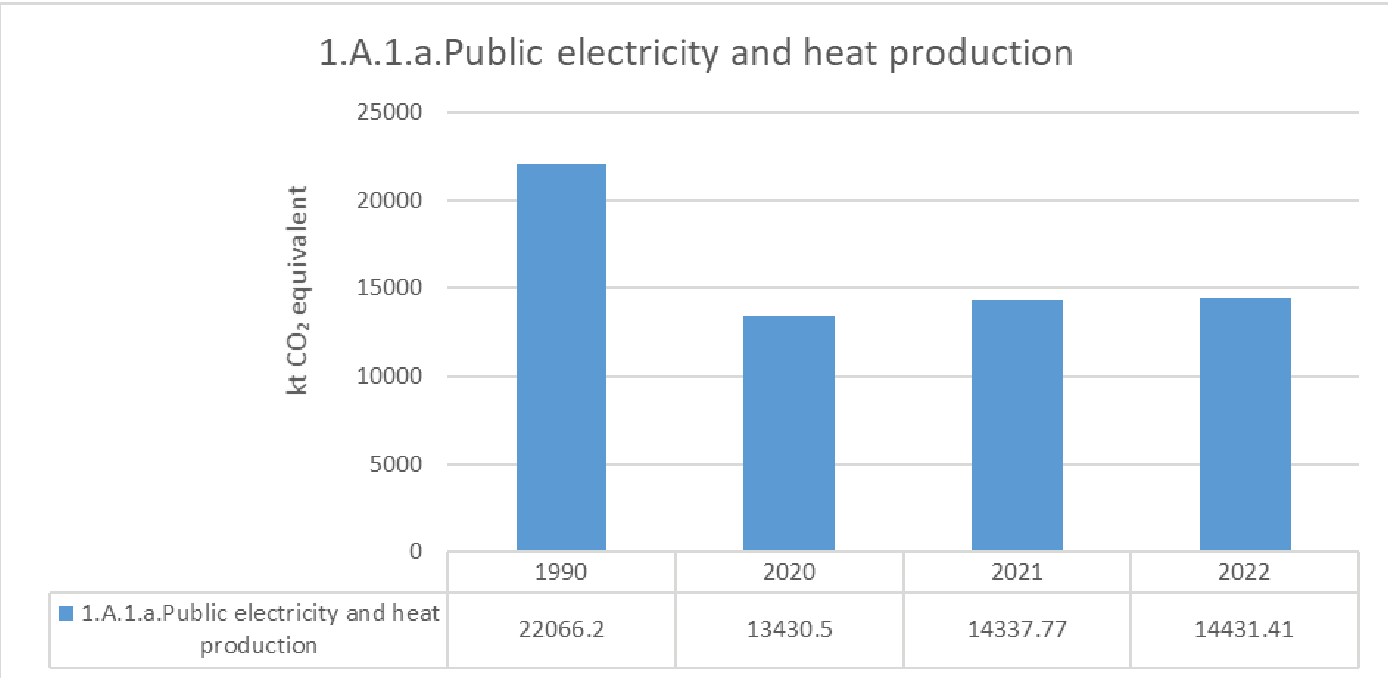


Figure 8. GHG emissions from the Public electricity and heat production

- **1990:** 22,066 kt CO_2 eq.
- **2022:** 14,431 kt CO_2 eq.
- **Change:** Decrease of 35%

Trend: Investments in clean technologies and the transition to natural gas for public electricity generation have played a significant role in the reduction of emissions.

A similar trend has been observed in the Public Electricity and Heat Production (1.A.1.a) category, where GHG emissions were 22,066 kt CO_2 equivalent in the 1990s, decreasing by 35% to 14,431 kt CO_2 equivalent in 2022. In this context, investments in cleaner technologies and natural gas for public electricity production have played a significant role.

2.1.1.2.1.2. MANUFACTURING INDUSTRIES AND CONSTRUCTION (1.A.2)

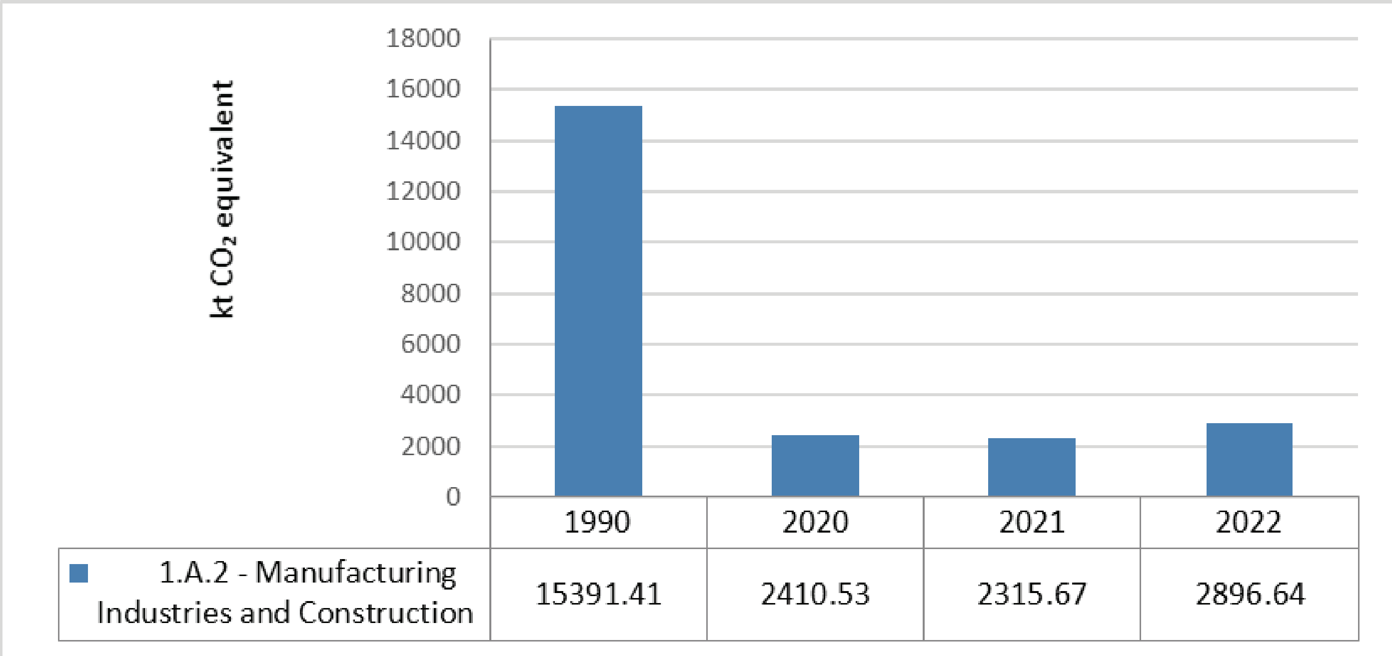


Figure 9. GHG emissions from the manufacturing industries and construction

- **1990:** 15,391 kt CO_2 eq.
- **2022:** 2,897 kt CO_2 eq.
- **Change:** Drop of 81%.

Trend: The collapse of energy-intensive industries, particularly cement and steel production, during the Soviet era in the 1990s is reflected here. Many of these industries have not fully recovered, and the transition to a more service-oriented economy has further reduced energy demand in this sector.

This subcategory includes all manufacturing and construction sites. Following the collapse of the Soviet Union, activities in the manufacturing and construction sectors began to weaken starting in the 1990s. This was due to the disruption of economic ties among the countries that were part of the Soviet Union and the lack of competitive production facilities in the country. From the 2000s onwards, with the revival of the oil and gas industry, activities in this industrial sector also began to recover. New companies and enterprises started to emerge. These industries are now equipped with modern equipment and are competitive. Consequently, the amount of GHG emissions that are released into the atmosphere is low. This situation is visually represented in the following figure.

In the Production and Construction (1.A.2) category, emissions were 15,391 kt CO_2 equivalent in 1990, decreasing significantly (by 81%) to 2,897 kt CO_2 equivalent in the last inventory year of 2022. Trend analyses indicate that this category reflects the decline of energy-intensive industries, particularly cement and steel production, during the Soviet era in the 1990s. Many of these industries have not fully recovered, and the transition to a more service-oriented economy has significantly limited energy demand in this sector.

2.1.1.2.1.3. TRANSPORT (1.A.3)

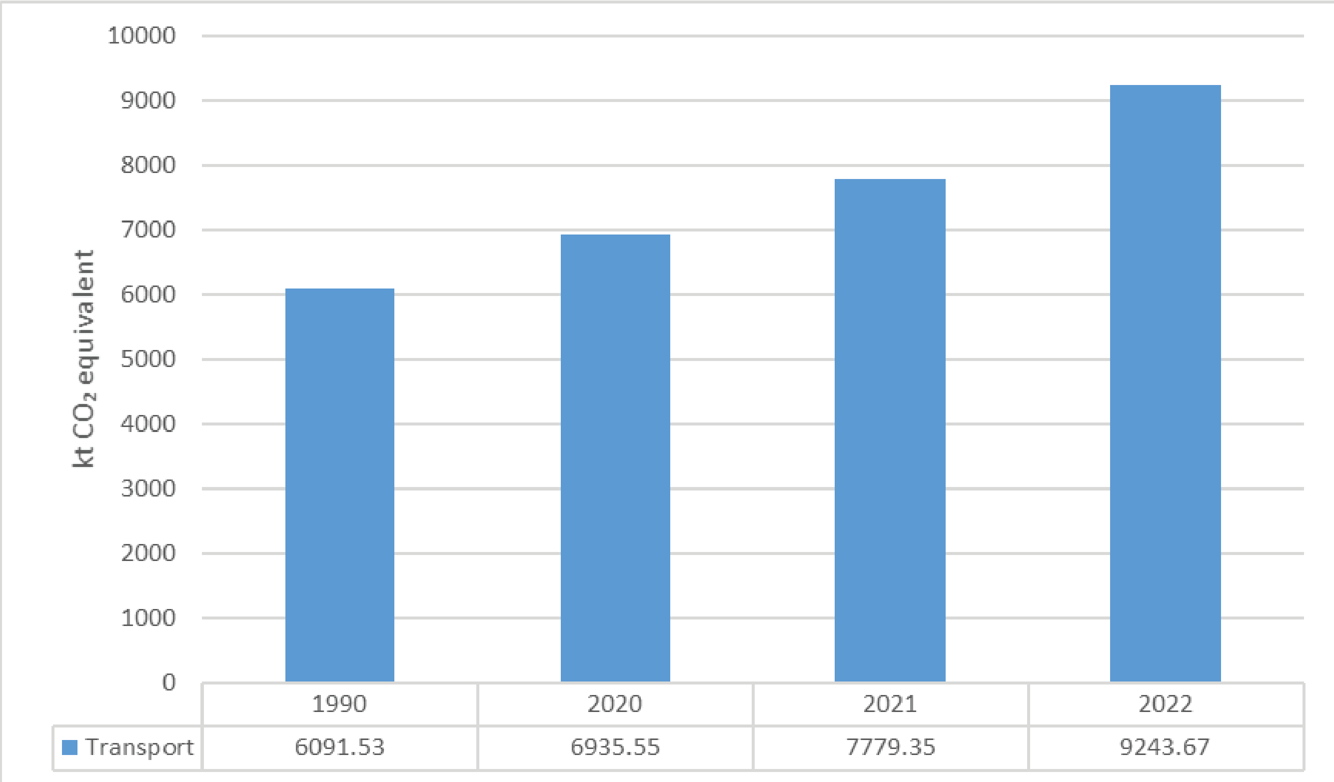


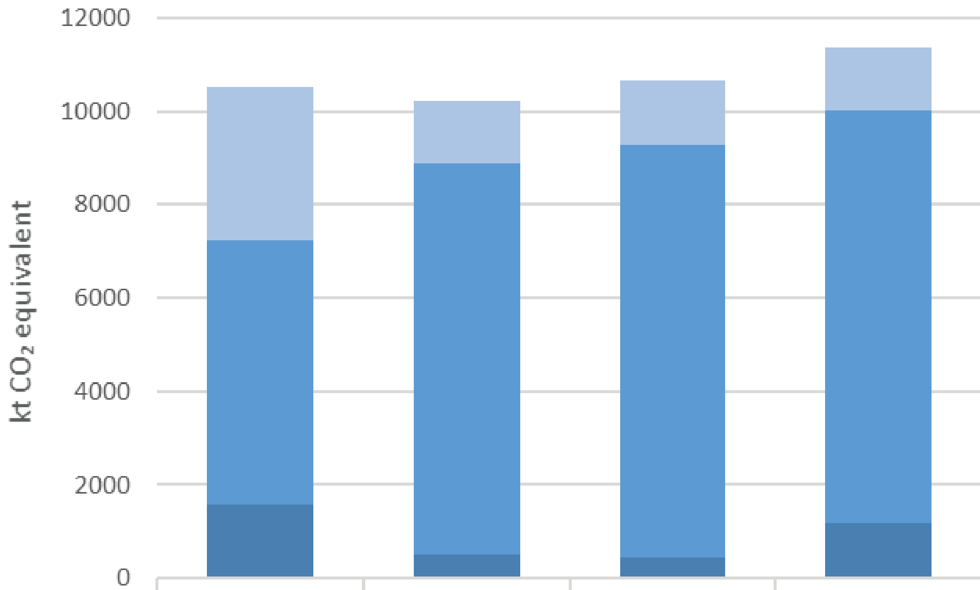
Figure 10. GHG emissions from the Transport category

- **1990:** 6,092 kt CO_2 eq.
- **2022:** 9,244 kt CO_2 eq.
- **Change:** Increase of 52%.

Trend: The increase in emissions in the transportation category is directly related to the growth in the country's population and income levels. The rise in income due to economic growth has led to a rapid increase in the use of cars and other means of transportation, consequently contributing to the rise in emissions.

The increase in emissions in the transportation category is directly related to the growth in the country's population and income levels. The rise in income due to economic growth has led to a rapid increase in the use of cars and other means of transportation, consequently contributing to the rise in emissions.

2.1.1.2.1.4. OTHER SECTORS (1.A.4)



	1990	2020	2021	2022
1.A.4.c.Agriculture/forestry/fishing	3311.01	1344.31	1361.48	1320.35
1.A.4.b. Residential	5642.8	8360.51	8850.87	8867.85
1.A.4.a. Commercial/Institutional	1582.79	510.64	431.8	1169.04

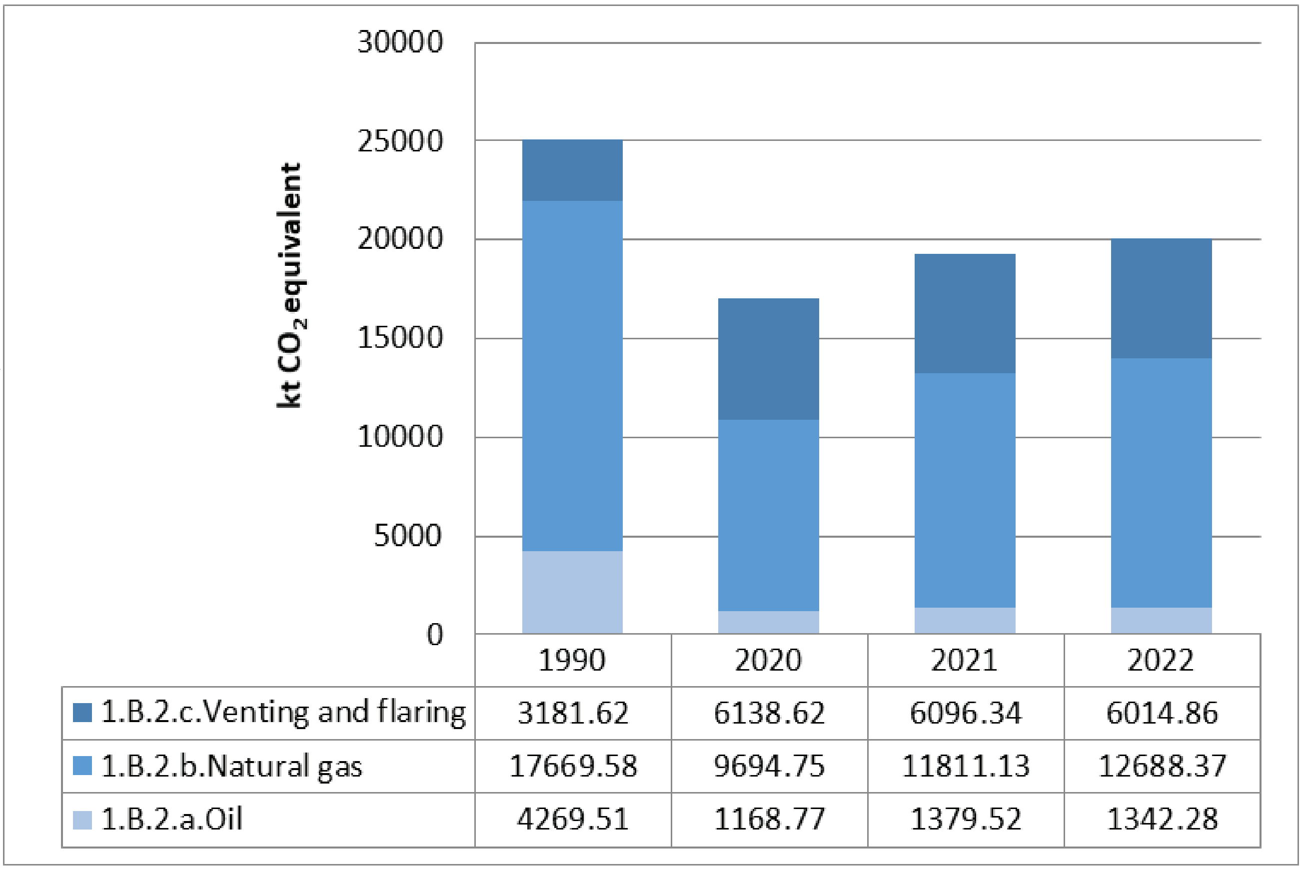
Figure 11. GHG emissions from the Other sectors category

- **1990:** 10,536.6 kt CO_2 eq.
- **2022:** 11,357.25 kt CO_2 eq.
- **Change:** Increase of 7.8%.

Trend: The rise in total emissions by 2022 is linked with emission trends in the commercial/institutional sector and residential subcategories. In Commercial/Institutional subcategory emissions fell significantly from 1,582.79 kt CO_2-eq in 1990 to 510.64 kt CO_2-eq in 2020 but surged to 1,169.04 kt CO_2-eq in 2022, likely due to economic recovery and increased activity in post-pandemic periods. In Residential subcategory emissions steadily increased from 5,642.8 kt CO_2-eq in 1990 to 8,867.85 kt CO_2-eq in 2022, driven by population growth, urbanization, and higher energy consumption in households. In Agriculture/Forestry/Fishing subcategory emissions dropped from 3,311.01 kt CO_2-eq in 1990 to 1,320.35 kt CO_2 eq. in 2022, reflecting improvements in energy efficiency and decreased use of fossil fuels in these activities.

2.1.1.2.2. FUGITIVE EMISSIONS FROM FUELS (1.B)

Fugitive emissions from oil and gas production (1.B) remain high. Although some reductions have been achieved in recent years due to improved management practices and technological advancements, the oil and gas sector continues to dominate emissions within the country.



	1990	2020	2021	2022
1.B.2.c.Venting and flaring	3181.62	6138.62	6096.34	6014.86
1.B.2.b.Natural gas	17669.58	9694.75	11811.13	12688.37
1.B.2.a.Oil	4269.51	1168.77	1379.52	1342.28

Figure 12. Fugitive emissions from Oil and Gas Production

- **1990:** 25,121 kt CO_2 eq.
- **2022:** 20,045.51 kt CO_2 eq.
- **Change:** Decrease of 20.2%.

Trend: Fugitive emissions from Azerbaijan's hydrocarbon production, particularly from oil and gas extraction, remain high. However, several improvements in leak detection and repair (LDAR) systems have helped to keep fugitive emissions relatively stable. On the other hand, despite ongoing oil and gas production, attracting foreign investments into Azerbaijan's energy infrastructure has partially maintained a downward trend in these emissions.

The oil and gas sector continues to dominate emissions within the country, and the amount of fugitive emissions from oil and gas production (1.B) remains high. In recent years, improvements in management practices and technological advancements have led to certain reductions in emissions within this category.

As seen in Figure 12, emissions from this category amounted to 25,121 kt CO_2 equivalent in 1990, while in 2022, this figure slightly decreased (by 20.2%) to 20,046 kt CO_2 equivalent. Trend analysis results indicate that due to Azerbaijan's continued dependence on hydrocarbon production, fugitive emissions primarily resulting from oil and gas extraction have remained high. However, despite ongoing oil and gas production, improvements in leak detection and repair (LDAR) systems, particularly due to foreign investments in Azerbaijan's energy infrastructure, have helped to keep these emissions relatively stable.

2.1.1.2.3. INTERNATIONAL BUNKERS

The International bunkers includes two types of transport:
1.A.3.a.i International Aviation;
1.A.3.d.i International water-borne navigation.

Unlike other subcategories, these two modes of transport operate by departing from one country and entering the territory of another. Since the transport mode operates within the territories of two countries, the emissions released from them create uncertainty regarding which country they should be attributed to, thus these emissions are not included in the national inventory.

According to the IPCC (2006) methodology, GHG emissions from international bunkers are calculated based on the amount of fuel loaded into tanks for international flights. In Azerbaijan's air and sea ports, diesel fuel is used in ships for international routes, while jet fuel of the kerosene type is used in airplanes.

In the current inventory report, data for the years 1990, 2020-2022 have been obtained to assess emissions from international bunkers. The results of the assessment are presented as follows.

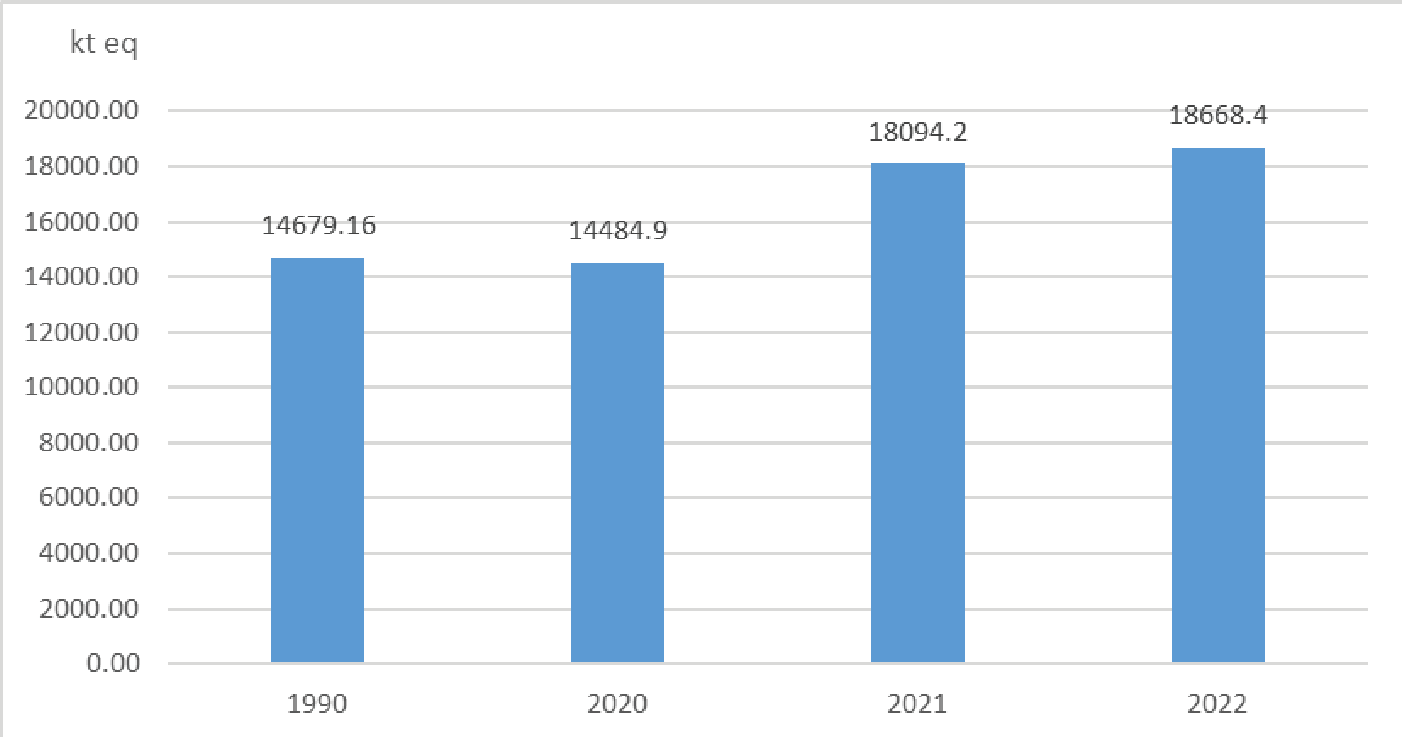


Figure 13. GHG emissions from International Bunkers

The assessment indicates that in 2022, the amount of GHG emissions released from international bunkers increased by 27.2% compared to the base year. Currently, three new international airports are being established in the region. Therefore, emissions from this sector are expected to continue rising. Consequently, it is essential to consider appropriate measures to regulate the increase in emissions from now on.

2.1.2. INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)

2.1.2.1. HISTORICAL TREND IN IPPU

"Industrial processes and product use" is the second sector of the IPCC methodology. The report considered 6 important categories of the sector. GHG emissions of the sector arise mainly from the technological processes of plants and factories, as well as from the use of some products. The largest resources of the sector are the categories of minerals production (cement and lime plants), chemical industry and metallurgy (steelmaking production). Today, industry is one of the main directions of economic policy in most countries. At present, most of the workforce in the world is concentrated in industries. Recently, the share of developing countries in the global industrial production has increased. Thus, the share of these countries in the global industrial production has increased by 2 times and reached 40% as compared to 2000.

As in the most countries of the world, industrialization is one of the priorities of economic policy in developing Azerbaijan. The first industrial oil production in the world in Baku in 1848 is considered the beginning of industrialization in Azerbaijan. The world's first refinery and oil tanker were put into operation in Azerbaijan. After that, enterprises of various profiles, which produced the equipment necessary for the oil industry, began to be established. During the industrialization period of 1945-1969, major industrial cities such as Mingachevir and Sumgayit were established in the country. Later Sumgayit became a city of chemists. Enterprises for ore refining in Dashkasan, for aluminum production in Ganja and Sumgayit, for cement production in Garadagh were put into operation.

In the 70-80s of the last century, large-scale funds were directed to the development of industry, a number of large industrial enterprises were created, industry diversification accelerated, and its structure improved. In the early 1980s, 100% of domestic air conditioners and deep-well working barrels, 70% of oil-field equipment, 1/3 of wine products, 10% of electric-welding equipment, 6% of refrigerators were produced in Azerbaijan in the former USSR. During this period, the largest steel-making plant in the South Caucasus, Baku domestic air conditioners, electronics production in Ganja, Sumgayit domestic compressors, plants specializing in the production of Integral microcircuits, and the largest Baku Deep Water Jacket Factory began to operate in Baku.

As a result of all the measures taken in 1969-1982, industrial production in Azerbaijan increased by 2.7 times, and this growth was achieved due to non-oil sectors. In the early 1980s, the share of petrochemical, chemical, metallurgical, mechanical engineering, instrument-making, electronics, furniture production, light and food industries in the structure of industry increased to 75%.

The political events that took place since 1985 and the crisis that began with the occupation of 20% of the country's territory by Armenia had a negative impact on all sectors of the economy. As a result, the volume and range of industrial production had sharply decreased till 1995.

Starting from 1997, the restoration of political and economic stability in the country breathed new life into the development of industrial production. Since 2003, rapid industrial growth has been observed in Azerbaijan, purposeful measures have been taken to resolve energy supply issues vital for industrial production. As a result of the works done, the industry has entered a new stage of development.

In order to ensure the sustainable development of the non-oil sector in Azerbaijan, attract foreign investments to the country, organize new competitive production and service areas and increase the employment of the population, “State program on the development of industry in the Republic of Azerbaijan for 2015-2020” was approved by the Order of the President of the Republic of Azerbaijan dated December 26, 2014. The main goal of the State Program was the following:

- Modernization of the industry and improvement of its structure;
- Increase of export potential of non-oil industry;
- Expansion of competitive industrial production that uses energy efficiently, generates high added value;
- Expansion of knowledge-intensive and innovative production;
- Training of qualified personnel for new production areas.

During the implementation of the State Program, the focus was on the strengthening the activities of existing industrial and technology parks, creating new industrial parks, launching special economic zones and increasing the industrial potential of the regions. So, during the implementation of the program, six industrial parks were created, hundreds of industrial enterprises of various purposes were built and commissioned and thousands of new jobs were created within the framework of other state programs.

The establishment of industrial districts in the country was determined by the Decree of the President of the Republic of Azerbaijan “On the establishment and organization of industrial districts” dated October 8, 2014. Industrial districts is of great importance in terms of reducing infrastructure costs in organizing the production process, strengthening cooperative relations, developing small and medium-sized businesses, and resolving other issues.

In addition, “Strategic roadmap for the development of heavy industry and mechanical engineering in the Republic of Azerbaijan” was approved by the Decree of the Head of State dated on December 6, 2016.

An analysis of the main geographical aspects of Azerbaijan's socio-economic development shows that potential GHG emissions are generated in Baku and its surrounding Absheron district. Cement plants of the country play an important role among enterprises that increase GHG emissions in the industrial sector.

In addition, the country has a large ethylene-polyethylene plant, enterprises for the production of various equipment for the energy sector, power engineering, chemical, metallurgical, new methanol and carbamide plants, construction, light and food industries enterprises.

In 2015, technical equipment plant of “Azertechnoline” LLC was established in "Sumgayit Chemical Industrial Park" established in Absheron district. After that, in 2018, “SOCAR Polymer” LLC's polypropylene production, Ferroalloy plants, tobacco products factory and Construction Chemicals plant started operating in the park. In 2019, carbamide and high-density polyethylene production plants of “SOCAR Polymer” LLC were commissioned. The increase in the number of industrial parks and districts, the reconstruction of the production of mineral substances and the metallurgical complex led to an increase in the amount of GHG emissions into the atmosphere in the sector. This is also reflected in the amount of emissions for 1990-2022 (Figure 14).

Emissions in all categories have increased compared to the 1990 reference year. There was an increase by about 4.5 times in the production of minerals, by 3.7 times in the chemical industry, by 9% in the metallurgical industry and by 4.9 times in the use of lubricants.

2A Production of mineral substances. Cement production accounts for the largest GHG emissions in the sector's mineral production category. In the reference 1990, one cement plant was operating in Azerbaijan, while now the number of enterprises has reached four, each of which produces more than a million ton of cement per year.

The first cement plant in the country was founded in 1950. The same Garadagh cement plant, which weakened its activity, was privatized by the Swiss “Holcim” company in 1999. The company called "Holcim-Azerbaijan" was put into operation in 2012. The plant marked the beginning of a new era in the cement industry of the South Caucasus region. At this enterprise, which meets the most modern requirements, equipment from the USA, Germany, Italy, Switzerland and other developed countries was installed, four furnaces operating with the old wet method were replaced by one oven operating with the dry method. The annual production capacity of the plant is 1.7 million ton. "Norm" cement plant has been operating in Garadagh district of Baku since 2014. The plant is the largest enterprise engaged in the production of cement not only in Azerbaijan, but in the South Caucasus as a whole. The annual production capacity is 2 million tons.

The expansion of construction works in connection with the population growth, emergence of new enterprises increased the demand for cement and lime materials. Therefore, the emission of carbon dioxide into the atmosphere has also increased. So, compared to the reference 1990, CO_2 in cement production in 2022 increased by 4.5 times, and in the production of lime - by 10.5 times. In glass production, on the contrary, CO_2 emissions decreased by 92%.

2B Chemical industry. The enterprises responsible for GHG emissions in this field are currently methanol and ethylene-polyethylene plants. During the Soviet period there was a large petrochemical complex in Azerbaijan. Thus, a large energy-intensive Surfactants plant, a superphosphate plant, a synthetic rubber plant, an Orgsynthesis plant, a synthetic detergents plant and other small subsidiary enterprises were concentrated in Sumgayit, called the city of chemists. At that time, the city was ranked 1st in the country in terms of atmospheric pollution. At present, most of the above-mentioned enterprises have been closed, the rest have been reconstructed on the basis of modern technologies. Now these enterprises are replaced with the plants operating with new technology. There is an ethylene-polyethylene plant in Sumgayit and a methanol plant in Baku referred to the largest chemical industry. The methanol plant was built in 2014 and started its production activity in 2016. Data on GHG emissions of these plants is provided in the following table.

Years	Methanol production		Ethylene production	
	CO_2	CH_4	CO_2	CH_4
1990	NO	NO	187.72	0.25
2020	319.32	1.10	229.62	0.31
2021	253.33	0.87	378.73	0.51
2022	358.12	1.23	31441	0.42

Table 15. GHG emissions from Methanol and Ethylene production, kt CO_2 eq.

The history of the chemical industry in our country dates back to 1945, when the first chemical enterprise – the enterprise called "Ozer" and later known as the Sumgayit surfactant plant. After that, in 1950, Sumgayit Synthetic Rubber Plant was built and put into operation, and in 1980-83, the first in the South Caucasus superphosphate plant. In the 70-80s of the last century, the construction of "EP-300" installation began, which was commissioned in 1989. With the launch of the new technological complex, production of such valuable chemical products as ethylene, propylene, butylene-butadiene fraction, light and heavy pyrolysis resin, propane has begun. The main raw materials of this complex are hydrocarbon products of the Oil Refinery plant named after Haydar Aliyev.

2C Metallurgical industry. This industrial field is one of the key categories of the "Industrial processes and use of products" sector that generates GHG emissions. This area is existed in the country since the beginning of the last century. In connection with the development of oil and gas industry, the metallurgical field also began to expand. The metallurgical industry includes the extraction and use of metals, semimetals and non-metals from the earth, ores, salts. There are six subcategories of this category, of which only two exist in Azerbaijan. These are steelmaking production and aluminium production.

2C1 In the **production of steel**, GHG sources are smelting furnaces. There are two largest metallurgical plants in Azerbaijan: "Baku Steel Company" and "Baku Steelmaking" OJSC. These enterprises and other small objects use mainly metal scrap waste as raw materials. "Baku Steel Company" is a new enterprise and is equipped with the most modern furnaces. Besides these, there are small enterprises that also produce various metallurgical products.

2C3 Aluminum production began back in the 1950s. The Ganja aluminum plant, commissioned in 1966, produced aluminum oxide from alunite obtained from Dashkasan Zaylik deposits in 1966-1997. Over the specified period, 2.1 million tons of aluminum oxide, 4.5 million tons of sulfuric acid and 0.8 million tons of fertilizer were produced from 18.4 million tons of alunite ore.

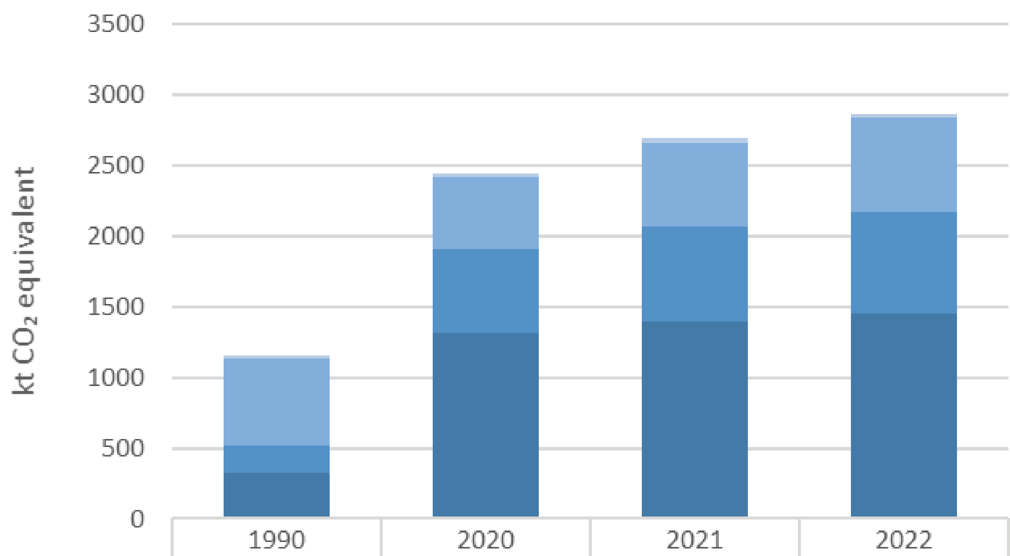
CO_2 and CH_4 gases are emitted into the atmosphere from steelmaking production, and CO_2, CF_4 and C2, F6 gases are emitted from aluminum production. Emissions of gases over the years are given in the figure 17.

2D Lubricant use is another category within the sector. Information on the amount of CO_2 emissions released into the atmosphere from its use is shown in Figure 18 (Non-Energy Products from Fuel and Solvent Use (2.D)).
As seen in the Figure, CO_2 emissions in this category have increased by 5% since the 1990 baseline year.

2F category. Due to lack of data on ODS substitutes included in the 2F category, its F-gases were not estimated. ODC substitutes are not produced in the country and were not imported in 1990. Also, in accordance with the requirements of the Montreal Protocol, the import of ODS substitutes into the country will be suspended in 2030. Thus, in 2030, zero emissions of this category will contribute to the reduction of GHG emissions in the country. The issue of inventory of these substances will be considered in the future by applying the flexibility provision to this category.

2.1.2.2. CURRENT TREND IN IPPU SECTOR

Since data on ODM substitutes included in the 2F category could not be obtained, its assessment was not carried out. However, according to the information obtained, ODM substitutes are not produced in the country and were not imported in 1990. Also, in accordance with the requirements of the Montreal Protocol, the import of ODM substitutes into the country will be suspended in 2030. Thus, in 2030, zero emissions of this category will contribute to the reduction of GHG emissions in the country. The issue of inventory of these substances will be considered in the future by applying the flexsibility rule to this category.



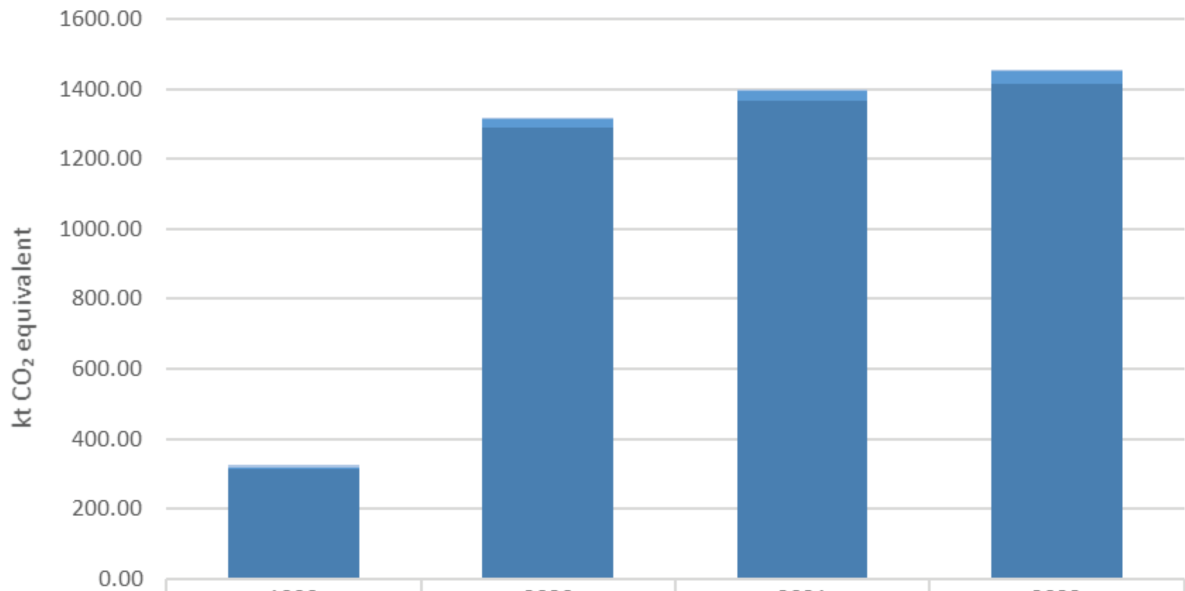
	1990	2020	2021	2022
2.D.Non-energy products from fuels and solvent use	28	21	34	26
2.C.Metal industry	613	519	593	668
2.B.Chemical industry	194.73	588.21	670.55	718.69
2.A.Mineral industry	324	1314	1395	1452

Figure 14. GHG emissions from the IPPU sector

- **1990:** *1,160 kt CO_2 eq.*
- **2022:** *2,865 kt CO_2 eq.*
- **Change:** *Increase of 147%.*

Trend: In Azerbaijan, the industrial sector has significantly expanded over the past twenty years, primarily due to subcategories such as petrochemical and cement production. The demand for such materials has increased due to large-scale urbanization projects associated with the growing population, including the modern development of Baku as a city and other infrastructure projects.

2.1.2.2.1. MINERAL INDUSTRY (2.A)



	1990	2020	2021	2022
2.A.3.Glass production	5.85	0.62	0.46	0.49
2.A.2.Lime production	3.30	25.73	26.80	34.69
2.A.1.Cement production	315.06	1287.72	1367.91	1416.65

Figure 15. GHG emissions in Mineral Industry category

- **1990:** 324 kt CO_2 eq.
- **2022:** 1,452 kt CO_2 eq.
- **Change:** Increase of 348%

Trend: The construction boom has led to a significant increase in cement production, which is one of the main reasons for the rise in emissions. As Azerbaijan continues to develop its infrastructure, the demand for cement has grown, resulting in an increase in emissions in this sector.

2.1.2.2.2. CHEMICAL INDUSTRY (2.B)

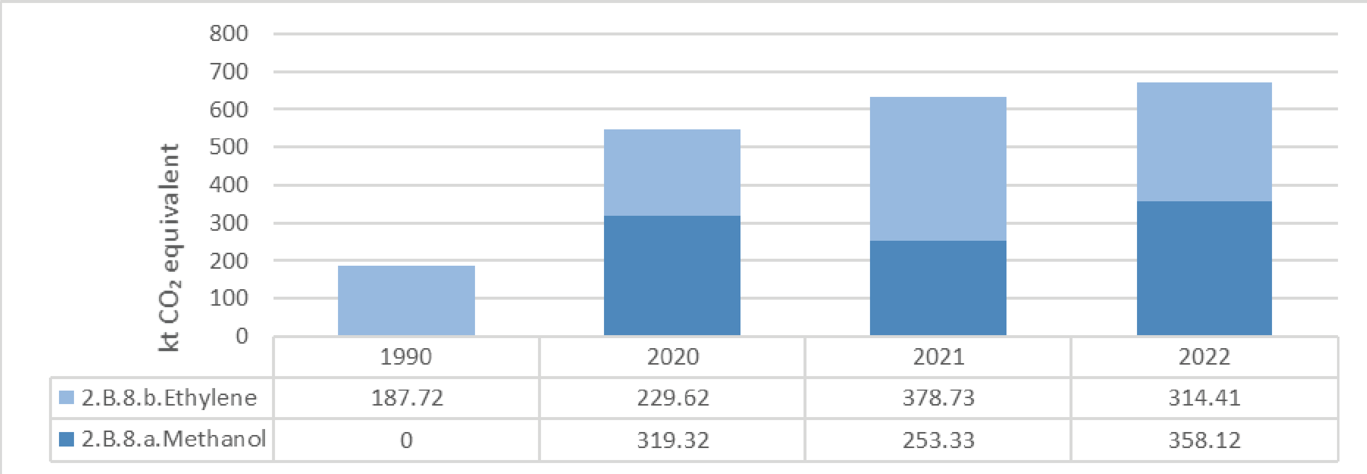


Figure 16. GHG emissions from Chemical Industry

- **1990:** 194.73 kt CO_2 eq.
- **2022:** 719 kt CO_2 eq.
- **Change:** Increase of 269%

Trend: The growth of the petrochemical industry has led to an increase in emissions. It should be noted that in 1990, the methanol production didn't take place.

2.1.2.2.3. METAL INDUSTRY (2.C)

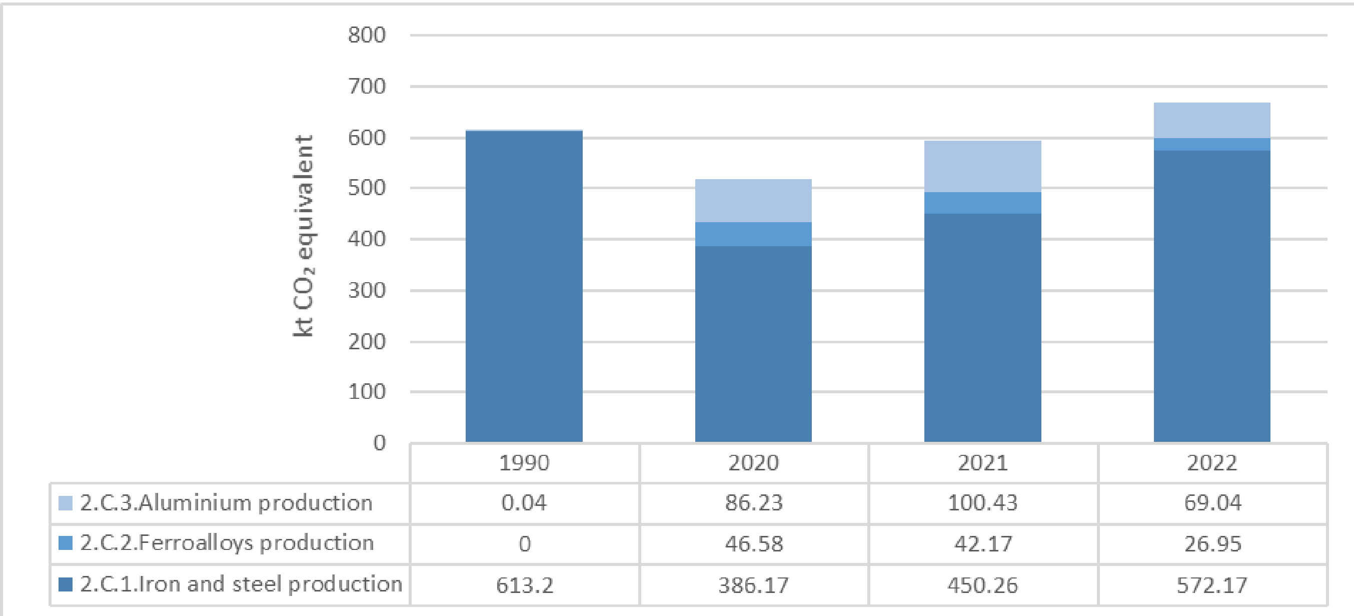


Figure 17. GHG emissions from Metal Industry

- **1990:** 613 kt CO_2 eq.
- **2022:** 668 kt CO_2 eq.
- **Change:** Increase of 9%.

Trend: The overall growth of the metal industry has been driven by the introduction of ferroalloy and aluminum production in the country. Although iron and steel production has decreased from 613 kt CO_2 equivalent in 1990 to 572 kt CO_2 equivalent in 2022, the launch of ferroalloy and aluminum production has contributed to the overall rise in GHG emissions within the metal industry. However, the total output of ferroalloys and aluminum production saw a decline in 2022 compared to 2020.

2.1.2.2.4. NON-ENERGY PRODUCTS FROM FUELS AND SOLVENT USE (2.D)

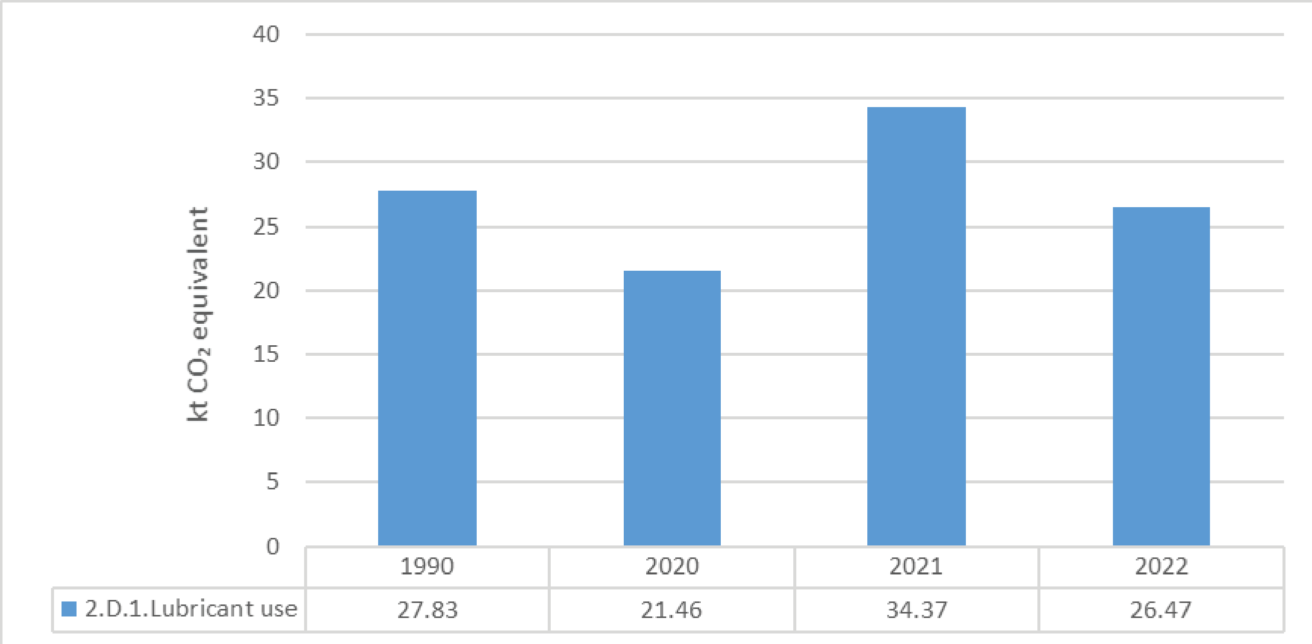


Figure 18. GHG emissions from Lubricant use

- **1990:** 27.83 kt CO_2 eq.
- **2022:** 26.47 kt CO_2 eq.
- **Change:** Increase of 4.9%

Trend: The trend of GHG emissions from lubricant use remained relatively stable, with a slight decrease of 4.9%, from 27.83 kt CO_2 equivalent in 1990 to 26.47 kt CO_2 equivalent in 2022. This decrease is attributed to the increase in technological equipment and the expansion of the transportation system in the country.

2.1.3. AGRICULTURE SECTOR

2.1.3.1. HISTORICAL TREND IN AGRICULTURE SECTOR

Historically, Azerbaijan has been an agrarian country, and agriculture has played a strategic role in the country's development at all times.

During the Soviet era, in 1986, there were 808 state farms and 608 collective farms in the republic, with 4.1 million hectares of land allocated for agriculture. Arable land amounted to 2.73 million hectares, and pastures covered 2.1 million hectares. Crop production made up 70% of agricultural output, with cotton being the main cash crop, concentrated in the Kura-Aras lowlands. Tobacco was grown in the Greater and Lesser Caucasus, and tea was cultivated in the Lankaran lowlands. Grain production accounted for 31% of crop production. In 1986, 855 thousand tons of vegetables and 1,539 thousand tons of grapes were produced. Subtropical fruit production was also significant. Livestock farming, focusing on meat and dairy production, was well developed, with 2 million head of cattle and 5.7 million sheep and goats in the country. Silk farming was also common

Crop production is one of Azerbaijan's traditional agricultural sectors. According to data from 1909-1913, per capita grain production in Azerbaijan was 2.5 times higher than the world average (233 kg) and 1.3 times higher than in then-developed countries like Germany, France, and Sweden (455 kg). Tea was introduced to Azerbaijan's Lankaran region in 1912, and the first tea factory was built in Lankaran in 1937. Mass tea production began thereafter, reaching 36,000 hectares in 1970-1980, with over 34,000 tons of tea produced. According to SSC data, in 2014, 474.2 tons of tea leaves were produced in the country, approximately 20% less than in 2013. The "State Program for the Development of Tea Growing in the Republic of Azerbaijan for 2018–2027," approved on February 12, 2018, aimed to strengthen state support, use the sector's potential effectively, and increase interest in tea production.

The total area of vineyards in Azerbaijan reached 280 thousand hectares in 1984, producing 2.1 million tons of grapes, with a yield of 100 centners per hectare. According to SSC data, 37.1 thousand tons of grapes were harvested by September 1, 2014, an increase of 5.2 thousand tons compared to 2013.

Horticulture is a specialized agricultural sector in Azerbaijan. The Guba-Khachmaz region specializes in pome fruits, the Shaki-Zagatala region in nuts (such as chestnuts, walnuts, and hazelnuts), the Nakhchivan Autonomous Republic in stone fruits (such as apricots and peaches), the Kura-Aras lowland in dry subtropical fruits (such as pomegranates and quinces), the Lankaran region in citrus fruits (such as mandarins, oranges, feijoas, and lemons), and the Absheron Peninsula in southern fruits (such as figs, olives, pistachios, and almonds). According to the Ministry of Agriculture, the area of orchards in the country was 130,467 hectares in 2011, producing 765,818 tons of fruit (excluding grapes), with a yield of 71.7 centners per hectare.

Azerbaijan was recognized as an agricultural country until the end of the 20th century. Due to its extensive agricultural resources, it was a major producer of agricultural goods. The production of grain, cotton, grapes, vegetables, and fruits thrived, along with livestock farming. In the 1970s-1980s, agriculture contributed 25% of the country's GDP, whereas it currently accounts for approximately 5%.

In the 1990s, the transition from a planned economy to a market economy led to a decline in all economic sectors, including agriculture. The return of land to the population and the creation of a favorable environment for agricultural development revitalized the sector. The sector has been consistently prioritized in state programs and plans, as reflected in the "Azerbaijan Republic's Strategy for Social-Economic Development for 2022-2026," which includes a direction focused on "Developing Sustainable and Competitive Agriculture and Agribusiness."

The country's local production potential and infrastructure support have been enhanced to strengthen food security. Based on the country's available land, water, and climate resources, self-sufficiency in primary agricultural products is generally at an acceptable level. In addition to local production potential, the development of storage and processing facilities for food supplies is of critical importance for food security. The establishment of local processing industries and infrastructure for products with relatively high import dependency, due to natural resource limitations, ensures the country's food security.

During the reporting period, there was a notable increase in agricultural sector emissions in Azerbaijan, primarily linked to growth in livestock production, particularly cattle farming. Increased emissions from enteric fermentation and manure management reflect the expansion of livestock farming.

Agricultural soil emissions also increased, mainly due to intensified crop production and the use of fertilizers. Overall, sectoral emission trends reflect the impact of economic changes and modernization efforts in rural areas following the collapse of the Soviet Union, which boosted agricultural activities. Although agriculture remains a vital part of the Azerbaijani economy, its contribution to national emissions increased until 2016 and has since stabilized gradually.

The third sector as per classification of the IPCC 2006 methodology is Agriculture, Forestry and other land use sector. 3 key categories of the AFOLU sector are as follows:

1. 3A Domestic animals
2. 3B Lands
3. 3C Aggregate resources and sources of emission of gases other than CO_2

Among these, categories 3A and 3C include mainly emissions, while category 3B include mainly absorption.
In the current report, the amount of absorption in the 1990 reference year differs from the amount of absorption calculated in the Fourth National Communication. This is due to the fact that at the time of the development of the National Communication Report, there was no data on the subcategories of "Pastures" and "Settlement lands" of the AFOLU sector.

3A Domestic animals category is the key category of the AFOLU sector on GHG emissions. In this category, CH4 and N2O greenhouse gases are emitted into the atmosphere from the internal fermentation of animals and the management of manure. Compared to the reference year of 1990, relevant change in the number of cattle, that is the main sources of the category, was occurred in 2022 (figure 19).

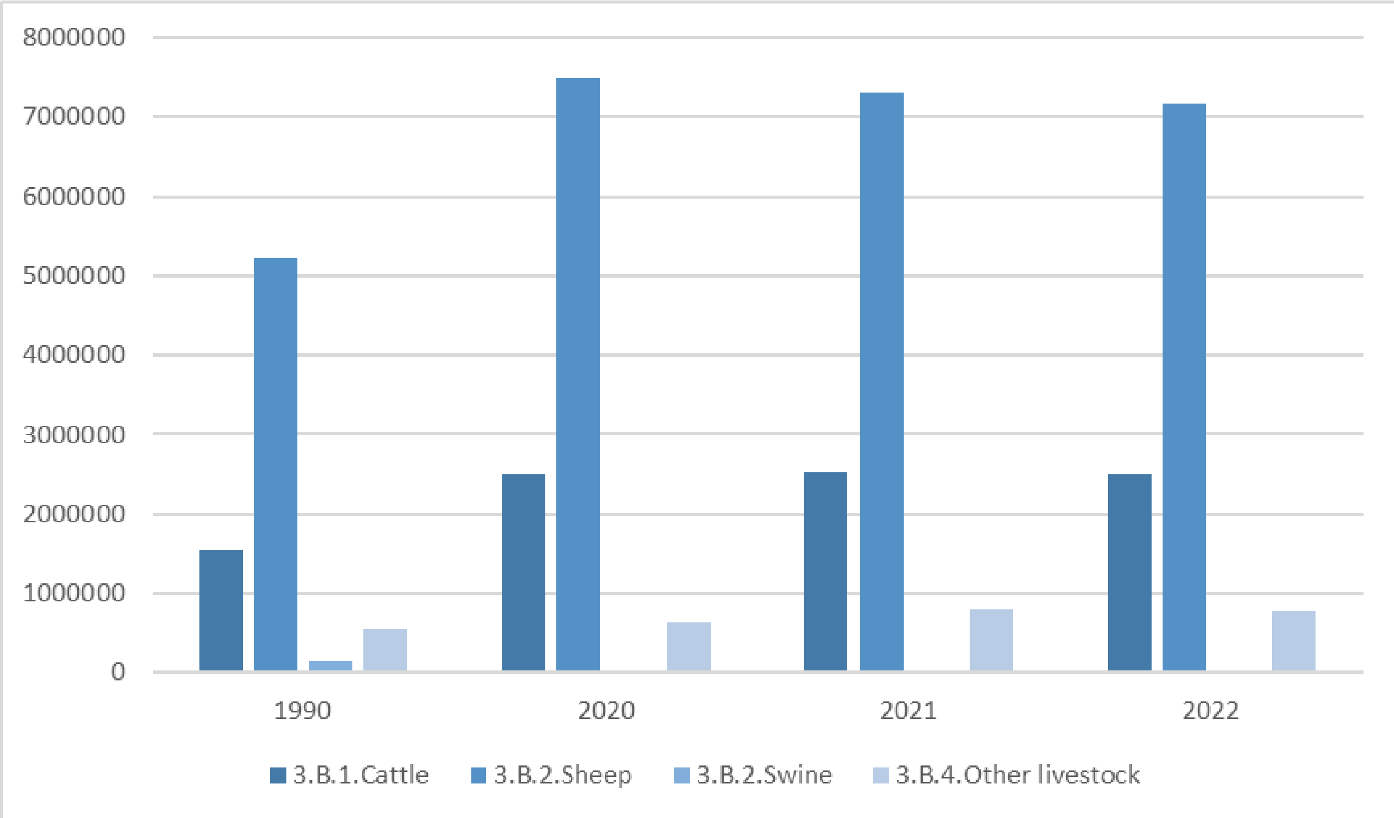


Figure 19. Change in the number of domestic animals that are the main sources of methane

As can be seen from the figure, the number of dairy cows, sheep and goats increased in 2022 as compared to 1990.

3C2 Liming. Lime is produced in Azerbaijan for the construction purposes. However, there is no information about its use for the purpose of injection into the soil.

3C3 Urea application. Various fertilizers are used for plants to grow quickly and give a good harvest. GHG occurred as a result of injection of some fertilizers into the soil are emitted into the atmosphere. According to the IPCC (2006) methodology, when nitrogen fertilizers are injected into the soil, carbon dioxide is released into the atmosphere as a result of the appropriate chemical reaction from the mixture of fertilizer with water. Carbamide is distinguished from other nitrogen fertilizers by its low cost, convenient application and high productivity in agriculture. Carbamide is considered a reliable and economical product in terms of storage and transportation due to the fact that it does not pose a fire or explosion hazard. Carbamide is widely used in the production of cattle feed and other chemicals, as well as in pharmaceuticals.

Previously, nitrogen fertilizers were mainly imported to Azerbaijan. At present, the carbamide plant put into operation in the country meets the needs of Azerbaijan.

3C4 Direct N_2O emissions from cultivating areas. In this sub-category of the 3C category of AFOLU sector, N2O is directly released into the atmosphere as a result of the appropriate chemical reaction of nitrogen fertilizers injected into the soil with water and other mineral substances. According to the amount of carbamide used from the SSC data, the amount of N_2O gas released into the atmosphere was calculated according to the IPCC methodology. The result of calculations is given in the below figure.

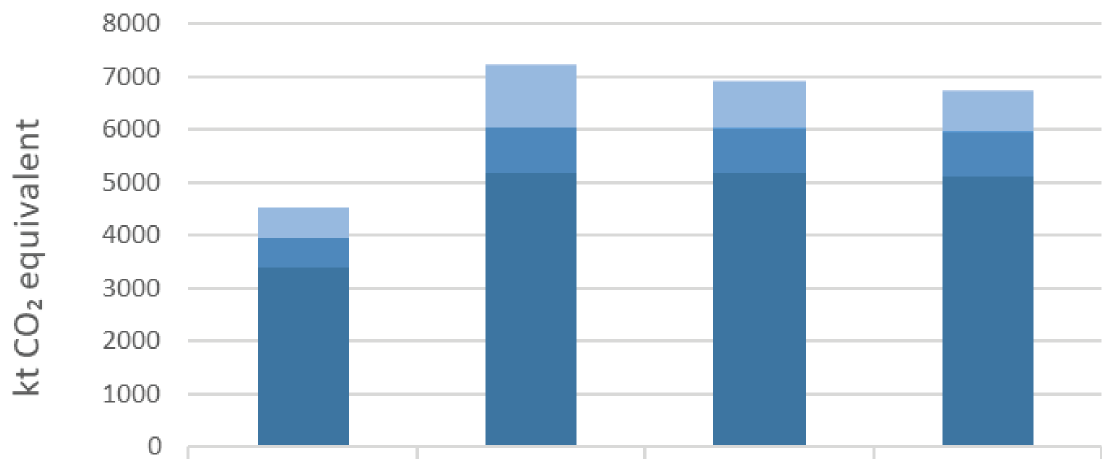
3C5 Indirect N_2O emissions from the cultivating areas. There is no information on the amount of minerals and amount of organic substances in the lands allocated for cultivation in Azerbaijan.

3C6 Indirect emission of N_2O from the collection, storage and use of manure. One of the sources of category 3C is the management of cattle manure. At this time, a direct N_2O is emitted. Data on the amount of this emission over the years is given in the following figure.

3C7 Rice cultivation subcategory. Rice fields that generate the CH_4 emission are among the main sources of the 3C category. Rice cultivation areas, like artificial wetlands, are characterized by high humidity, high nutrient content and low oxygen content. The main factor determining the flow of methane into the atmosphere is the ratio of methane and methanogenic bacteria. Formation of CH_4 emission depends on the temperature of the soil, as well as the level of groundwater.

Data on the amount of CH_4 emitted from the rice plantation fields is given in the figure 23. In the last National Data, the area of rice cultivation in 1990 was unknown. At present, CH_4 emissions are included in the report.

2.1.3.2. CURRENT TREND IN AGRICULTURAL SECTOR



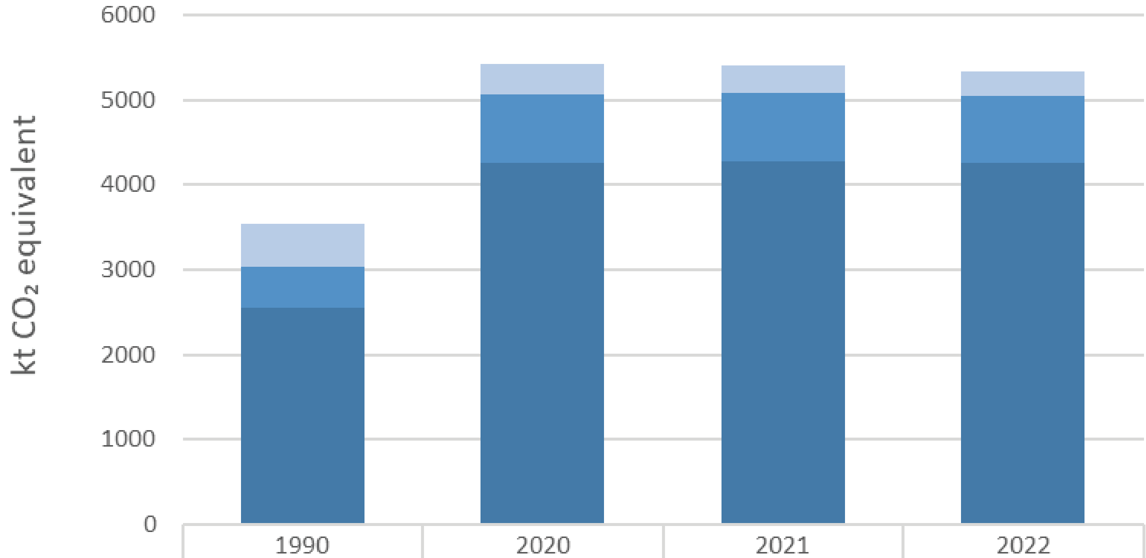
	1990	2020	2021	2022
3.H.Urea application		0.16	0.07	0.01
3.D. Agricultural soils	575.81	1152.93	873.24	757.48
3.C.Rice cultivation	7.67	12.78	13.14	13.33
3.B. Manure management	562.43	847.97	849.48	843.68
3.A. Enteric Fermentation	3377.04	5177.38	5163.59	5102.67

Figure 20. GHG emissions from the Agricultural sector

- **1990:** *4,522.95 kt CO_2 eq.*
- **2022:** *6,717.16 kt CO_2 eq.*
- **Change:** *Increase of 48.5%*

Trend: Azerbaijan's agricultural sector has expanded further after 1990, with a focus on livestock farming. Cattle farming, in particular, has contributed to the increase in methane emissions, primarily through enteric fermentation and manure management. Starting from 2020, the 30-year trend of rising emissions has shifted to a decline.

3.1.3.2.1. ENTERIC FERMENTATION (3.A)



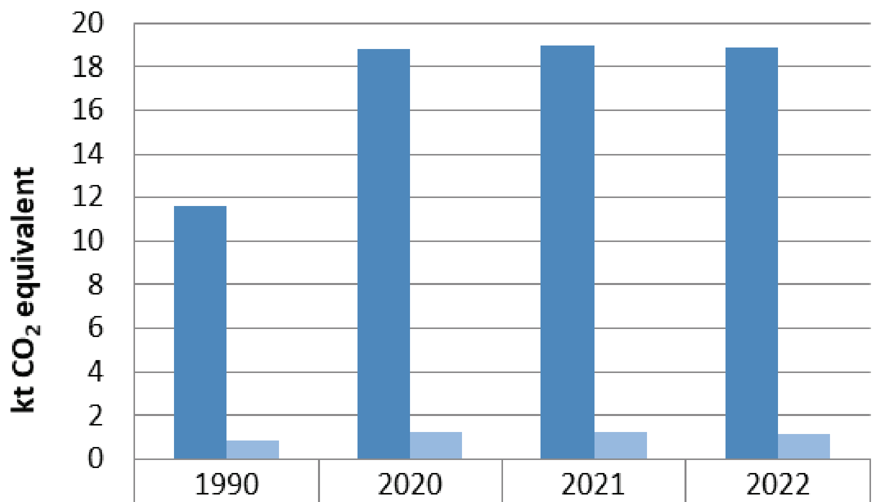
	1990	2020	2021	2022
3.A.4. Other livestock	501.79	348	316.51	300.64
3.A.3. Swine	6.58	0.25	0.25	0.21
3.A.2. Sheep	487.42	821.63	809.31	789.82
3.A.1. Cattle	2543.92	4249.44	4280.17	4251.13

Figure 21. GHG emissions from Enteric fermentation

- **1990:** *3,377.04 kt CO_2 eq.*
- **2022:** *5,102.67 kt CO_2 eq.*
- **Change:** *Increase of 51%*

Trend: Livestock, particularly cattle, has become a significant agricultural product contributing to methane emissions in Azerbaijan. Since the base year of 1990, the shift towards more intensive livestock farming, especially in plains and foothill areas, has led to an increase in methane emissions from enteric fermentation. After 2016, these emissions stabilized and have relatively decreased from 2020 to 2022.

2.1.3.2.2. MANURE MANAGEMENT (3.B)



	1990	2020	2021	2022
3B(a).CH4 emissions	11.58	18.83	18.93	18.89
3B(b).N20 and NMVOC emissions	0.9	1.21	1.21	1.19

Figure 22. GHG emissions from Manure management

- **1990:** *562.43 kt CO_2 eq.*
- **2022:** 843.68 kt CO_2 eq.
- **Change:** *Increase of 50%.*

Trend: The increase in livestock numbers has resulted in a corresponding rise in emissions from manure management, particularly in areas where animal waste is not effectively managed or treated. However, from 2020 to 2022, there has been a gradual increase in emissions from this category.

2.1.3.2.3. RICE CULTIVATION (3.C)

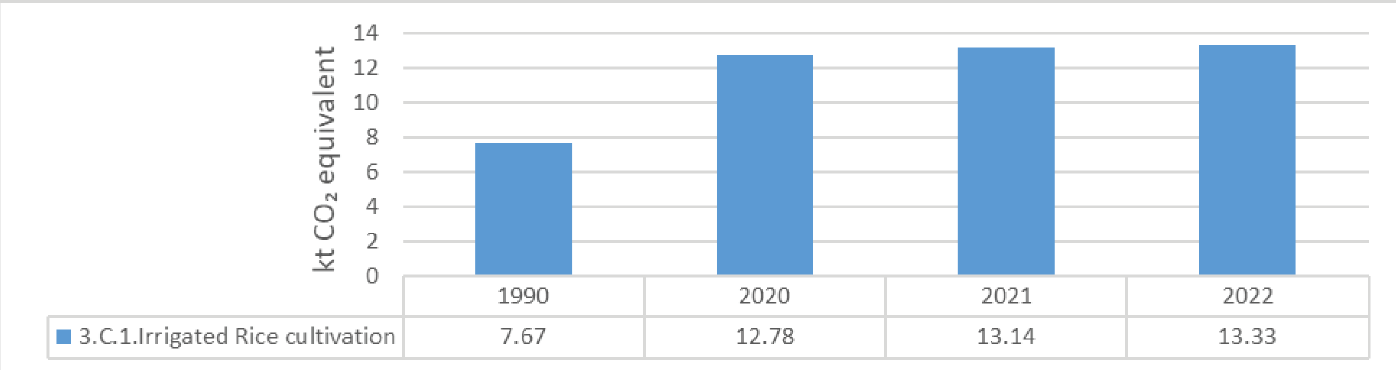


Figure 23. GHG emissions from Rice cultivation

- **1990:** *7.67 kt CO_2 eq.*
- **2022:** *13.33 kt CO_2 eq.*
- **Change:** *Increase of 74%*

Trend: An increase in the land area dedicated to rice production results in a significant increase from 7.67 kt CO_2 equivalent in 1990 to 13.33 kt CO_2 equivalent in 2022, indicating a 74% increase over this period.

2.1.3.2.4. AGRICULTURAL SOILS (3.D)

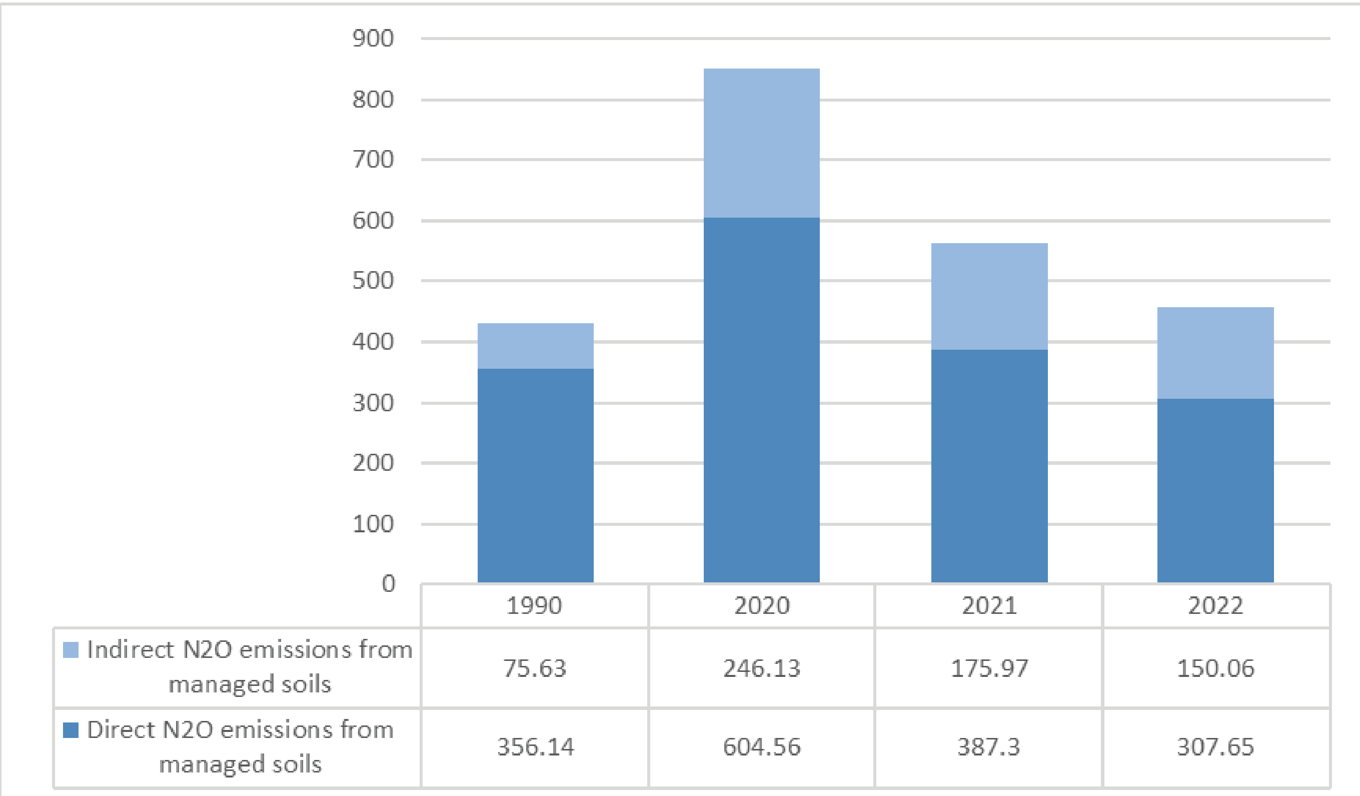


Figure 24. Direct and Indirect N_2O emissions from Agricultural soils, kt CO_2 eq.

- **1990:** *575.81 kt CO_2 eq.*
- **2022:** *757.48 kt CO_2 eq.*
- **Change:** *Increase of 31.55%*

Trend: The data on direct and indirect nitrous oxide (N_2O) emissions from agricultural soils indicates a notable increase from 575.81 kt CO_2 equivalent in 1990 to 807.41 kt CO_2 equivalent in 2022, representing a 40.2% increase over this period. The significant rise in N_2O emissions points to growing pressures from agricultural activities on soil.

2.1.3.2.5. UREA APPLICATION (3.H)

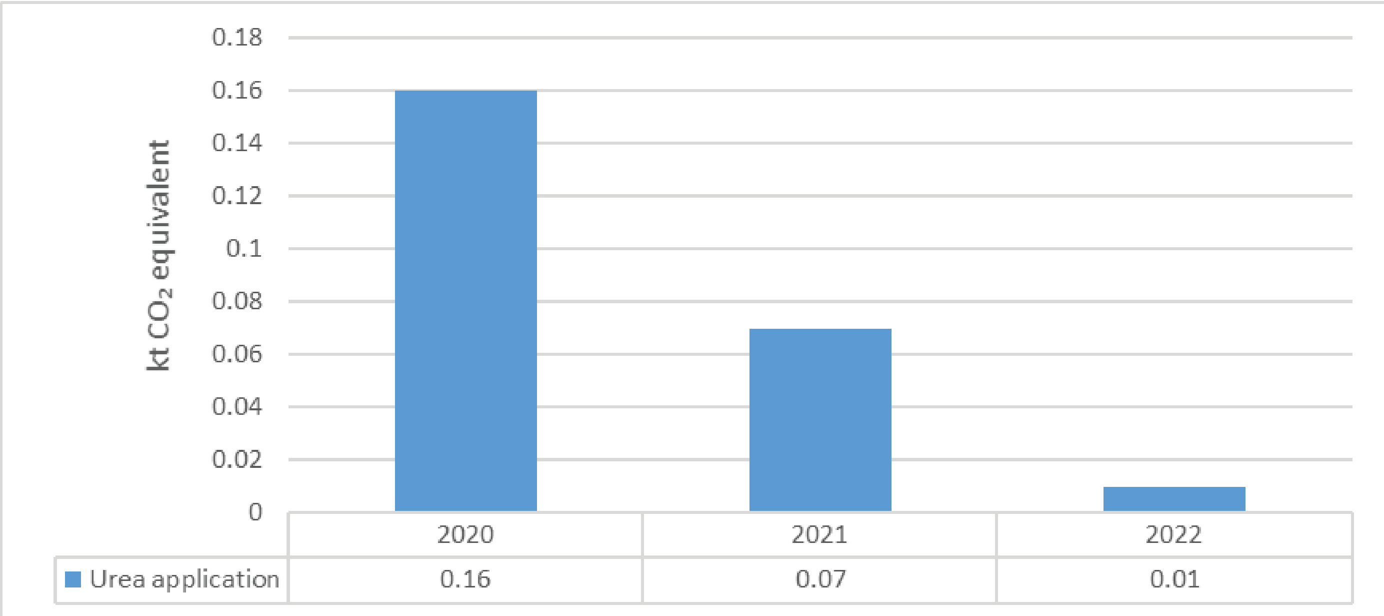


Figure 25. GHG emissions from Urea application

- **1990:** *NE*
- **2020:** *0.16 kt CO_2 eq.*
- **2022:** *0.01 kt CO_2 eq.*

Trend: Due to lack of data on urea application in 1990 emissions were not estimated for 1990. Emissions decreased sharply from 2020 to 2022, dropping from 212.40 kt CO_2 equivalent to 20.30 kt CO_2 equivalent. The significant reduction in urea application emissions from 2020 to 2022 suggests a positive shift toward more sustainable agricultural practices.

2.1.4. LAND USE, LAND-USE CHANGE, AND FORESTRY (LULUCF)

2.1.4.1. HISTORICAL TREND IN LULUCF SECTOR

3B1 Forest land is one of the national treasures of states. The protection of forests, which provide humanity with oxygen, and assistance in their development should become the sacred duty of every country.
The total area of forest areas in Azerbaijan was about 1.04 million ha by the end of 2022 (SSC, 2023). 49% of the forest areas are located in the Greater Caucasus, 34% in the Lesser Caucasus and 15% in the Talysh mountains. Only 2% of the forest area belongs to the lowland zone.

In Azerbaijan's forests, broadleaf species make up 88%, softwood species account for 8.9%, and coniferous species constitute only 0.06%.

In 1993-2020, fascinating forests, city parks, gardens and arable lands of the population living there, and immense pastures were looted, burned and destroyed in the territory of 20% of the territory of Azerbaijan under Armenian occupation. Preliminary assessments carried out in order to determine the harm and losses caused as a result of Armenian occupation, showed that 54,328 hectares out of 228 thousand hectares of forest-covered areas within the forest fund were destroyed. As a result, the humus layer of soils was destroyed, a large amount of greenhouse gases was emitted into the atmosphere.

Unfortunately, for 30 years none of the relevant international organizations has expressed their opinion to Armenia in this regard.

After the collapse of the country of the Soviets, the political situation in the country, the severance of economic ties with neighboring countries and other socio-economic situations had a negative impact on the development of forests as well. Thus, after the supply of coal to the country stopped, the forests were degraded as a result of the use of forests as fuel by the population of districts and villages due to problems in the supply of energy resources.

After the establishment of stability in the country, forest management was improved. The management of forests was entrusted to the Ministry of Ecology and Natural Resources, established in 2001. In this regard, the "Forest Development Service" was established in the ministry. The following areas of activity of the service were identified:

3B2 - The Croplands subcategory includes all land plots suitable for agriculture. Lands suitable agriculture consist of cultivation areas, pacified lands, perennial plantings and pasture areas with hayfields. Change dynamics in the designations of these lands from 1990 to 2022 is presented in the table below.

Indicators	1990	2022	Difference
Arable lands	1,589.0	2,052.8	29%
Fallow lands	80.8	39.1	-51.6%
Perennial crops	347.4	273.6	-21.2%
Hayfields and pastures	2,365.7	2,415.0	2%
Total	**4,382.9**	**4,780.5**	**9%**

Table 16. Dynamics of changes in land plots suitable for agriculture, thousand ha

As it can be seen from the table, the volume of land suitable for agriculture increased in 2022 by 397.2 thousand ha as compared to the 1990 reference year.

3B3 Natural hayfields and pastures in Azerbaijan are located mainly in Gobustan, Jeyranchol, Ajinohur, Shirvan, Mil, Karabakh, Salyan plains, covering 67% of natural pastures, and in the mountains of the Greater and Lesser Caucasus, Talysh covering the middle mountainous, subalpine and alpine zones, account for 33% of natural pastures.

The reason for the decrease in Grassland is associated with the development of urban planning, road structure, the expansion of other works of state importance, as well as the transfer for private ownership.

It should be noted that the national data did not contain information about pastures as of 1990. The SSC is improving its statistics by collecting the missing data of the 1990 reference year. At present, major part of information about the lands has been posted, including information about pastures and areas of settlement lands.

3B4 Wetlands cover a very small portion of the country, approximately 150,426 hectares. According to the IPCC classification, wetland areas are included under the managed subcategory, while rivers and natural lakes fall under the unmanaged subcategory. The GHG emissions from wetlands primarily arise from the peat deposits in these areas (IPCC 2006). Since the peat deposits in Azerbaijan's wetland areas are minimal, their potential GHG emissions are negligibly small.

3B5 Residential (settlement) lands. The territory of the Republic of Azerbaijan is divided into fourteen major including Baku and minor economic regions. Baku has a special status as the capital city of Azerbaijan. The remaining economic regions of Azerbaijan include cities and separate regions. In Baku and other regions of the Republic there are areas with trees and greenery such as parts and gardens that do not belong to the forest fund.

3B6 Other lands subcategory include bare rocks, clay-salt water on the surface, debris cones of river banks, places of man-caused deformation, coastal sands and other unregistered places. That is, these are lands not included in the Lands subcategories listed earlier.
Data on other types of lands and their distribution in the territory of the Republic of Azerbaijan is shown in the following figure.

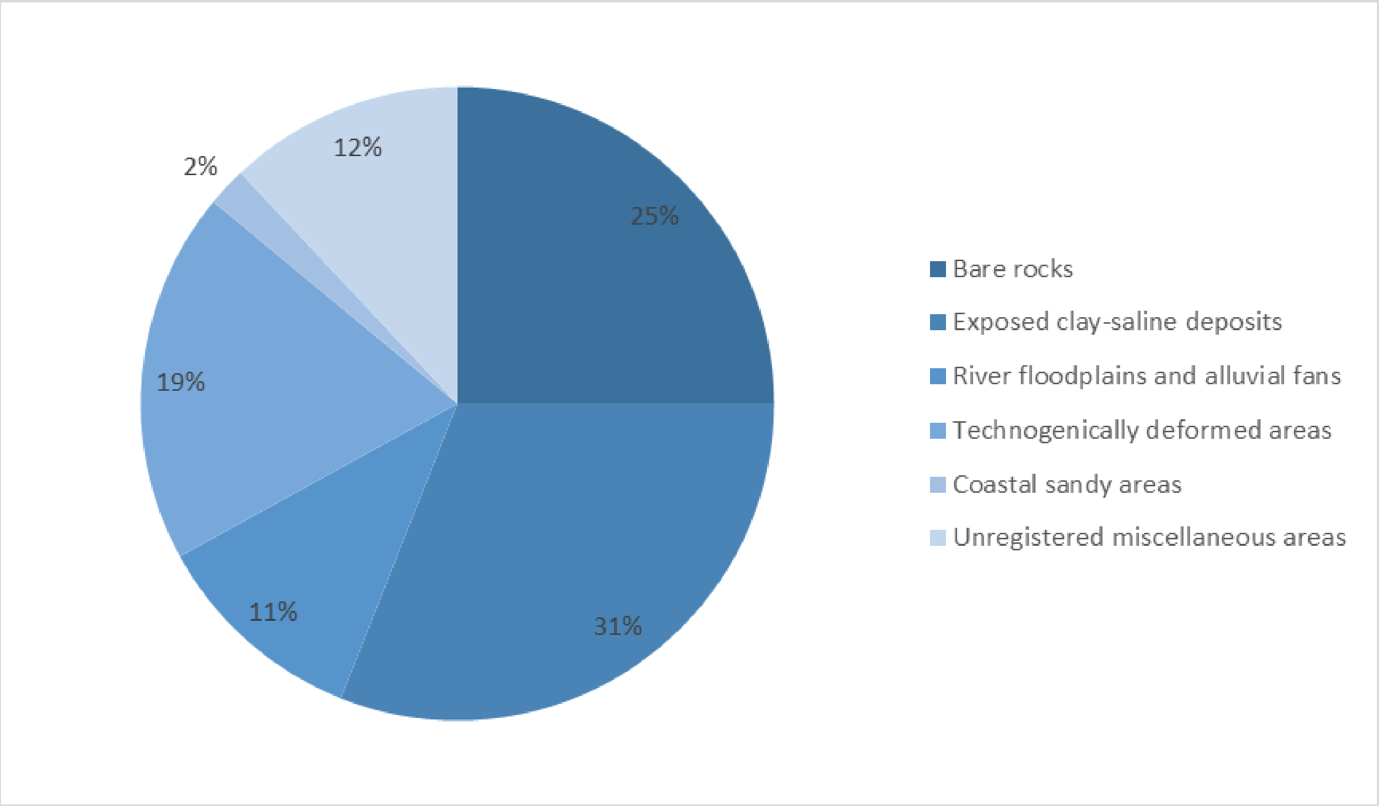


Figure 26. Structure of Other lands category

These lands are located mainly in mountainous and foothill places, around volcanoes and their rocks, in semi-desert zones.

3C Aggregate resources and sources of emission of gases other than CO_2

In the IPCC (2006) methodology, all sources not included in the 3A and 3B categories of the AFOLU sector are included in the mentioned category. These sources are as follows:

3C1 Biomass burning (applies to all soil types)
3C2 Injection of lime into the soil
3C3 Use of uric acid (carbamide)
3C4 Direct N_2O emission from cultivating areas
3C5 indirect N_2O emission from cultivating areas
3C6 Indirect N_2O outburst from the collection, storage and use of manure
3C7 Rice growing
3C8 Others
3D1 Collection of forest materials
3D2 Others

GHG emissions are emitted from the sources of this category. So, mainly CO_2 gas is emitted into the atmosphere depending on the combustion process and other management conditions. However, since these combustion processes arise in disorganized sources, gases other than CO_2, i.e. CH_4, N_2O, NOx, CO, SO_2 and other gases are emitted into the atmosphere since complete combustion does not occur in them. Two of those gases (CH_4, N_2O) are gases that produce a direct thermal effect. The rest ones indirectly create a thermal effect. Various GHG emissions also arise from other land management.

Formation of the afore-mentioned gases occurs mainly from the combustion process. In general, combustion processes in soils occur for natural and anthropogenic reasons. Natural burns are caused by lightning, volcanic activity, while anthropogenic burns are caused by human activity, that is, can occur as a result of direct arson, recklessness (leaving a bonfire burning, etc.).

3C1 Biomass burning. In general, waste burning in areas of agricultural lands and forests is prohibited by law. Combustion processes in the territory of Azerbaijan usually occur in forests. Data on the scale of forest fires in 1990-2022 and the resulting direct GHG emissions into the atmosphere are given in the table below.

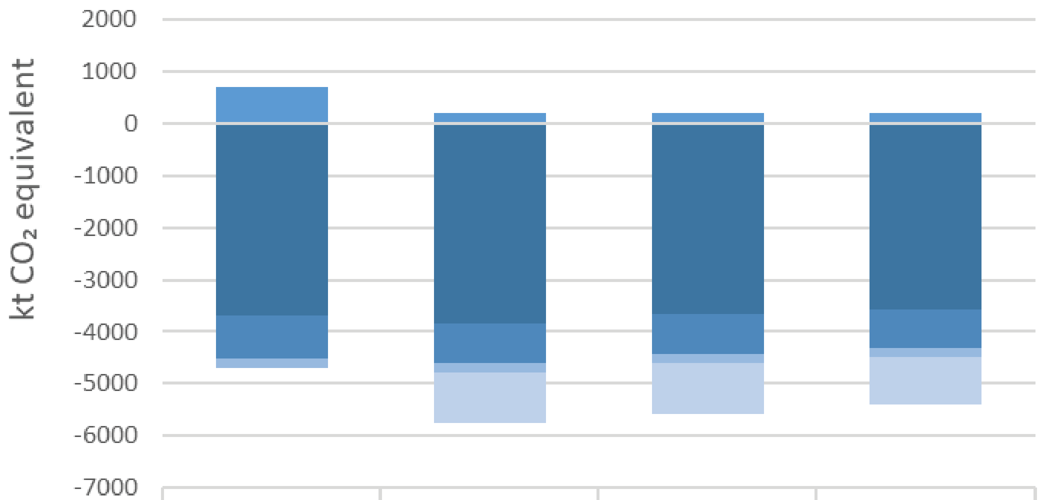
Direct GHG	1990	2020	2021	2022	1990-2022, difference, %
Burning territory, ha	186	48	380.1	869.2	367.31
CH_4	0.014	0.011	0.09	0.21	1,400
N_2O	0.0008	0.0006	0.004	0.01	1,250
Total	**0.604**	**0.467**	**3.58**	**8.53**	1,009.23

Table 17. Direct GHG emissions from forest fires, kt CO_2 eq.

Precursor gases are also emitted into the atmosphere during the forest fires. Their volume is very small.

2.1.4.2. CURRENT TREND IN LULUCF SECTOR

In Azerbaijan, the LULUCF sector has historically been characterized by carbon removals, with forests playing a crucial role in carbon sequestration. However, recent trends indicate a decrease in net removals by 2022. This decline is mainly attributed to the expansion of settlements at the expense of arable land and changes in land use related to the development of agriculture.



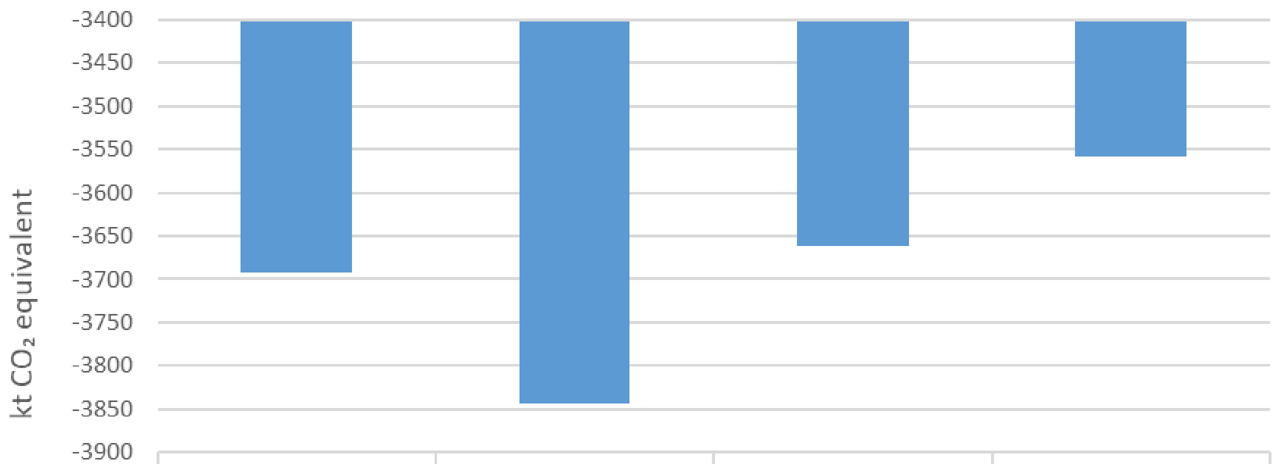
	1990	2020	2021	2022
4.G.Harvested wood products		-974.13	-987.77	-909.27
4.E.Settlements	-177.87	-177.87	-177.87	-177.87
4.C.Grassland	703.53	215.21	194.5	200.02
4.B.Cropland	-832.98	-751.1	-754.58	-760.05
4.A.Forest land	-3692.68	-3843.69	-3661.49	-3558.69

Figure 27. Carbon emissions and removals from the LULUCF Sector

- **1990:** *- 3,999.89 kt CO_2 eq. (sink)*
- **2022:** *- 4,523 kt CO_2 eq. (sink)*
- **Change:** *The volume of removals has increased by 13.1% (excluding HWP).*

Trend: Despite the recent increase in carbon emissions from lands, removals have continued to rise. This increase is primarily attributed to the forest area, croplands, and settlements categories. Emissions exceeding carbon removals occurred only in grasslands. Since there is no data available for the base year of 1990, removals in the category of harvested wood products were not calculated, and therefore, this category is not considered in the comparison with removals in 2022.

2.1.4.2.1. FOREST LANDS (4.A)



	1990	2020	2021	2022
Forest land	-3692.58	-3843.69	-3661.49	-3558.69

Figure 28. Carbon removals from the Forest land

- **1990:** *-3,692.58 kt CO_2 eq.(sink)*
- **2022:** *-3,558.69 kt CO_2 eq. (sink)*
- **Change:** *Decline of 3.6% in sink capacity*

Trend: It should be noted that although the volume of removals in 2020 was higher than in 1990, in recent reporting years, the increase in the scale of forest fires has led to an increase in carbon losses, which in turn has caused a decrease in net removals.

2.1.4.2.2. CROPLAND (4.B)

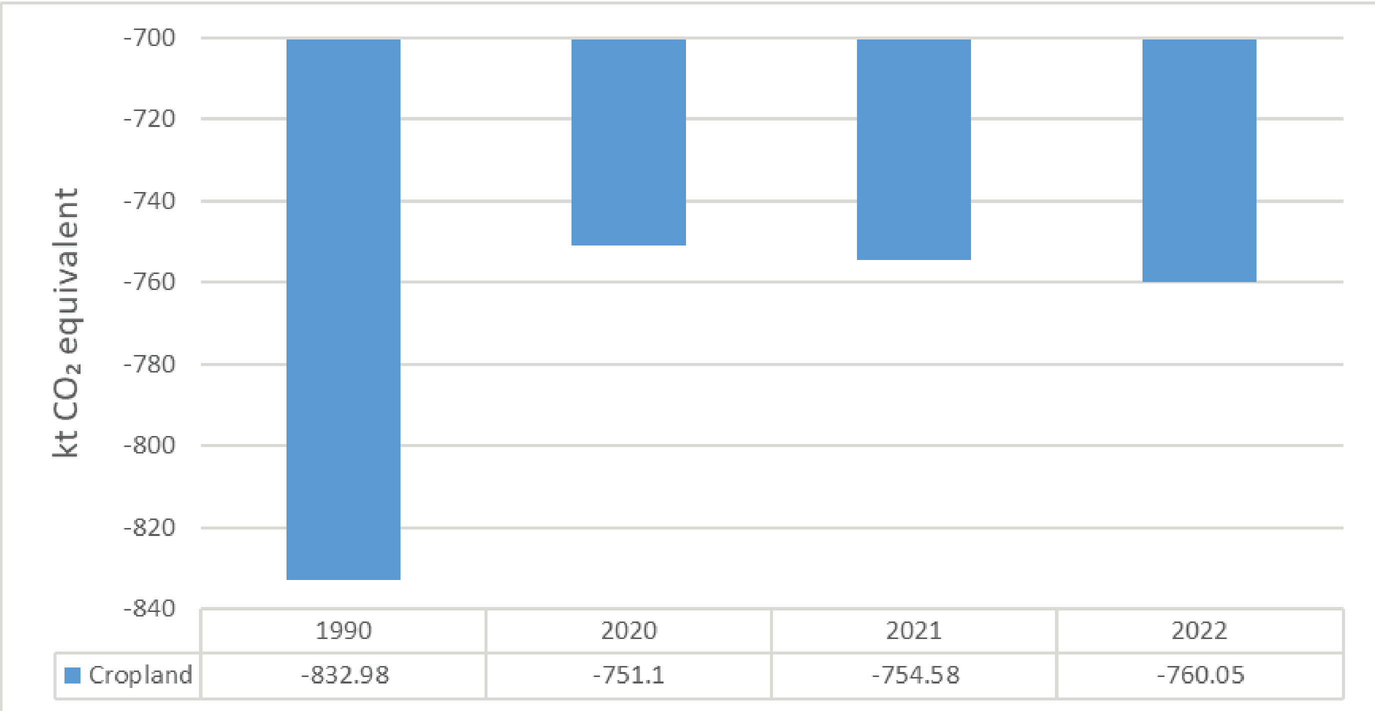


Figure 29. Carbon removals from the Cropland

- **1990:** *-832.98 kt CO_2 eq.(sink)*
- **2022:** *-760.05 kt CO_2 eq. (sink)*
- **Change:** *8.75% decrease in sink capacity*

Trend: The decrease in CO_2 removals from agricultural lands is related to the reduction in the area of land available for agricultural purposes, particularly perennial crops and fallow lands. This is associated with the transfer of some of these lands to other categories.

2.1.4.2.3. GRASSLAND (4.C)

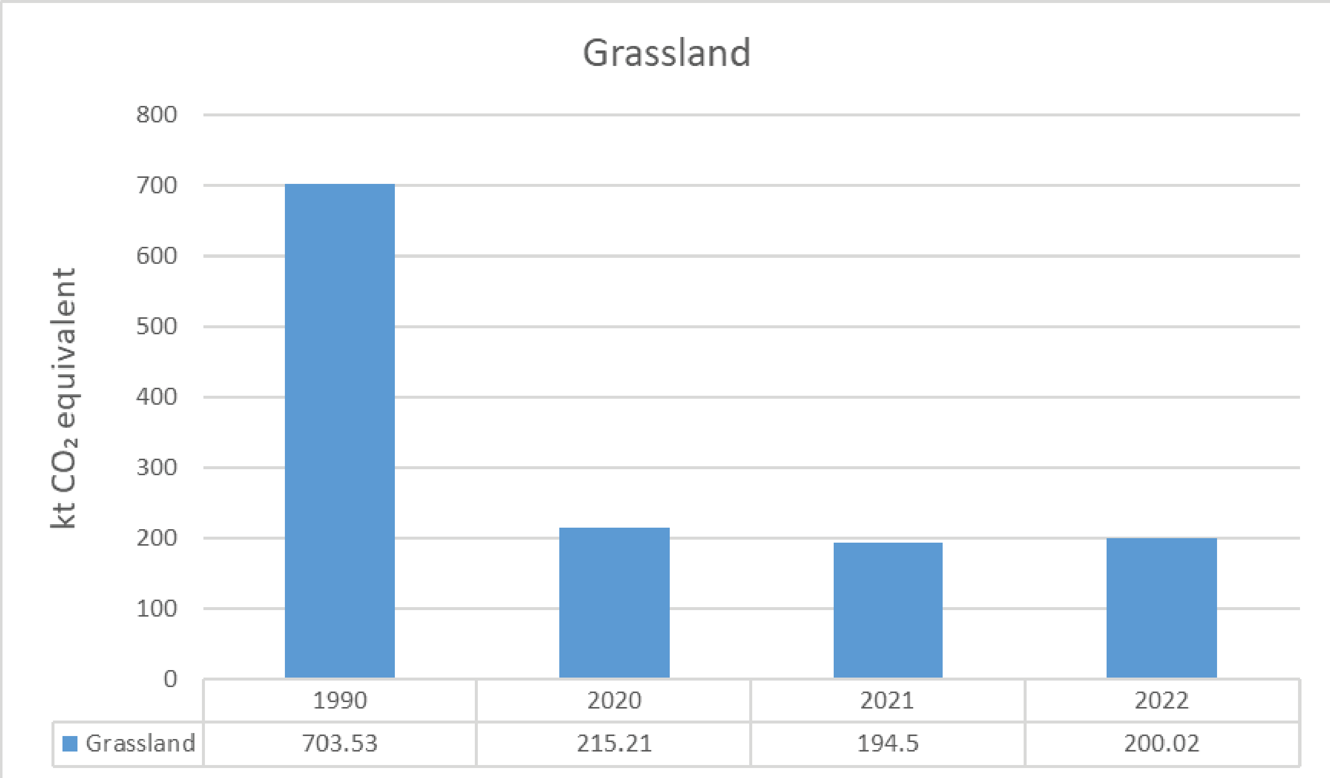


Figure 30. Carbon emissions and removals from the Grassland

- **1990:** *703.53 kt CO_2 eq.*
- **2022:** *200.02 kt CO_2 eq.*
- **Change:** *Decrease of 71.6% in sink capacity.*

Trend: Despite the reduction in emissions between 1990 and 2022, emissions in the grassland category still exceed removals, primarily due to soil degradation caused by overgrazing and the conversion of grasslands to agricultural and urban land use.

2.1.5. WASTE SECTOR

2.1.5.1. HISTORICAL TREND IN WASTE SECTOR

One of the sectors adopted in the IPCC methodology (2006) is the waste sector. The main GHG os this sector is methane (CH_4), Carbon 4 oxide (CO_2) and nitrogen 1 oxide (N_2O).
The categories of the sector are as follows:

4A Disposal of solid waste

4B Biological processing of solid waste

4C Organized and open incineration of waste

At present, the management of both domestic and industrial wastes in Azerbaijan is unsatisfactory. Waste management is at a very low level in other cities, districts and settlements, except for the capital city of Baku. This increases the emissions of the waste sector. However, there is also a positive situation in the sector. Thus, the cases of organized and open incineration of waste, which is the 4C category of the sector, practically do not occur. So, under the laws on Emissions and on the Protection of atmosphere, the process of open incineration is prohibited in the country. The Administrative Offenses Code (Article 271) considers a fine of up to eight thousand manats regarding this type of violation.

As the population, industrial enterprises grow, so does the waste. As solid waste increase, so do GHG emissions from it.

4A Solid Waste. The sources of the category of disposal of solid waste are solid waste landfills, official and unofficial landfills. During the collection and removal of industrial and solid household waste in cities, methane emissions are mainly caused by the waste decay in landfills and dumpers.

The quantitative and qualitative composition of biogas generated at the disposal landfill of solid waste depends on the climatic and geological conditions of the landfill, morphological and chemical composition of waste, its density, storage conditions (area, volume, density), humidity and other factors. The gas produced in landfills is the product of biological separation of the organic fraction of the stored waste. The source of biogas is food waste, waste from gardens and parks, waste paper and other pulp-containing waste. On average, 60-80% of solid waste masses are biodegradable waste fractions. The amount of methane from these sources was calculated using the "IPCC_WASTE_MODEL" software.

Solid waste issue within the waste has become one of the most acute economic and environmental problems. Solid waste is divided into two parts:

1. **solid household waste (4A1);**
2. **solid industrial waste (4A2).**

4B Biological processing of solid waste. In Azerbaijan, until the middle of the last century, waste was thrown on empty places. After 1950, the collection of waste in large cities and its placement in landfills by transport began to be managed. For the first time in the country, a waste landfill was created in the Balakhani settlement of Baku. After the problem of global climate change occurred, appropriate works began to be carried out to control the gases that create a thermal effect in waste landfills.

For this purpose, "solid waste sorting" plant was established on the basis of Balakhani landfill and its surrounding area. The solid waste sorting plant was built in order to develop the field of recycling in the country. The plant with an annual capacity of 200 thousand tons was built based on advanced German technologies. As a result of sorting, paper, glass, plastic, non-ferrous metals, iron and other raw materials suitable for recycling are allocated, as a result of which the total volume of waste is reduced, the market of cheap raw materials is formed, the foundation for recycling is created in the country, energy is saved, and most importantly - the negative impact of waste on the environment is reduced. In addition, hazardous waste such as batteries and accumulators generated in the household, including electronic waste of this kind, are separated from the general mass and sent to the relevant places for proper disposal. A technical park was created near the plant to use the sorted waste as raw materials. At enterprises in technical park, paper and scrap, plastics, processed oils and others sorted from the waste are used as raw materials.

4C Organized and open incineration of waste. Open burning of any waste in the Republic of Azerbaijan is prohibited by law. Therefore, in order to manage waste in an organized manner, a plant was built near the Balakhani landfill. Baku solid waste incineration plant is the only plant built within the framework of the "Comprehensive Action Plan for improving the environmental situation in the Republic of Azerbaijan for 2006-2010". The annual capacity of the plant built in Balakhani settlement is 500 thousand tons of household waste, including 10 thousand tons of medical waste. As a result of the waste incineration process, the plant is capable of producing up to 200 million kW/h of electricity per year.

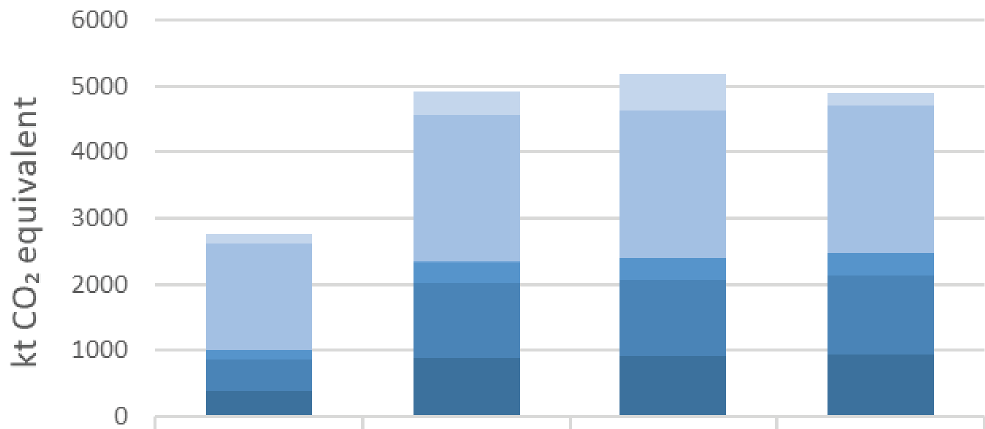
4D Wastewater treatment and discharge. Household and industrial wastewater is discharged through sewage systems into the appropriate reservoirs. When they are processed or placed in an anaerobic manner, they can be the source of CH_4 and N_2O. CO_2 generated from wastewater is not taken into account in the IPCC methodology due to its low emission. Unfortunately, wastewater waste in many residential areas is discharged through sewage directly into basins, rivers, lakes, the sea, and etc.

Sewage collectors in Baku and other major cities and regions of Azerbaijan are usually closed and placed underground. Wastewater in closed, underground sewage collectors is not considered to be a significant source of CH_4 emission.

2.1.5.2. CURRENT TREND IN WASTE SECTOR

Significant growth in emissions has been observed in Azerbaijan's waste sector from 1990 to 2022, primarily due to solid waste disposal and wastewater treatment. This increase reflects Azerbaijan's growing population and urbanization, leading to a rise in waste volumes.

Managed and unmanaged landfill sites contribute substantially to emissions, while domestic wastewater is a notable source of methane (CH_4) and nitrous oxide (N_2O). The sector's emissions highlight the need for improved waste management systems and sustainable waste treatment solutions to mitigate its environmental impact.



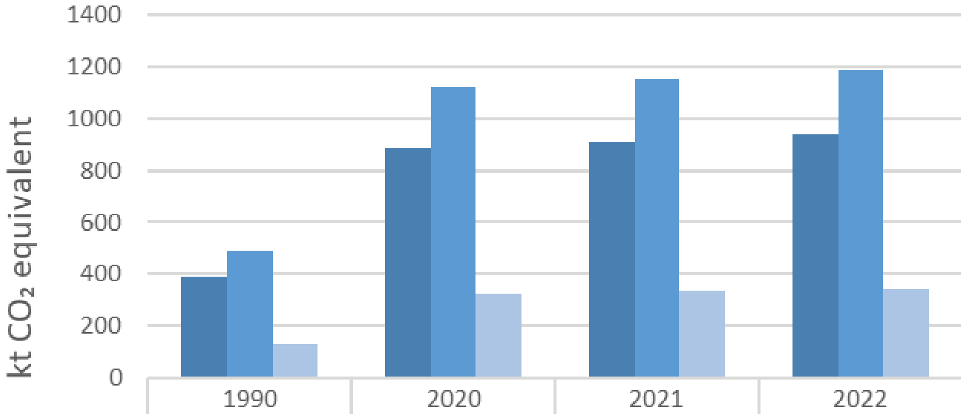
	1990	2020	2021	2022
5.D.2.Industrial wastewater	155.09	348.57	553	182.84
5.D.1.Domestic wastewater	1599.01	2215.24	2221.69	2233.74
5.C.1.Waste Incineration		9.31	8.81	8.65
5.A.3.Uncategorized waste disposal sites	129.27	325.09	334.24	345.49
Unmanaged waste disposal sites	488.35	1122.72	1150.79	1186.44
5.A.Managed waste disposal sites	387.81	888.31	910.41	938.51

Figure 31. GHG emissions from the Waste sector

- **1990:** *2,759.53 kt CO_2 eq.*
- **2022:** *4,895.66 kt CO_2 eq.*
- **Change:** *Increase of 77.4%.*

Trend: The sharp increase in emissions from the waste sector is largely due to urbanization and population growth, particularly in cities like Baku. As Azerbaijan’s economy has grown, the amount of solid waste generated has also increased. Waste management practices, including the use of unmanaged or categorically open waste disposal sites, have contributed to a rise in emissions, particularly methane emissions from decomposing organic waste.

2.1.5.2.1. SOLID WASTE DISPOSAL (5.A)



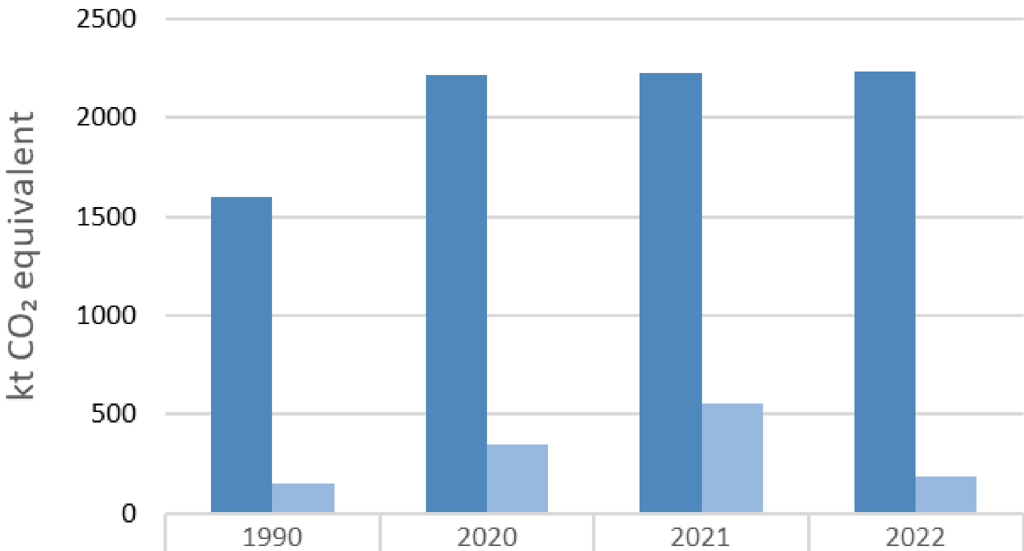
	1990	2020	2021	2022
5.A.1.Managed waste disposal sites	387.81	888.31	910.41	938.51
5.A.2.Unmanaged waste disposal sites	488.35	1122.72	1150.79	1186.79
5.A.3.Uncategorized waste disposal sites	129.27	325.09	334.24	345.49

Figure 32. GHG emissions from the Solid Waste Disposal

- **1990:** *1,005.42 kt CO_2 eq.*
- **2022:** *2,470.43 kt CO_2 eq.*
- **Change:** *Increase of 145%*

Trend: The increased emissions are tied to the rise in solid waste production due to economic development, but waste management infrastructure has not kept pace. Much of the waste is still disposed of in unmanaged landfills, which produce high levels of methane, exacerbating greenhouse gas emissions.

2.1.5.2.2. WASTEWATER TREATMENT AND DISCHARGE (5.D)



	1990	2020	2021	2022
5.D.1.Domestic wastewater	1599.01	2215.24	2221.69	2233.74
5.D.2.Industrial wastewater	155.09	348.57	553	182.84

Figure 33. GHG emissions from the Wastewater Treatment and Discharge

- **1990:** *1,754 kt CO_2 eq.*
- **2022:** *2,417 kt CO_2 eq.*
- **Change:** *38% increase.*

Trend: The growth of urban populations, particularly in cities such as Baku, has increased the amount of wastewater generated. Although there have been improvements in wastewater treatment processes, the scale of growth has outpaced infrastructure upgrades, resulting in a rise in emissions, especially from domestic wastewater.

3. ENERGY (CRT SECTOR 1)

3.1. OVERVIEW OF THE SECTOR

3.1.1. ENERGY BALANCE OF AZERBAIJAN

The energy balance includes a system of accounting ratios for collecting and coordinating data on all energy products imported, exported and utilized in the territory of the country during a certain period.

In 2022, 88.0% of energy products with a total production volume of 75.5 million tons of oil equivalent in the country were primary energy products, 8.3% were oil products, and 3.7% were heat and electricity. 50.5% of all primary energy products were crude oil (including gas condensate), 49.1% were natural gas, and 0.4% were energy products produced from renewable energy sources.

Azerbaijan is a country exporting crude oil, natural gas and oil products. In 2022, exports in the country amounted to 49.6 million tons of oil equivalent, 55.2% of which accounted for crude oil, 42.5% for natural gas, 2.0% for petroleum products, and 0.3% for electricity.

In 2022, Azerbaijan's energy demand (measured by total energy supply) amounted to 16.1 million tons of oil equivalent (Mtoe) (according to data from the State Statistics Committee). Azerbaijan is mainly a producer of crude oil (32.7 Mtoe, including natural gas liquids in 2022) and natural gas (35.0 billion cubic meters in 2022). Due to significant hydrocarbon production, Azerbaijan takes one of the highest places in the world in terms of self-energy supply ratio, and its production exceeds demand by almost four times.

Compared to 2021, total energy supply increased by 6.2% and amounted to 18.7 million tons of oil equivalent. Processes of the transformation sector account for 20.1%, internal consumption of the energy sector for 4.5%, losses for 4.0% and final consumption for 71.4% of total energy supply.

40.4% of final energy consumption fell on households, 27.8% on transport, 16.3% on industry and construction, and 15.5% on other sectors of the economy. The statistical collection on "Energy of Azerbaijan" covers the National Energy Balance for 2007-2022 and provides commodity balances of energy products and other necessary information on energy statistics. The collection consists of 5 sections. Section 1 includes the main indicators of the activities of energy enterprises, energy consumption and share of electricity in energy consumption, energy capacity, energy efficiency in industrial areas, Section 2 includes the energy balance by years and distribution of the balance by sectors, Section 3 covers the balance of energy products (commodities) including the energy balance, Section 4 includes the consumption of energy products by the economic activity types, Section 5 covers production of crude oil, natural gas, power stations capacity, information on pollutants released into the atmosphere by enterprises operating in separate sectors of the economy.

The current energy balance developed by “Oslo Group”, of which the UN, International Energy Agency, Eurostat and other international organizations and 21 countries, including Azerbaijan are members, and is based on the requirements of “International recommendations on energy statistics” adopted at the 42nd session of the UN Statistical Commission in February 2011.

3.1.1.1. STRUCTURE OF ENERGY BALANCE

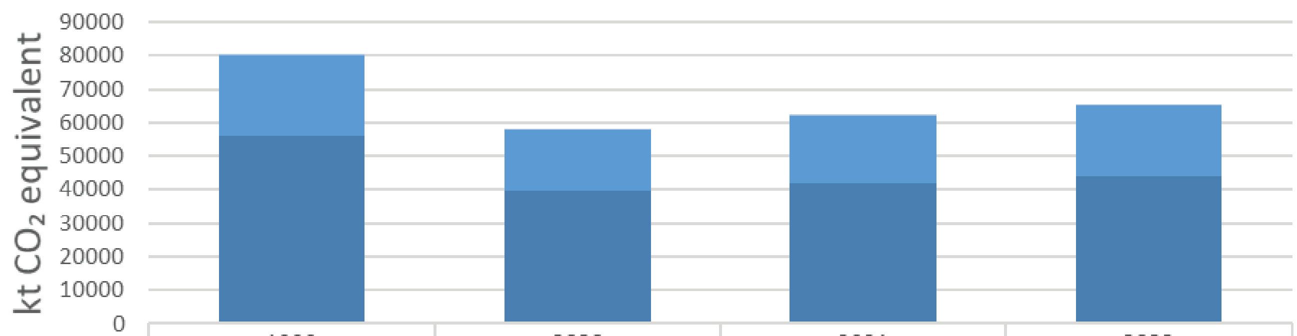
The energy balance is a complex aggregate expressed by the energy unit of a ton of oil equivalent (NET), combining the balances of individual energy products (crude oil, natural gas, electricity and etc.). 1 NET is 41.868 Gigacoula, or 0.041868 Teracoula, 1 Teracoul is equal to 1,000 Gigacoula. The development of energy balance is preceded by the development of commodity balances of all energy products specified in the balance sheet. The energy balance consists of 50 rows and 23 columns in the form of a matrix. The rows indicate the flows of energy from the place of its formation to the place of its final use, and the columns indicate energy products. The model of the National Energy Balance of Azerbaijan is based on the UN "International recommendations on Energy Statistics" and the unified structure of energy balances, considering the local features.

The energy balance table for the last inventory year of 2022 is provided separately in excel format in the Annex 1.

3.2. OVERVIEW OF GHG EMISSIONS OF THE SECTOR

The energy sector is the main source of anthropogenic GHG emissions in Azerbaijan. The energy sector in total greenhouse gas emissions (excluding LUCLUF) for 2022 has the largest share amounted to 81.8%.

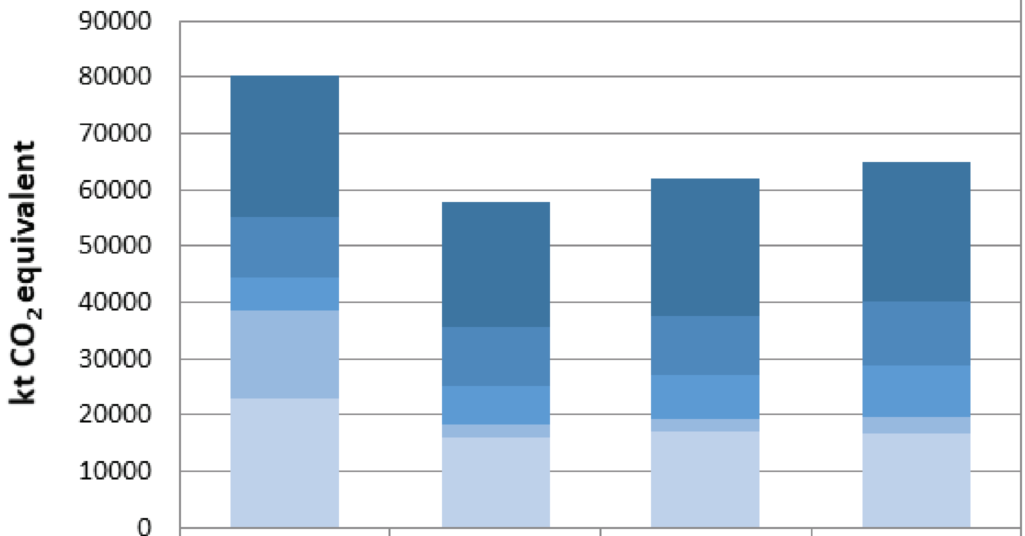
CO_2 emissions of the energy sector accounted for 67.5% of total CO_2 emissions in 2022. Non-CO_2 emissions generated by energy-related activities accounted for a fairly small proportion of total national emissions. In 2022, CH_4 emissions accounted for 32.3% of total national CH_4 emissions, while N_2O emissions accounted for 0.2% of total N_2O emissions.



	1990	2020	2021	2022
N2O	159	113.95	124.55	145.75
CH4	24064.6	18180.96	20317.92	21031.92
CO2	55935.29	39537.43	41705.48	43889.58

Figure 34. GHG emissions by gases in Energy sector

GHG emissions in the energy sector are primarily CO_2 generated as a result of energy production (1.A.1), processing industry and construction (1.A.2), transport (1.A.3) and combustion of residual fuels in other sectors (1.A.4).



	1990	2020	2021	2022
1.B.Fugitive emissions from fuels	25121	22372	24455	24885
1.A.4. Other sectors	10537	10215	10644	11357
1.A.3.Transport	6092	6936	7779	9244
1.A.2.Manufacturing industries and construction	15391	2411	2316	2897
1.A.1.Energy industries	23018	15899	16954	16684

Figure 35. GHG emissions in Energy sector

Figure 35 shows that the emissions of the energy sector have decreased by 24.86% since 1990. The reduction in emissions occurs primarily due to the transition from carbon-intensive fossil fuels such as diesel and residual fuel oil to cleaner fuels such as natural gas to improve energy efficiency and generate electricity. Nevertheless, from 2016 to 2022, there was a 28% increase in total emissions. This is primarily due to an increase in the volume of gas production and transmission, that is, fugitive emissions of CH_4 from oil and natural gas operations. A significant increase of 51.8% in the transport category was also observed, mainly due to the increase in automobile transportation. Due to the increase in the use of natural gas for heating purposes, there has also been a slight increase in the construction sector.

Emissions from combustion activities in the energy sector is calculated based on fuel consumption data provided by the SSC for 1.A.1.b Category of Oil Refining and 1.A.1.cii Other Energy Industries (oil and gas production). And SOCAR's data is used for natural gas processing. All calculations are performed based on the net calorific values with standard carbon content of IPCC 2006 guidelines.

Fugitive emissions were calculated based on the data provided by the SSC on oil and gas production, pipeline transportation of liquid natural gas and oil, transfer and storage of gas, raw gas supply for gas processing, as well as SOCAR and BP Azerbaijan - gas and oil production operators. All calculations were carried out on the basis of the Tier 1 approach of the IPCC 2006 guidelines.

In its previous reports Azerbaijan used the Global Warming Potential (GWP) values from the IPCC's second assessment report, while the GWP values from the IPCC Fifth Assessment Report is used in the current report. The recalculations carried out show an increase in emissions, which is largely due to the introduction of a new GWP value for methane.

Total emissions from the energy sector for 2022 amounted to 60,226.75 kt CO_2 equivalent. The main share of emissions from the energy sector (27.7%) accounted for the energy industries.

3.2.1. FUEL COMBUSTION (1.A)

Fuel combustion category in the energy sector of the country covers all the areas of human activity. Since no restrictions apply to the statistical collection of data on these areas, this category also includes areas such as residential and commercial/institutional. At the same time, oil and gas are combusted in the country in the processes of production and processing of oil and gas. In the last inventory year of 2022, liquid fuel (156,468.584 TJ) and natural gas (512,112.26 TJ) were mainly used in fuel combustion processes.

This category includes stations that provide electricity and thermal energy, and enterprises that produce industrial products. The energy balance includes information on the fuel supplied to the stations generating electric and thermal energy. To protect confidential business and military information, a minimum level of collection was carried out and open data of the SSC was used.

3.2.1.1. FUEL COMBUSTION IN THE PRODUCTION OF ELECTRICITY

1.A.1 of the 1.A(a) Table of CRT The amount of fuel combusted at power stations operating based on fuel in the Electric Power Generation section is given in TJ. As can be seen from Table 1A(a) of CRT, in 2022, gas (255,772.7 TJ) and partly diesel and fuel oil (923.3 TJ) were used in the processes of electricity generation at thermal power stations in Azerbaijan. As a result of waste burning at the Baku Solid Waste Incineration Plant in Balakhani, Tamiz Shahar OJSC produces up to 200 million kWh of electricity per year, which is transmitted to the general network of Baku city.

3.2.2. VERIFICATION OF THE SECTORAL APPROACH FOR CRT 1.A

3.2.2.1. COMPARISON OF THE SECTORAL APPROACH WITH THE REFERENCE APPROACH

Report on CO_2 emissions related to fuel combustion is of paramount importance in the context of international climate protection, since such emissions make up the bulk of total emissions. To this end, countries apply a sectoral approach that allows diversity in the analysis of emission structures, appealing to the level of energy consumption of individual sectors.

"Sectoral approach" (1.AA) is the calculation of CO_2 emission by multiplying the amount of fuel consumed in the sectors by the emission ratio.

"Reference approach" (1.AB) is the calculation of CO_2 emission using the flow of all total fuel in the country (initial data on production, imports and exports, as well as data on changes in the energy balance) (IPCC 2006 Guidelines, Vol.2, Chapter 6).

In accordance with the IPCC 2006 Guidelines, the carbon emission factors used are equivalent to those of the sectoral approach and thus, contain values referenced at the national level. Calculated CO_2 emission data is used to verify the sectoral approach.

GHG emissions of the energy sector are compared using the sectoral approach (SA) and the reference approach (RA).

As mentioned, SA is a "bottom-up" approach method in assessing CO_2 emissions, while RA is a “top-down” approach in assessing CO_2 emissions using the National fuel statistics.

These values for GHG emissions in Azerbaijan are based on the data provided by the SSC, the bottom-up activity data, which presents the annual consumption of primary and secondary fuel in various economic sectors, as well as data on the non-energy use of various types of fuel. The difference between SA and RA arises, first of all, from the statistical differences between production and demand within the National Energy Statistics, statistical differences between fuel estimates, underestimation of fuel used for non-energy purposes, “other types of fuel” in National Statistics, as well as from more general approaches to the application of emission factors to the activity data on fuel types.

	1990	1995	2000	2005	2010	2015	2020	2021	2022
RA (kt CO_2)	57,138.79	37,484.27	32,065.58	35,839.05	29,209.25	36,236.78	36,843.38	38,828.13	41,239.41
SA (kt CO_2)	54,748.16	33,823.62	28,747.44	33,782.24	25,911.82	33,803.35	35,257.19	37,468.42	39,930.22
Difference CO_2 emissions (%)	4.37	10.82	11.54	6.09	12.73	7.2	4.5	3.62	3.28

Table 18. Comparison of RA and SA in terms of CO_2 emissions

Difference between the reference approach and the sectoral approach to CO_2 estimations for Azerbaijan was 4.4% in 1990, however in 2022 this figure decreased to 3.3%. Such a decrease in the trend of difference between RA and SA since previous GHG inventory reports indicates significant improvements in the data collection process.

More information on the RA, SA and RA-SA comparison can be found in CRT Table 1.A(b), Table 1.A(c) and Table 1.A(d).

3.2.2.2. COMPARISON WITH OTHER SOURCES OF INFORMATION AVAILABLE FOR AZERBAIJAN

In accordance with the provisions of the IPCC 2006 Guidelines, the results of detailed sectoral calculations of energy-related CO_2 emissions should be compared with any other sources of information available by the reporting country.

When calculating CO_2 emissions from fuel combustion within the framework of such an inspection Global CO_2 emissions data set (detailed estimates) of the International Energy Agency was used. The report cites that global CO_2 emissions from fuel combustion and industrial processes have increased by 0.9% or 321 Mt in 2022, and reached 36.8 Gt, an all-time high level. These values are based on the IEA's latest official National Statistics and fuel analysis, which includes open information on energy use and economic performance by regions.

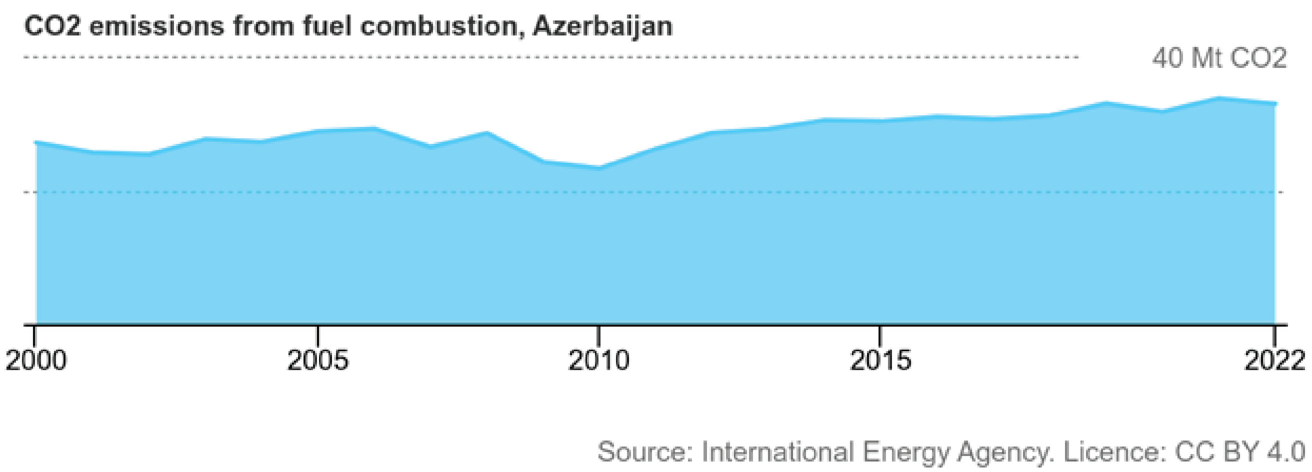


Figure 36. GHG emissions from fuel combustion, IEA

The IEA's assessment of CO_2 emissions from fuel combustion in Azerbaijan states that the country's share in global emissions is approximately 0.1%, the growth trend in 2000-2021 is 21%, and the total amount of emissions is 33.1 million tons in 2022, which means a significant difference, although it is partially close to the results of the current report (39.9 million tons).

The comparative data is developed and published by the IEA. Sometimes it does not fully match the data of the IEA, since it carries out calculations based on the data collected, processed and provided by the relevant institutions in Azerbaijan.

Despite a number of methodological limitations, a comparison with the IEA data shows an average discrepancy of 19%, and therefore it likelihood confirms the CO_2 emissions established for Azerbaijan. It is assumed that the uncertainties are greater because the IEA is an international source.

Comparable national emissions in all relevant years in the report are significantly higher than the relevant results published by the IEA.

3.2.3. CO_2 EMISSIONS AS A RESULT OF NON-ENERGY USE OF FUEL

The vast majority of oil and gas used by Azerbaijan is used for energy-related purposes. However, part of these fuels is also used as raw material for non-energy-related production processes. In the energy balance of Azerbaijan (EB), this consumption, which is not related to energy, is mentioned separately in line 50. The main consumer that dominates in this area is the chemical industry, and the most important derivative products include ethylene and methanol.

Bitumen and lubricants, on the other hand, are produced at oil refineries. Applications for bitumen include the production of road covering and roofing, while lubricants are used in transport vehicles and various other types of machinery.

CO_2 generated from energy substances used for non-energy purposes and other GHG emissions are calculated in the respective sector categories.

Table 19 reflects data on substances used for non-energy purposes for 2022.

Fuel	Estimated Quantities (TJ)	Conversion Factor (TJ/Unit)	Estimated Quantities (TJ)	Carbon content (t C/TJ)	Excluded Carbon (Gg C)
Bitumen	10,735	1	10,735	22	236.17
Gas/Diesel Oil	490.6	1	490.6	20.2	9.91012
Liquefied Petroleum Gases	10,936.2	1	10,936.2	17.2	188.1026
Lubricants	3,452.6	1	3,452.6	20	69.052
Naphtha	11,026.2	1	11,026.2	20	220.524
Other Petroleum Products	27,010.4	1	27,010.4	20	540.208
Petroleum Coke	123.1	1	123.1	26.6	3.27446
Refinery Gas	2,090.8	1	2,090.8	15.7	32.82556
Residual Fuel Oil	8.5	1	8.5	21.1	0.17935
Natural Gas (Dry)	29,052.8	1	29,052.8	15.3	444.5078

Table 19. Fuels used for non-energy purposes (without combustion) (2022)

It should also be noted that there is no detailed information on the production of such products as White alcohol and SBP, Orimulsion, paraffin waxes and other by-products of the petrochemical industry. The non-use of such products in the industry for non-energy purposes also leads to an increase in the difference between RA and SA.

3.2.4. INTERNATIONAL BUNKER FUELS

3.2.4.1. EMISSIONS FROM INTERNATIONAL TRANSPORTATION (1.D.1.A / 1.D.1.B)

International Transportation is divided into Civil Aviation (1.D.1.a) and International Shipping (1.D.1.B). International bunker emissions (international aviation and shipping) are not included in the national total emissions, but they are reported separately. Activity data for both subcategories are taken from the national energy balance, while emission factors (EF) are taken from the standard emission factors of the IPCC 2006 Guidelines.

	1990	1995	2000	2005	2010	2015	2020	2021	2022
International Bunkers	**1,295.11**	**317.41**	**458.54**	**1,221.01**	**1,453.88**	**983.85**	**1,146.01**	**1,391.35**	**1,370.48**
1.D.1.a. Aviation	1,057.55	307.93	304.82	1,122.86	1,219.60	824.26	1,043.55	1,303.58	1,344.95
1.D.1.b.Navigation	237.56	9.48	153.72	98.15	234.28	159.59	102.46	87.77	25.54

Table 20. GHG emissions from international bunkers, kt CO_2 eq.

3.2.4.1.1. METHODOLOGICAL ISSUES (1.D.1.A / 1.D.1.B)

These calculations were made according to Tier 1 adopted for aviation and naval bunkers, as described in the relevant chapters of IPCC 2006 Guidelines.

The activity data for both subcategories are taken from the National Energy Balance, while the emission factors are taken from the table below:

Indicators	kg CO_2 /TJ	kg CH_4 /TJ	kg N_2O /TJ
International aviation			
Jet kerosene	71,500	0.5	2
International water-borne navigation			
Gas/diesel oil	74,100	7	2
Residual fuel oil	77,400	7	2
Other petroleum products	73,300	7	2

Table 21. EF for international aviation and naval bunkers

The corresponding emission factors given in the IPCC 2006 Guidelines are selected as emission factors and the IPCC 2006 provisioning program is used. Data on activities are taken from the official energy statistics of the SSC and are based on the division of annual fuel quantities for international and domestic flights. Such divisions are obtained based on annual shares of domestic flights from the total fuel filled into the bunkers.

3.2.4.1.2. ANALYSIS OF UNCERTAINTIES (1.D.1.A / 1.D.1.B)

In the inventory trend of the countries recommended in the IPCC Guiding Principles, uncertainties for the international bunker are calculated based on the IPCC software.

In 1990 and 2022, jet fuel was used in international aviation, while fuel oil and diesel were used in international water transport in the 1990s, and only diesel in 2022.

Indicators	Gas	Uncertainty in trend in national emissions introduced by emission factor uncertainty (%)	Uncertainty in trend in national emissions introduced by activity data uncertainty (%)	Uncertainty introduced into the trend in total national emissions (%)
1.A.3.a.i - International Aviation	CO_2	0.013	0.087	0.008
1.A.3.a.i - International Aviation	CH_4	0.000	0.000	0.000
1.A.3.a.i - International Aviation	N_2O	0.000	0.000	0.000
1.A.3.d.i - International water-borne navigation	CO_2	0.014	0.002	0.000
1.A.3.d.i - International water-borne navigation	CH_4	0.000	0.000	0.000
1.A.3.d.i - International water-borne navigation	N_2O	0.000	0.000	0.000

Table 22. Uncertainties in the national GHG emissions trend

As it can be seen from the table 22, 1.A.3.a.i -uncertainty in the emission factor of the International Aviation source is 0.013%, in the activity data – 0.087% and in the trend of total CO_2 emission is 0.008%. Since the emissions of the other two gases (CH_4 and N_2O) are very small, the uncertainties of their emission factor and activity data are virtually negligible.

Similarly, 1.A.3.d.i- the uncertainty in the emission factor of international water transport is 0.014%, in activity data – 0.002% and in the general emission trend is close to zero.

3.2.4.1.3. CATEGORY-RELATED QUALITY ASSURANCE / CONTROL AND VERIFICATION (1.D.1.A / 1.D.1.B)

Quality Control and Quality Assurance were carried out by the relevant specialists in accordance with the requirements of the IPCC 2006 Guidelines and other related relevant documents.

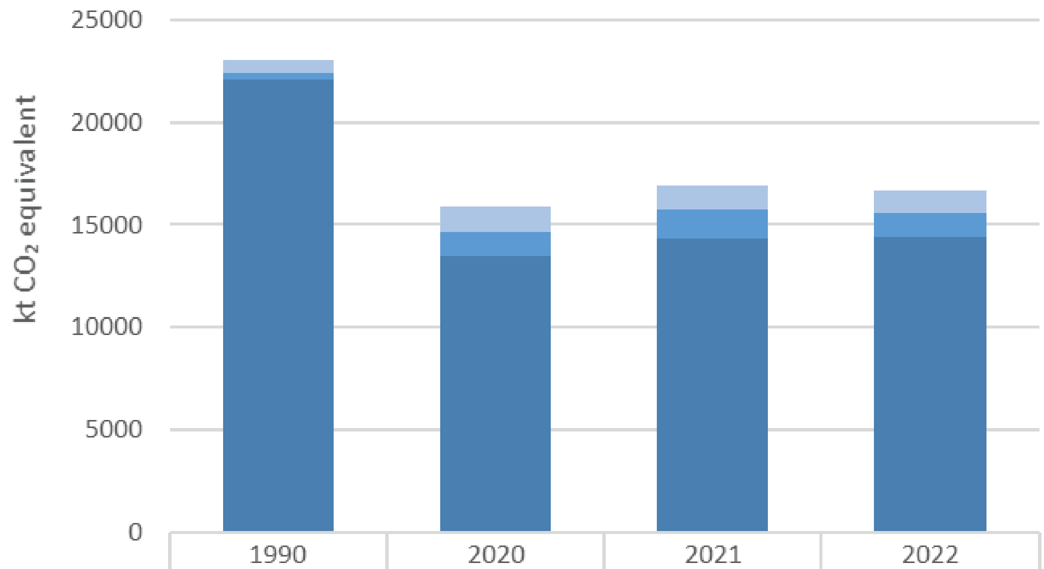
3.2.4.1.4. CATEGORY-RELATED RECALCULATIONS (1.D.1.A / 1.D.1.B)

Recalculations in the category were carried out only for 1990 as the reference year.

3.2.5. ENERGY INDUSTRY (CATEGORY 1.A.1)

3.2.5.1. CATEGORY DESCRIPTION

This source category includes emissions associated with electricity and thermal energy generation, oil refining, as well as oil and gas production. This category is one of the main sources of emissions in Azerbaijan. The share of CO_2 emissions from the energy industry amounted to 41.8% of the total energy sector in 1990, and to 41.5% in 2022. 1.A.1 source is the key category of gas fuels in 2022 in terms of CO_2 emission level and emission trend.



	1990	2020	2021	2022
1.A.1.c.Manufacture of solid fuels and other energy industries	567.36	1232.34	1191.66	1112.1
1.A.1.b.Petroleum refining	383.95	1235.92	1424.99	1140.17
1.A.1.a.Public electricity and heat production	22066.2	13430.5	14337.77	14431.41

Figure 37. GHG emissions in the energy industry

There are several reasons for the decrease in emissions from the energy production sector since 1990:

- Power generation in the energy industry of Azerbaijan has changed from residual fuel oil burned at steam plants to gas use at combined cycle gas-turbine plants.
- Transition of the fuel mixture from more carbon-intensive fuels such as residual fuel oil to less carbon-intensive fuels such as natural gas has been ensured;
- Implementation of the oil and gas refineries modernization project ensured the increase of energy efficiency, which, in turn, led to a decrease in the emission intensity of the processing;
- Use of residual fuels has decreased due to the increase in the use of waste and renewable energy sources.

The increase in emissions from fuel combustion processes, starting from 2018, is explained by an increase in the demand for energy products, mainly due to the growth of population.

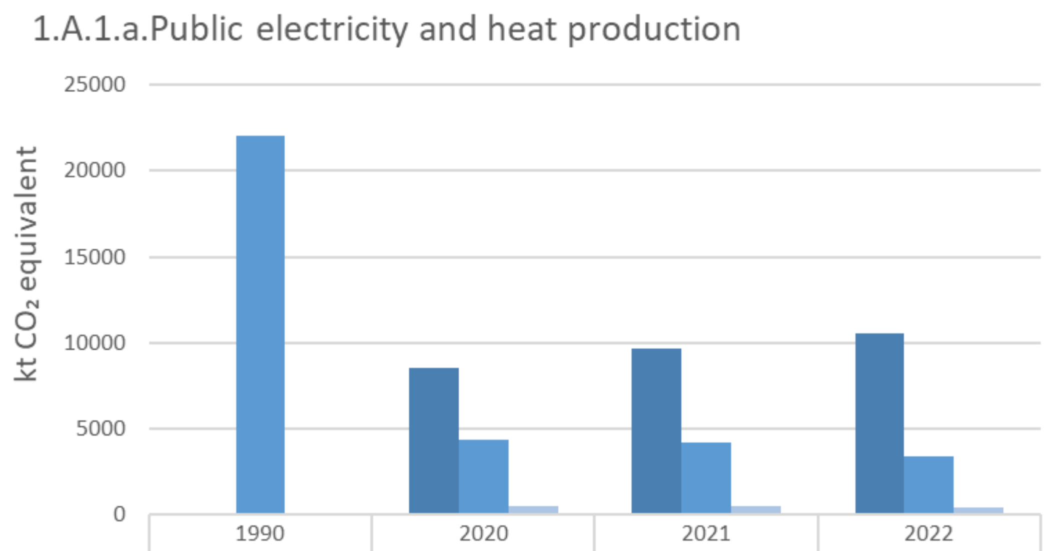
Public electricity and heat production (1.A.1.a) subcategory is the key category for CO_2 and CH_4 emissions in terms of level and trend.

"Public electricity and heat power generation" subcategory (1.A.1.a,) includes central heating plants and public power plants, which include electricity and heat generation. Installations that generate from biomass and supply electricity to the public grid also refer to Category 1.A.1. This includes electricity generation (1.A CRT Table A (a).1.a.i. Electricity generation), combustion of fuel in combined (generating both electrical and thermal energy) plants (CRT Table A(a) 1.A.1.a.ii. Combined heat and power generation) and heat plants (boilers) (CRT Table A(A) 1.A.1.a.iii. Heat plants).

In 2022, mainly natural gas (60,761.7 TJ) and partially residual fuel oil (48.9 TJ) were used as fuel at combined thermal power plants (TPP) in Azerbaijan.

To ensure the heat supply to population, economy and administrative buildings, numerous thermal stations (boiler houses) operate, mainly in city and regional centers, as well as in various industrial, household, tourist and other areas. Mainly gas (7 953.9 TJ) and partly residual fuel oil (12.8 TJ) were used as fuel in these boiler houses in 2022. At the same time, it should be noted that these fuels do not include those used in autonomous combined heating systems for heating private houses, high-rise buildings being built, which significantly increases the ambiguities in this category.

The following figure shows CO_2 emissions in Category 1.A.1.a.



	1990	2020	2021	2022
1.A.1.a.i.Electricity generation		8574.27	9645.65	10558.48
1.A.1.a.ii.Combined heat and power generation	22024.29	4353.58	4212.63	3412.34
1.A.1.a.iii.Heat Plants		489.52	464.49	446.43

Figure 38. GHG emissions from key activities on public electricity and heat generation

In this subcategory, emission is mainly formed from the development and structures of electricity generating facilities. In terms of trends, the industry has generally undergone changes due to the collapse of the industry in the 1990s and the impact of the coronavirus pandemic in 2020, however increase in demand is being observed. However, obviously, there was no significant increase in the amount of emissions due to the replacement of fuels used in this subcategory with cleaner fuel (transition from residual fuel oil to gas), the transition to the use of low-power technologies in power plants and the use of renewable energy sources. Oil and natural gas are used as fuel in oil refining processes in Azerbaijan (CRT Table, 1.A.1.b.) to meet the demand. In 2022, oil (10,429.13 TJ) and gas (7,297. 06 TJ) were used as fuel in oil refining processes. Figure 39 provides data on emissions released in oil refining processes.

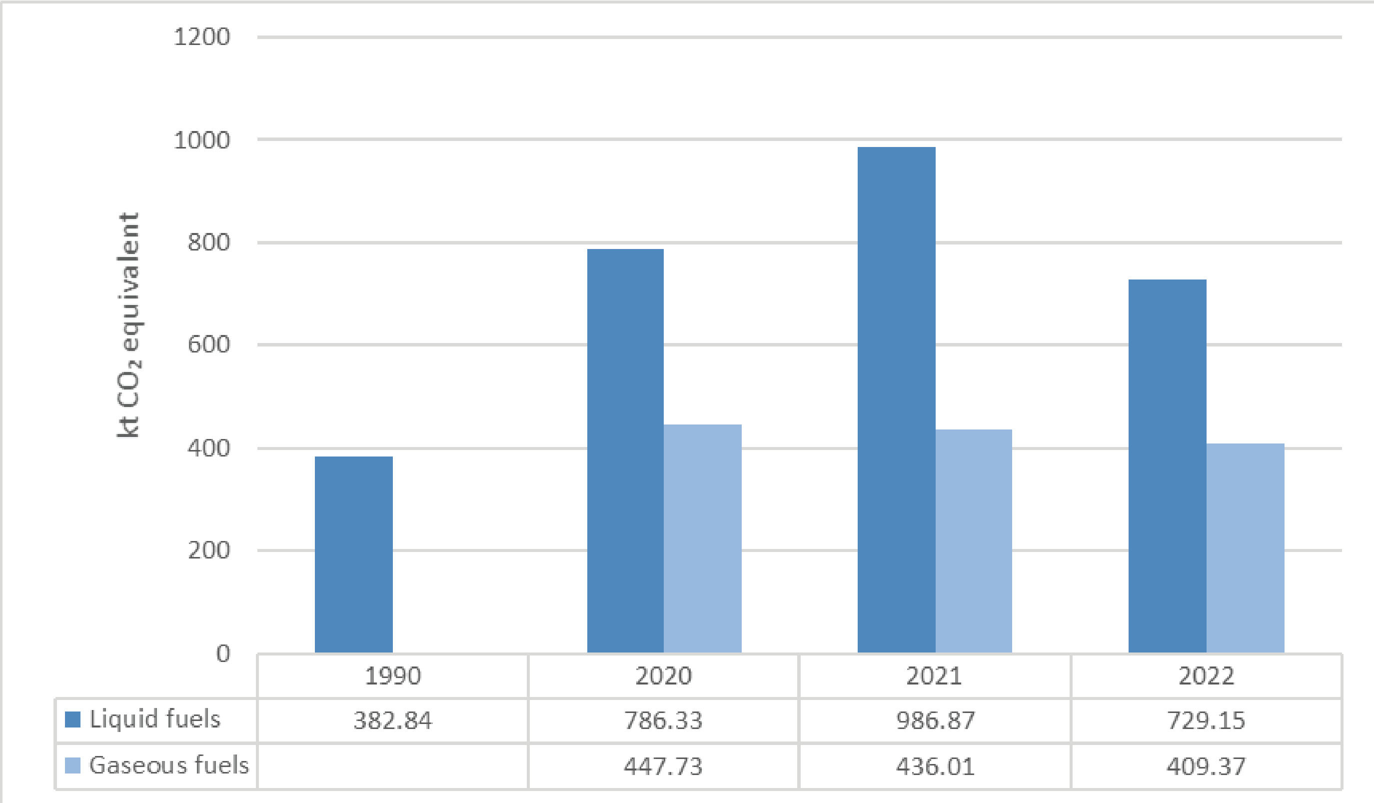


Figure 39. GHG emissions from oil refining processes

In terms of GHG emission level and trend oil refining in the country is the key category for CO_2 emissions. Common factors that condition emission trends include annual production quantities. In recent years, the country's oil production has been rapidly declining. If in 2010-2011 50-51 million tons of oil were produced annually, then in 2015 (after the adoption of PS) it decreased from 41,628 thousand tons by about 23%, and in 2022 it fell to 32,646 thousand tons. This trend is predicted to continue in subsequent years.

SOCAR's Oil refinery plant named after Haydar Aliyev is currently building diesel and gasoline production facilities in accordance with Euro-5 standards. Diesel is already being produced at the ORP in accordance with Euro-5 standards, and in the near future the quality of gasoline will be increased to “Euro-5” standards. Modernization works are expected to be completed in 2026-2027. At the end of the current stage of the project, 22 main technological facilities will operate at the ORP. A number of new and modern technological and industrial facilities have been built and put into operation. Some restoration works have been carried out in 5 main facilities and a large part of the offsite utilities and existing infrastructure of the ORP has been completely renewed.

3.2.5.2. METHODOLOGICAL ISSUES (1.A.1)

The Tier 1 approach of the IPCC 2006 Guidelines was used to calculate emissions in energy industries. Emissions from public electricity and heat generation (1.A.1.a) are calculated based on data on the carbon content of fuels provided by the IPCC 2006 Guidelines and the national low-heat capacity ratio from the Statistical Compendium on Energy of the SSC. The category of State Electric and heat energy generation includes electric and heat generation of all electric power generation facilities in operation. SOCAR responded to the inquiries developed by national GHG inventory experts to obtain data on fuel used in oil refining.

In 2022, the last year of inventory in this category, a total of 238,992 TJ of fuel was combusted. Of these, 238,441.8 TJ accounted for natural gas and 550.2 TJ for residual fuel oil. At the same time, Tamiz Shahar OJSC generated electricity due to combustion of 8.5 TJ of biomass since 2013. Stone-coal is not used in Azerbaijan for the purpose of obtaining electricity and heat energy. Since 1990, the use of natural gas for electricity generation has increased significantly, and most of the residual fuel oil enterprises have been replaced with gas, and new modular power plants operating on natural gas have been built and put into operation. The data was taken from the official data of the SSC. When calculating GHG emissions, Tier 1 of IPCC 2006 Guidelines was used. The corresponding emission ratios of IPCC 2006 were used as emission factors, and the IPCC's latest software was used to calculate.

All data on the production of petroleum products were obtained from official statistics. The SSC provides a comprehensive description of transformational inputs and ORPs' own consumption and imports. 1.A.1.b Category reports only on crude oil refinery. Since almost all emissions of the oil refinery plant are caused by combustion processes, ORP emissions are reported in 1.A.1.b category. And torch emissions are reported in 1.B.2.a.iv Category. The GHG inventory used Level 1 of IPCC Guidelines, corresponding emission factors, and the latest provisioning software of the IPCC 2006 Guideline.

3.2.5.3. UNCERTAINTIES AND CONSISTENCY OF TIME SEQUENCES (1.A.1)

Uncertainties for activity data were identified for previous reports and current reporting period. This appears in situations that can occur in statistical data collection, changes in technological processes.

Emission factor uncertainty for calculation of CO_2 emission into the atmosphere during natural fuel combustion is relatively small. Because, the emission factor is determined by the carbon content of the fuel. It should be noted that some discrepancies can occur in uncertainties of CO_2 emission factors for petroleum products, coal and natural gas. Therefore, the uncertainties in the emission factors of these three types of fuel are different. Another form of possible uncertainties may lie in the selection of emission factors. The figures are based on the range covered by the carbon content of different fuels. Uncertainties in emission data are the result of several different factors. A distinction must be made to these, within the framework of emission measurement, random and systematic errors, as well as to the completeness of the database regarding the existing measurements. For example, the variability of the plant's emissions during the mentioned period (intra-plant variability) and the differences between the emissions of different sources under consideration (inter-enterprise variability) increase uncertainties.

In order to estimate the emission amount of CO_2 from the combustion of oil and gas products processed in Azerbaijan the uncertainties of the emission factors taken are very small. This is explained by the fact that there is only one oil refinery and one gas processing plant in the country. Therefore, the range of carbon content of products produced in these plants is small.

As per CH_4 and N_2O gases, the uncertainties in their emission factors can be high. Because they are not precisely measurable and therefore their uncertainties are different. Since uncertainties are underestimated in most countries, the IPCC 2006 methodology uses “default” ratios given to relevant sources. According to expert estimates, the uncertainties for emission ratios and activity data used to calculate emissions in the combustion process in the country are close to the default figures. Within the IPCC framework, a limit of ±50% has been estimated for the uncertainty in GHG sources in this category. In this regard, when using emission factors in the literature, all qualitative information provided by the afore-mentioned sources should also be used. In general, it is recommended to use expert reasoning in cases where there is not enough data to quantify the available empirical data.

3.2.5.4. CATEGORY-RELATED QUALITY ASSURANCE / QUALITY CONTROL (1.A.1)

General and category-related quality assurance and quality control were carried out by independent experts in accordance with the requirements of the IPCC Guidelines and the relevant applicable documentation. To document Quality Assurance Measures in the development of energy balances, the Working Group on energy balances submits relevant quality reports to the SSC. Quality assurance of official statistics is carried out through the internal quality system. If necessary, regular exchanges are additionally carried out within the framework of meeting.

3.2.5.5. CATEGORY-RELATED RECALCULATIONS (1.A.1)

Recalculations for the category of energy industry were carried out for 1990.

3.2.5.6. PLANNED IMPROVEMENTS TO THE CATEGORY (1.A.1)

Taking into account the fact that the energy industry is the category of primary resources, planned improvements, including improvements in the analysis of carbon content values and low heat dissipation ability ratios of residual fuels are envisaged to ensure the collection of statistical activity data.

Relevant measures are intended to improve statistical data on activity sources as the second improvement area in the category. Improvements in the energy sector are provided in the Recalculations and improvements section (Chapter 10).

3.2.5.7. SOLID FUEL PRODUCTION AND OTHER ENERGY INDUSTRY (1.A.1.C)

Activities in this category are not estimated. In this regard, it is marked with "NO".

3.2.6. PROCESSING INDUSTRY AND CONSTRUCTION (1.A.2)

3.2.6.1. CATEGORY DESCRIPTION

Calculation for structural elements in the subcategory 1.A.2 was revised through the justification of the quality of activity data. In most cases, they are based on data from the SSC. Different division of activity data by sectors was carried out only for the process of fuel combustion. Although combustion data is presented in accordance with the sector, the available data does not allow for complete disaggregation in accordance with UNFCCC requirements. For example, the heat and energy production of industrial electric and thermal power plants cannot be completely focused on specific sectors. Differentiation of the combustion process associated with energy for heat production in industrial boiler systems was carried out through statistical data. In the last inventory year of 2022, 44,458.2 TJ of natural gas and 5,375.3 TJ of liquid fuel were used in the category of processing industry and construction (1.A.2).

Emissions fluctuations in this category in recent years reflect production trends in the manufacturing sector of Azerbaijan, which are related to general economic trends. This resource category consists of manufacturing industry sectors. The IPCC classifies the manufacturing industry as iron and steel, non-ferrous metals, chemical, pulp, paper and printing, food processing, beverages and tobacco, non-metallic minerals and other industries.

	1990	1995	2000	2005	2010	2015	2020	2021	2022
1.A.2.a	724.3	347.8	122.6	237.2	61.9	105.1	37.3	52.2	49.4
1.A.2.b	1,390.2	670.2	208.0	273.7	18.5	9.8	4.5	9.1	19.5
1.A.2.c	2,129.0	1,029.3	272.8	116.6	448.0	570.7	776.4	579.0	877.4
1.A.2.d	4.0	1.9	0.5	0.2	2.6	4.4	4.6	5.3	5.5
1.A.2.e	1,436.0	702.0	200.7	177.0	507.8	853.4	283.1	287.5	348.7
1.A.2.f	6,753.1	3271.1	871.8	378.6	257.8	562.3	857.4	948.5	1045.0
1.A.2.g	12.7	8.8	11.7	17.1	11.7	20.9	0.8	0.8	0.8
1.A.2.h	1,086.5	528.4	144.7	70.8	31.0	64.1	39.1	36.6	57.9
1.A.2.i	151.3	122.3	95.3	123.6	31.0	28.7	50.4	54.1	58.9
1.A.2.j	4.0	1.9	0.5	0.2	0.4	6.1	0.2	0.2	0.0
1.A.2.k	423.0	386.2	48.8	121.3	171.7	268.9	318.1	300.6	394.6
1.A.2.l	74.0	31.1	8.2	3.5	9.0	15.4	27.9	26.9	23.1
1.A.2.m	1,203.3	582.6	154.4	66.0	1.2	55.2	10.8	14.9	16.0

Table 23. GHG emissions from manufacturing industry and construction, kt CO_2 eq.

1.A.2. "Processing industry and construction" is a subcategory of the Fuel combustion category. This subcategory is divided into the following, corresponding to production areas:

- Iron and Steel (1.A.2.a) - is the key category in terms of emission levels and trends for CO_2 emissions. Iron and steel industry along with cement industry in the field of technological combustion, is the second important source of CO_2 emissions.
- Non-ferrous metals (1.A.2.b) include emissions released as a result of combustion processes in various areas of non-ferrous metal production. At the same time, it should be noted that the available statistics do not support more detailed description of emissions.
- Main relevant facilities in the chemical (1.A.2.c) industry consist of industrial-purpose power plants and boiler houses. Such facilities are reported in 1.A.2.g other sub-category for all sectors.
- Pulp, paper and printing (1.A.2.d) is not the key category.
- Sugar production (1.A.2.e) is not the key category.
- Transport equipment (1.A.2.g vii) - stationary and mobile sources in 1.A.2.g are grouped together for the purposes of attributing them to the key categories. Accordingly, Category 1.A.2.g vii - Other: Cars and other vehicles, where emissions from the construction sector transport are taken into account, are the key category for CO_2 in terms of emission levels and trends.
- Other power generation (1.A.2.G viii) - all emissions for 1.A.2.c sub-category are included in other category (IE). For this reason, 1.A.2.c sub-category is not mentioned separately as the key category. In the chemical industry, most emissions come from combustion processes. Therefore, emissions from the energy-related use of fuels in the chemical industry are reported in the 1.A.2.gviii "Other" category along with the emissions for other industrial sectors. As mentioned, this is to avoid double calculation with the SPMI sector. In addition, it is important to ensure that the emissions resulting from the combustion of other extracted gases are not underestimated. Therefore, the first analytical step was to identify areas of the chemical industry where other extracted gases are generated and used for energy generation. More than half of the gas generated is used in the production of other organic base materials and chemicals. Still a small part of these gases is used in the manufacture of plastics in primary forms. The corresponding gas consumption for recalculation was determined by the main products produced in each sector. Despite the fact that combustible coal is used in this area in developed countries, natural gas is used as fuel in Azerbaijan historically and currently.

3.2.6.2. METHODOLOGICAL ISSUES (1.A.2)

Since 2010, the division of national energy balance sheets by sectors partially corresponds to IPCC categories. All data are taken from the annual data of the SSC. The Tier 1 approach of the IPCC 2006 Guidelines was used to calculate emissions in the Processing industry and Construction categories.

The relevant calculations were carried out with IPCC software using emission factors and SSC data on activities in accordance with the IPCC 2006 Guidelines.

3.2.6.3. UNCERTAINTIES AND TIME SEQUENCE MATCHING (1.A.2)

Uncertainties are similar to those in the energy industry (1.A.1).

3.2.6.4. QUALITY ASSURANCE / QUALITY CONTROL (1.A.2)

Quality control and Quality Assurance were carried out by the relevant specialists in accordance with the requirements of the IPCC 2006 Guidelines and other related relevant documents.

3.2.6.5. SUBCATEGORY-RELATED RECALCULATIONS (1.A.2)

Recalculations for the category of energy industry were carried out for 1990.

3.2.6.6. PLANNED IMPROVEMENTS ON THE SUBCATEGORY (1.A.2)

As an area of improvement in the category, appropriate measures are envisaged to improve statistical data on the sources of activity.

3.2.7. TRANSPORT (1.A.3)

3.2.7.1. SUBCATEGORY DESCRIPTION (1.A.3)

The assessment of emissions in transport is carried out by the following sources:

- Domestic Aviation (1.A.3.a)
- Road Transportation (1.A.3.b)
- Railways (1.A.3.c)
- Domestic Water-borne Navigation (1.A.3.d)
- Pipeline (other transport) (1.A.3.e.i)

GHG emissions from this source were higher in 2022 than in 1990 by 51.8%. In 2022, emissions increased on average by more than 38.3% compared to 2016 and amounted to 9,243.7 kt of CO_2 equivalent.

GHG emissions from the transport sector in the total share of the energy sector in 2022 amounted to 14.2%, and in 1990 - only to 7.6%. As shown in the table 24 road transportation is the main source, accounting for 92.4% of CO_2. In 2022, the share of domestic aviation in transport emissions amounted to 5.1%, domestic water-borne navigation - 1.9%, railways - 0.4%. The share of other shipments, including pipeline and off-road transport, is 0.07%.

	Domestic Aviation	Road Transportati on	Railways	Domestic Water-borne Navigation	Other Transportation
1990	462,06	5367,78	124,54	100,76	34,86
1995	55.99	2,805.08	42.02	32.71	NE
2000	52,88	1,959.01	57.73	29.36	NE
2005	199.07	3,387.48	91.47	49.31	NE
2010	279.63	4,623.64	11.35	88.14	0.30
2011	321.31	5,419.88	62.08	110.43	8.80
2012	339.04	6,000.66	60.61	117.14	9.64
2013	484.91	6,762.21	62.66	102.14	12.52
2014	513.22	6,998.47	53.07	95.75	13.31
2015	587.25	6,379.06	55.97	83.13	12.08
2016	703.27	5,815.64	56.26	91.60	13.30
2017	1,005.91	6,617.23	30.65	151.29	9.61
2018	1,122.24	7,248.55	21.92	137.25	9.47
2019	933.75	7,452.43	28.59	97.98	7.66
2020	411.82	6,384.58	6.98	124.16	8.02
2021	296.43	7,286.74	6.59	183.53	6.06
2022	473.10	8,545.22	39.08	179.69	6.58

Table 24. GHG emissions from Transport for 1990-2022, kt CO_2 eq.

3.2.7.2. METHODOLOGICAL ISSUES (1.A.3)

The activity data for calculating transport emissions are taken from the annual data of the SSC in TJ. Air transport emissions were calculated in accordance with the Tier 1 of the IPCC 2006, based on the type and amount of fuel (kerosene and aviation gasoline) used for national flights. Flights in Azerbaijan are classified as domestic or international. This division plays a decisive role in the report. CO_2 emissions directly depend on fuel consumption.

Calculations are carried out in general for out for motor vehicles, motorcycles, light trucks, heavy trucks, buses and other categories of vehicles. Thus, since there is no data on the type and quantity of fuel used by separate types of transport in Azerbaijan, the data on the fuel sold of the SSC were used. For calculation purposes, the sources of vehicles were taken as types of vehicles with the same emission behavior. The Tier 1 approach of the IPCC 2006 guidelines was used. Despite the fact that road transport is one of the main sources of GHG emissions, it is still difficult to properly distribute emissions due to the lack of a reliable MRV system for collecting data on national GHG, standard carbon content and EF. This hinders the inventory process, as well as the evaluation of the results of measures taken by the state to reduce emissions from these sources. For example, the application of e-mobility technology and the use of low-emission fuels in public transport (buses and taxis), etc.

Data on activities for the use of fuel in off-road transport (mainly airport cargo) for 2017-2022 were provided by the Ministry of Digital Development and Transport.

Type of fuel	unit	2017	2018	2019	2020	2021	2022	2023
Gasoline	TJ	52.72	48.60	50.62	47.70	36.61	40.59	23.94
Diesel	TJ	2,248.85	2,072.94	2,159.18	2,034.85	1,561.52	1,731.30	1,021.00

Table 25. Activity information on off-road transport (airport territory and other special modes of transport)

1.A.3.b.iii - Heavy trucks and buses - it was decided to include emissions from the consumption of natural gas in road transport. During consultations with the Ministry of Digital Development and Transport, it was agreed that compressed gas is used in public buses in Baku. It is used in taxis and private cars only in small quantities. All emissions from combustion of compressed natural gas in Sub-Category 1.A.3.b.iii were decided to be calculated. Further studies are planned to be carried out to separately calculate emissions for heavy trucks and buses.

3.2.7.3. UNCERTAINTIES AND TIME SEQUENCE MATCHING (1.A.3)

Uncertainties are evaluated similar to the energy industry (1.A.1). Uncertainties of CO_2 emission factors were determined according to the IPCC 2006 Guidelines. These figures are based on various estimates, as well as a small number of measurement and analysis results and thus have a large range of uncertainty.

3.2.7.4. CATEGORY-RELATED QUALITY ASSURANCE / QUALITY CONTROL (1.A.3)

Quality Control and Quality Assurance were carried out by the relevant specialists in accordance with the requirements of the IPCC 2006 Guidelines and other related relevant documents.

3.2.7.5. CATEGORY-RELATED RECALCULATIONS (1.A.3)

Recalculations for the Transport category were carried out for 1990.

3.2.7.6. PLANNED IMPROVEMENTS TO THE CATEGORY (1.A.3)

As an area of improvement in the category, appropriate measures are envisaged to improve statistical data on activity sources in accordance with the IPCC 2006 Guidelines.

3.2.8. OTHER: RESIDENTIAL, COMMERCIAL / INSTITUTIONAL, AGRICULTURAL, FORESTRY AND FISHING (1.A.4)

3.2.8.1 CATEGORY DESCRIPTION (1.A.4)

Other, stationary and mobile sources for the category 1.A.4 are grouped together in order to determine the status of the key category. Other sub-categories of 1.A.4 – 1.A.4.a, b and c are the main sources for CO_2 emissions in terms of emission level from sources and trend. 1.A.4.a source is the primary source of CH_4 in terms of trend. 1.A.4.b is the key category in terms of Level 1 analysis. Also, 1.A.4.b sub-category was defined as the key category for N_2O through the analysis of approach

1. Stationary and mobile sources categories in 1.A.4 are grouped together in order to determine the status of a key-category.

1.A.4 Others subcategory include 1.A.4.a - Commercial and institutional (administrative buildings, trade and services), 1.A.4.b - Residential place, 1.A.4.c - Agricultural, forestry and fishing sources.

1.A.4.a provide information on emissions from commercial and institutional (stationary) heat generation systems in small combustion systems of small commercial and institutional users.

1.A.4.b sources provide information on emissions of stationary combustion systems in the residential sector.

1.A.4.c sources covers the stationary part of agricultural, forestry and fishing areas. The report in this category includes emissions resulting from heat production in small and medium combustion systems.

In residential and commercial/institutional resources, the combustion systems group is very diverse in terms of installation design and size. It covers a wide range of combined-type heaters of various sizes and various room stoves (such as fireplaces, stoves). The main source of CO_2 emissions in 1.A.4 is energy consumption for the purposes of heating spaces. Therefore, the change in consumption is highly dependent on weather conditions.

Starting in 1990, the transition from oil and coal to natural gas in that period has led to a significant reduction in CO_2 emissions. Improving energy efficiency has also contributed to reducing consumption.

The emissions included in this subcategory arise mainly from fuel consumption in commercial/institutional, residential and agricultural/forestry/fishing. The increase in emissions from this category is mainly the result of measures carried out within the framework of population growth and gasification of regions.

3.2.8.2. METHODOLOGICAL ISSUES (1.A.4)

Activity data were calculated based on data from National Statistics, and emission factors were calculated based on the IPCC 2006 Guidelines.

The determination of emission factors is based on a category-specific bottom-up approach. In addition, to differentiate sub-categories and fuels data on emission factors are collected across all systems within the mentioned sub-categories.

To assess emissions from other sectors, most of the activity data was taken from the SSC's annual data and the Tier 1 approach of the IPCC 2006 Guidelines was applied. To differentiate standard carbon content and emission factors and the activity data for Category 1.A.4.c, an expert opinion is used, which assumes that emissions from fossil fuel combustion occur mainly during Mobile combustion. The residential sector is the main sector, which in 2022 accounted for 78.1% of CO_2 emissions of other sectors. The contribution of Agriculture/Forestry/Fisheries is 11.6%, followed by the commercial/institutional subcategory and equal to 10.3%. Activity data in the 1.A.4 category source are taken from the SSC, like stationary combustion systems. All of the gasoline fuels listed on residential sector are allocated to mobile sources (1.A.4.b ii).

It also includes commercial and institutional, fuel consumption areas of the sector, which are separately mentioned in statistics. An additional distribution is carried out in Agricultural (1.A.4.c ii (i) and Forestry (1.A.4.c ii (ii)) areas.

1.A.4.C (iii) Activity data on coastal and open sea fisheries included in the Fisheries clause is calculated within the framework of an expert assessment.

In general, the amount of combusted lubricants is derived from the corresponding annual fuel quantities accordingly. Regarding CH_4 and N_2 emissions as a result of joint combustion of lubricants, it is assumed that such emissions have already been taken into account in the corresponding emission factors for the fuels already used and thus must be reported as IE (included elsewhere).

3.2.8.3. UNCERTAINTIES AND TIME SEQUENCE MATCHING (1.A.4)

Uncertainties are evaluated similar to the energy industry (1.A.1). A complex procedure is usually required for the method used in order to identify uncertainties for the activity data. Along with the emission figures, it is also necessary to obtain other information, for example, the corresponding operating mode, installation structure and final power consumption specific to the device should be taken into account. Nevertheless, given the large number of objects involved and the wide range of combustion systems and fuels used, it should be assumed that the data has sufficient "uncertainty".

Besides, emission factors for combustion systems are determined in accordance with the design of the device, age level, output category and typical operating mode. And the information about this is almost not available.
Moreover, for some types of installation, there is only inadequate or no information about the amount of emissions associated with the use of certain fuels. It is important to note that current legislation does not require the measurement of greenhouse gas emissions of combustion systems of residential and commercial/institutional users.

3.2.8.4. CATEGORY-RELATED QA/QC AND INSPECTION (1.A.4)

In accordance with the requirements of the IPCC 2006 Guidelines related to emission factors and the applicable documents associated with it, category-specific quality control and quality assurance were carried out by the relevant experts.

3.2.8.5. CATEGORY-RELATED RECALCULATIONS

Recalculations within the framework of the current report were carried out only for 1990. In addition, Correction of N2O emission factors in 1.A.4. category has led to a slight increase in emissions for the entire time sequence.

It should be noted that recalculation was carried out only for 1990.

3.2.8.6. PLANNED IMPROVEMENTS TO THE CATEGORY (1.A.4)

Ensuring the collection of statistical data on activities in accordance with the IPCC 2006 classification is included in the Improvement Plan (Chapter 10).

3.3. FUGITIVE EMISSIONS FROM FUELS (1.B)

Fugitive emissions can be released into the atmosphere during the extraction, processing, transportation, storage, distribution and use of natural fuel oil and gas. Methane emissions are the most important emissions in the source category of fugitive oil and gas emissions.

3.3.1. SOLID FUELS (1.B.1)

No activities are carried out on solid fuels (coal, turf, etc.) in Azerbaijan. In CRT tables, this activity is marked as "NO".

3.3.2. FUGITIVE EMISSIONS FROM OIL AND NATURAL GAS (1.B)

3.3.2.1. FUGITIVE EMISSIONS FROM OIL AND NATURAL GAS PRODUCTION (1.B.2)

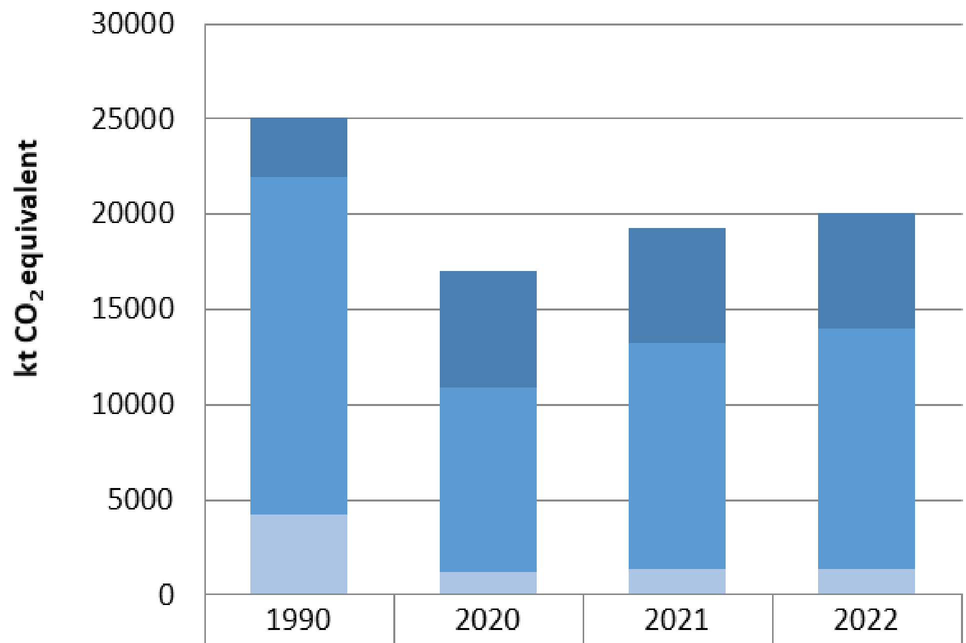
The fugitive emissions subcategory includes the emissions that are released as a result of extraction, production, processing, transportation, storage, distribution of non-combusted residual fuels, etc.

3.3.2.1.1. CATEGORY DESCRIPTION (1.B.2)

This resource category includes fugitive CO_2, N_2HE, CH_4 emissions as a result of exploration, production, preparation, transportation and storage of oil and natural gas. This category includes three subcategories - oil (1.B.2.a), natural gas (1.B.2.b), ventilation and flaring (1.B.2.c).

This category is the key category in terms of emission levels and CH_4 emission trend. In 1990, the share of fugitive emissions in the energy sector was only 31.3%, while in 2022 this share was 33.3%. CO_2 and CH_4 emissions come mainly from oil production. About 73% of emissions from oil and gas systems are those generated during the extraction and processing of oil and the extraction of natural gas. As of 2017, according to emissions from the exploration process, it was included in 1.B.2.a.iii.2 - Oil production and processing clause. In subsequent recalculations, it is planned to provide a time sequence by including emissions from exploration works for 1990-2019 in the same category.

CH4 emissions are mainly caused by oil production, as well as its pipeline transmission and distribution of natural gas. As a result of numerous measures taken to reduce technological losses in distribution and transmission networks, a significant reduction in emissions from gas transmission and distribution processes has been observed since 1990.



	1990	2020	2021	2022
1.B.2.c.Venting and flaring	3181.62	6138.62	6096.34	6014.86
1.B.2.b.Natural gas	17669.58	9694.75	11811.13	12688.37
1.B.2.a.Oil	4269.51	1168.77	1379.52	1342.28

Figure 40. GHG emissions from oil and gas systems

The growth trend of methane emissions from natural gas systems is mainly due to the increased supply of natural gas to the EU in connection with the obligations arising from the Memorandum of Understanding on strategic partnership in the field of Energy signed with the European Union. The increase in methane emissions from the distribution network is associated with population growth and an increase in the rate of gasification in the regions. These measures make it possible to prevent deforestation and uncontrolled burning of biomass for energy purposes.

Since 2017, the gas combustion in the torch during natural gas operations has been completely stopped, and in this regard, the "NO" registration key has been used for the following years. Emissions into the air during natural gas operations are included in the category of natural gas production.

3.3.2.1.2. METHODOLOGICAL ISSUES (1.B.2)

GHG emissions from Sector 1.B.2 were calculated using the Tier 1 approach of the IPCC 2006.

Fugitive emissions from the transportation of crude oil and condensate in accordance with the IPCC 2006 Guidelines (Vol.2, PG. 4.40, figure 4.2.3) are estimated based on the amount and emission factor of oil by using the Tier 1 method. In this category, fugitive emissions from crude oil when produced and transported in onshore and offshore oil fields are assessed. All crude oil is transported by pipeline by sea and no fugitive emissions are expected from other transportation methods. Land transport includes pipeline, railway, motor tanks, etc. However, it is very difficult to differentiate them statistically. Therefore, emissions were calculated on the basis of the assumption that all the oil produced is transported by tanks and rail.

The standard values given in the IPCC 2006 guidelines were used as emission factors. Official statistics is used as activity data.

Domestic production data on oil and natural gas are taken from the national energy balance figures.

The difference between SOCAR and SSC data on activities by the volume of oil processed was analyzed and the activities data provided by the SSC were used to ensure a conservative approach.

Data on the volume of transmission of oil and natural gas through the pipeline and the storage of natural gas, including data on the volumes of distributed and processed natural gas, were provided by SOCAR (a state-owned company responsible for the transportation of crude oil and natural gas). Fugitive GHG emissions from oil and natural gas systems were calculated using the IPCC 2006 Guidelines. Since this category is the main in terms of CH_4 emission level and trend, levels in the assessment of CH_4 emission should be increased. A detailed study was implemented to find out the existence of country-related EF. To clarify the availability of the information required for the Level 2/Level 3 Assessment of CH_4, it is planned to cooperate directly with the relevant authorities and to continue research in this area.

According to the data obtained as a result of chromatographic analysis at SOCAR's Gas Processing Plant, the share of methane and carbon dioxide in unrefined natural gas is 93.5% and 3.5-4%, respectively, and the share of methane gas in processed natural gas is 98%. It was decided to divide losses into types of activities in order to include data on losses in the IPCC inventory software. Thus, 1/6 of the total volume of natural gas is lost during extraction, 2/6 in the transmission network and 3/6 in the distribution network.

This category studies fugitive CH_4 emissions, which occur during the processing and storage of crude oil in oil refineries.

From this source, CO_2 emissions are reported as "NE". Since there are neither actual dimensions of the CO_2 content of crude oil nor any standard values for emission factors exist, CO_2 from this source are not estimated. N_2O emissions from this source are reported as "IE".

3.3.2.1.2.1. DISTRIBUTION OF PETROLEUM PRODUCTS (1.B.2.A.V)

In Azerbaijan CO_2 and CH_4 emissions can be discarded from the distribution of petroleum products. However, as a result of the activity, emission of CO_2 or CH_4 is considered insignificant in terms of of petroleum products properties. In addition, the IPCC 2006 Guidelines and its 2019 upgrade document provide “NA” for this source.

Other (abandoned oil wells, etc.) (1.B.2.a.vi). This includes fugitive emissions from abandoned oil wells, accidents, etc. The GHG assessment method for gas emissions from the abandoned oil wells is not provided for in the IPCC 2006 Guidelines. In this regard, fugitive emissions from the abandoned wells are reported as “NA”.

According to expert estimates, there are no emissions from the abandoned oil wells in Azerbaijan. Therefore, it is reported as “NA” for these sources, that is, activity occurs, but there are no emissions. And if occurs, it is negligible. Fugitive emissions as a result of the accident are reported as “NE”. It is very difficult to determine the amount of GHG emissions in these sources. This category analyzes the fugitive emissions of CO_2, CH_4 and N_2O as a result of exploratory drilling of natural gas fields. According to SOCAR, greenhouse gas emissions caused by exploration drilling of natural gas wells in Azerbaijan are combusted in torches as per the instructions. Therefore, “Exploration” for natural gas (1.B.2.b.i) is reported as "NA" in the CRT and the emissions released into the air during exploration drilling for natural gas are not calculated, only "Flaring (gas) (1.B.2.c.ii.2)" is assessed.

Emissions were assessed based on the Tier 1 method according to the IPCC 2006 Guidelines (Vol. 2, PG. 4.42, figure 4.2.1) and using the latest software model of the IPCC.

Since the improved IPCC 2006 emission factors do not indicate the cleaving degree of leaks, ventilation and flaring for gas collection, leakage is accepted for all CH_4 and CO_2 emissions, and flaring for all N2) emissions. The emissions resulting from flaring are described in “Flaring (gas) (1.B.2.c.ii.2)” section of CRT.

3.3.2.1.3. CATEGORY-RELATED QA/QC

General inventory quality control procedures were carried out in accordance with the IPCC 2006 Guidelines. In this regard, the main focus is directed on checking parameters for activity data and emission factors and archiving reference materials. In accordance with the requirements of the IPCC 2006 Guidelines and relevant documentation, quality control and quality assurance of the category were carried out by the experts involved.

3.3.2.1.4. ANALYSIS OF UNCERTAINTIES (1.B.2)

The uncertainty of emission factors for fugitive CO_2 and CH_4 emissions generated from the production, transportation, storage and distribution of crude oil and condensate is adopted as ±100% in the IPCC 2006 Guidelines. As for the uncertainty of the activity data, the IPCC 2006 Guidelines use up to ±15% of the uncertainties regarding the given values.

Emission factors on natural gas (1.B.2b) are used in the IPCC 2006 Guidelines, the uncertainty for CO_2 and CH_4 was ±20%. Since the impossibility to determine the uncertainty in the source statistics for the activity data, it was used as specified in the IPCC 2006 Guidelines (uncertainty in the number of production facilities: ±25%). As a result, during the exploration drilling of natural gas fields, the uncertainties of CO_2 and CH_4 emissions were estimated at ±32%.

3.3.2.1.5. CATEGORY-RELATED RECALCULATIONS (1.B.2)

Recalculations carried out in the Other sectors category were carried out only for 1990 (1.B.2).

3.3.2.1.6. PLANNED IMPROVEMENTS TO THE CATEGORY (1.B.2)

No improvements are planned.

3.4. OTHER (FUGITIVE EMISSIONS ASSOCIATED WITH GEOTHERMAL ENERGY PRODUCTION) (1.B.2.D)

This is marked with "NO" as no activities are carried out in this category in Azerbaijan.

3.5. CO_2 TRANSPORTATION AND STORAGE (1.C)

These sub-categories are marked with "NO" as no activities are carried out in this sub-category in Azerbaijan.

4. INDUSTRIAL PROCESSES AND PRODUCT USE (CRT SECTOR 2)

4.1. SECTOR OVERVIEW AND BACKGROUND INFORMATION

As in most countries of the world, industrialization is one of the main priorities of economic policy in developing Azerbaijan. It was during the period of industrialization in 1945-1969 that large industrial cities such as Mingachevir and Sumgait were established in the country. Mineral refining in Dashkasan, aluminum production in Ganja and Sumgayit, and cement production in Garadagh have been commissioned.

In the 70s and 80s of the last century, large amounts of funds were directed to the development of the industry, a number of large industrial enterprises were established, the diversification of the industry was accelerated, and its structure was improved. During this period, the largest steel casting plant in the South Caucasus, Baku domestic air conditioners, electronic products production in Ganja, factories specializing in the production of household compressors, integrated microcircuits in Sumgayit, and the largest Baku Deep Insulation Plant began to operate.

The restoration of political and economic stability in the country starting from 1997 gave a new breath to the development of industrial production. Rapid industrial growth has been observed in Azerbaijan since 2003, and purposeful measures have been taken to solve energy supply issues, which are vital for industrial production. As a result of the works, the industry has entered a new stage of development.

The Industrial Processes and Product Use (IPPU) sector in Azerbaijan covers greenhouse gas emissions from industrial processes, the use of products, and the use of carbon in combustible natural resources for non-energy purposes. Industrial Processes and Products Use includes greenhouse gas emissions from industrial processes, product use, and non-energy use of carbon in combustible natural resources.

4.1.1. CATEGORIES AND TOTAL EMISSIONS

The Industrial Processes and Product Uses (IPPUs) sector covers GHG emissions from industrial processes, products and non-energy uses of carbon in combustible natural resources.

Emissions in this sector occur during the following activities:
• cement, lime, glass, ceramics, etc. as a result of chemical or physical transformation involved in the production of mineral, chemical and metal products;
• in the use of fossil fuels for purposes other than energy production (eg as lubricants) and products, including emissions of HFCs used as refrigerants and SF6 from electrical equipment.

In the industrial sector of Azerbaijan, Mineral industry (2.A), Chemical industry (2.B), Metal production (2.C) and Use of non-energy related products from fuels and solvents are reported.

Indicators	1990	2020	2021	2022
Energy	90.5	78.3	79.4	80.6
IPPU	1.3	3.6	3.8	3.8
Agriculture	5.1	10.7	9.6	9
Waste	3.1	7.3	7.2	6.6
Total emissions	**100**	**100**	**100**	**100**

Table 26. Share of sectors in the amount of GHG emissions, %

As can be seen from the table, the share of the sector in the country's total emissions in 1990 was 1.3%, and in 2022 it was 3.8%.

4.1.2. MINERAL INDUSTRY (2.A)

CRT category 2.A Mineral industry is divided into subcategories 2.A.1 to 2.A.4. These categories include:

- cement production (2.A.1)
- lime production (2.A.2)
- glass production (2.A.3)
- ceramic production (2.A.4.a)

The mineral industry produces CO_2 emissions due to the use of carbonate-based minerals. The main emission from the mineral production category is CO_2. Emissions from other soda ash use (2.A.4.b) production of non-metallurgical magnesium products (2.A.4.c) and other limestone and dolomite use (2.A.4.d) processes in Azerbaijan not estimated because these categories were not found. Therefore, these categories are marked as “NO” in the respective CRT tables.

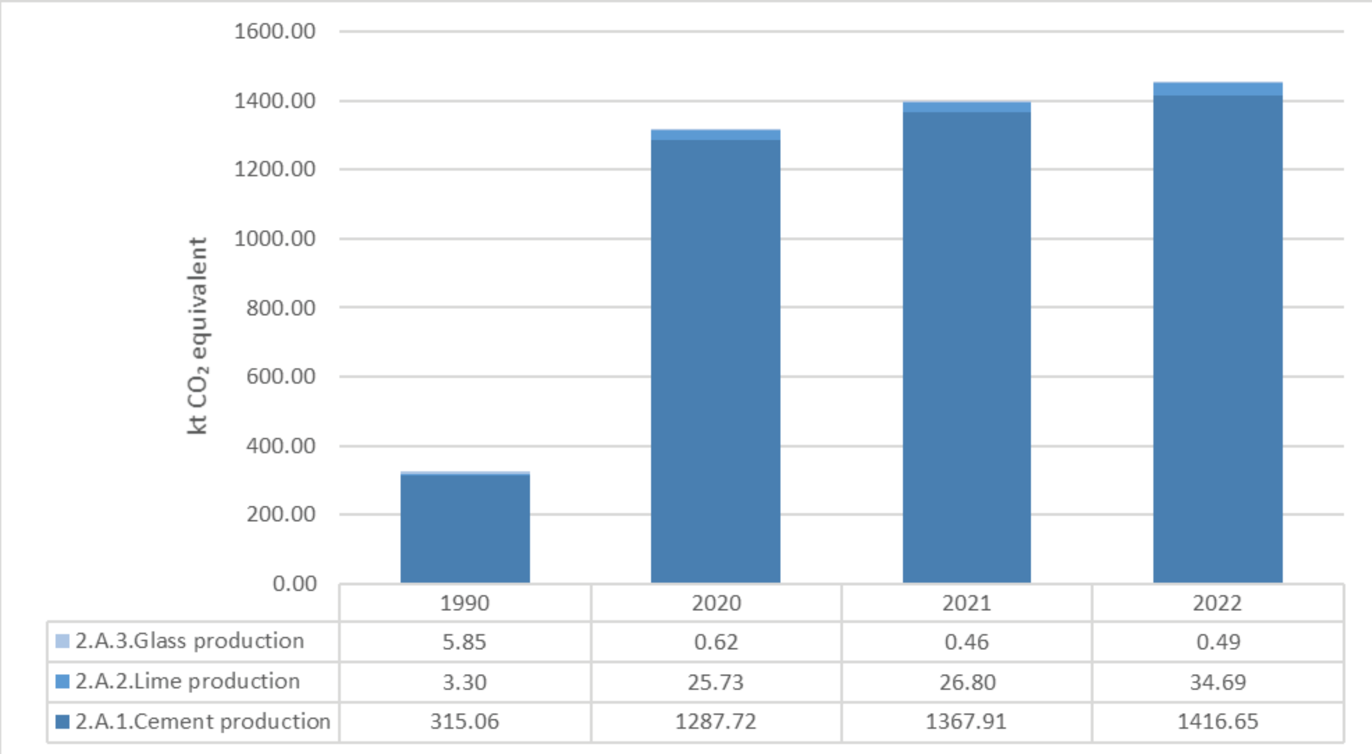


Figure 41. GHG emissions from Mineral Industry category

4.1.2.1. CEMENT PRODUCTION (2.A.1)

The cement production category in the IPPU sector in Azerbaijan is not the key category for CO_2 emissions in terms of emission level and trend. CO_2 is produced during the production of Portland clinker, an intermediate product in cement production. The production of cement in Azerbaijan currently occurs within four cement plants, which has grown from 1990 when only one plant was in operation. Table 27 presents production statistics for Azerbaijan in 1990 and 2020-2022, which shows the growth of cement production over time series.

Years	1990	2020	2021	2022
Cement production	792,000	3,237,100	3,438,700	3,561,200

Table 27. Cement production in Azerbaijan, tons

4.1.2.1.1. METHODOLOGICAL ISSUES (2.A.1)

Emissions were calculated according to the Tier 1 method in the IPCC Guidelines (IPCC (2006a): Vol. 3, Chapter 2.2.1.1).

The activity data used in the calculation is "cement production" (tons) as determined by the SSC. Production statistics are available only at the country-wide level and are presented as a grand total by summing up production figures for individual plants.

It should be noted that data on clinker production from facilities and data on clinker import or export are not available. Thus, the total clinker production statistics required for emission estimation are obtained from the total cement production using the standard clinker fraction of cement (75%) according to the IPCC guidelines. Previously, information on the amount of clinker imported from abroad was provided in the SSC, and this approach was used in the First National Data of Azerbaijan.

A standard emission factor per ton CO_2/ton clinker from the IPCC Guidelines was applied to the activity data used for the time series. Standard cement kiln dust (CKD) was applied in the fraction.

As can be seen from the Figure 42, the production of each subsequent year exceeds the production of the previous year. As production increased, the amount of GHG emissions began to increase

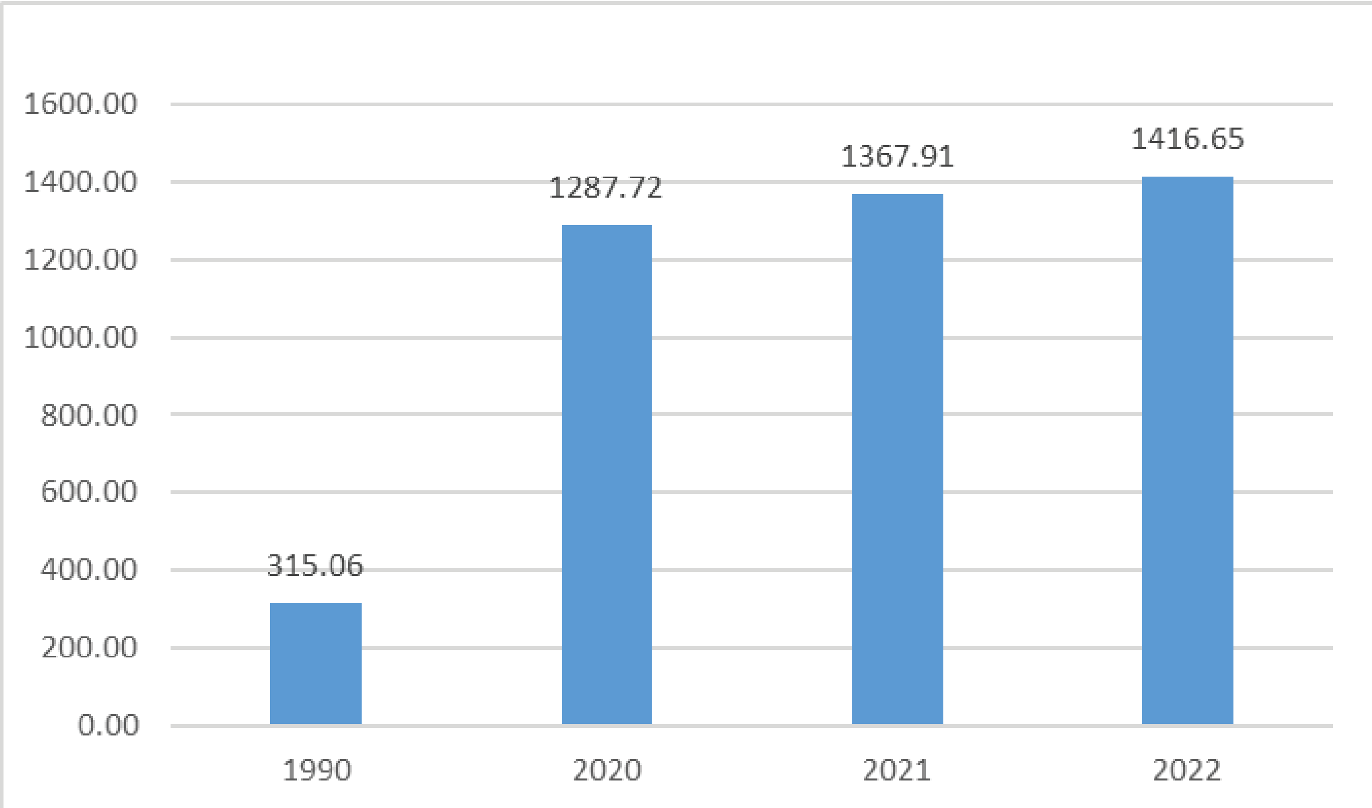


Figure 42. GHG emissions from cement production processes, kt CO_2 eq.

4.1.2.1.2. UNCERTAINTIES AND CONSISTENCY OF TIME SERIES (2.A.1)

Consistency in the time series is achieved using the same activity data set and default emission factors.

Uncertainties in the emission factor For Tier 1, the major uncertainty component is the clinker fraction of the cement(s) produced. As import and export data are not available within Azerbaijan, then the uncertainty of the clinker production estimate is considered to be high. The default uncertainty range given by the IPCC when using the assumption that 95% clinker factor in portland cement is ±2-7%. The upper range has been selected for use in the uncertainty assessment.

The uncertainty in the activity data is driven by the need to estimate clinker production data from cement production statistics. The IPCC estimates that where clinker production data are estimated from cement production, the uncertainty of the activity data can be as high as about 35 percent, therefore this value has been used in the uncertainty assessment.

4.1.2.1.3. QUALITY ASSURANCE/ QUALITY CONTROL AND VERIFICATION (2.A.1)

Since the QA/QC plan was not ready, quality control and quality assurance for the cement category was carried out by an independent expert within the general procedures of QA/QC IPCC 2006.

All data used for quality assurance were cross-checked for reliability against comparative data from the SSC. Those materials were accepted as evidence by the inspection team. The determined emission factor for raw material-related CO_2 emissions was compared with the corresponding figures. Small deviations from the IPCC Tier 1 standard factor (about 1%), the results of 0.52 t CO_2/t, the emission factor using higher lime content in some clinkers differ only slightly (1%) from the considered emission factors.

As a result of expert assessment, the same figure was used for all relevant years during that period.

4.1.2.1.4. RECALCULATIONS BY CATEGORY (2.A.1)

Emissions have been recalculated for 1990 only.

4.1.2.1.5. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS (2.A.1)

Improvements are planned in this category to reduce uncertainty in performance data and improve the accuracy of Tier 1 emission calculations for cement production. It is planned to impose new obligations on all enterprises, including cement plants, to submit activity data at the facility level. In this way, Azerbaijan hopes to collect information on facility-level clinker production to eliminate the demand for clinker production to be diverted from cement production. Data on clinker imports and exports will also be collected to ensure that emissions from exported clinker production are taken into account in the national emissions assessment.

4.1.2.2. LIME PRODUCTION (2.A.2)

In lime production, CO_2 emissions are released into the atmosphere mainly during calcination processes where limestone (CaCO3) is heated to produce lime (CaO) and release CO_2. 2.A.2 The following statements refer only to the quantities of quicklime and dolomite lime produced in lime plants. Information on other sectors using limestone is provided in the relevant reporting tables (CRT 2.A.4d). Lime production in the country has increased over time as shown in Table 28.

Years	1990	2020	2021	2022
Lime production	4,400	34,310	35,736	46,255

Table 28. Lime production in Azerbaijan, tons

4.1.2.2.1. METHODOLOGICAL ISSUES (CRT. 2.A.2)

Emissions from lime production in Azerbaijan were calculated using the Tier 1 method given in the IPCC Guidelines (IPCC (2006a): Volume 3, Chapter 2.3.1.1).

The corresponding emission level is obtained by multiplying the quantity of the product in question (lime or dolomite lime) by the corresponding emission factor. National lime production statistics were provided by the SSC and multiplied by a first-order default emission factor (0.75 tonnes of CO2/ton of lime production) to obtain an emission estimate.

4.1.2.2.2. UNCERTAINTIES AND TIME SERIES (2.A.2)

Consistency in the time series was obtained using the same method for each year in the current GHG inventory time series.

Uncertainties for the emission factor is expected to be between ±4-8% due to the assumption of the average CaO content in lime. Disaggregated data by type of lime produced is not available in Azerbaijan, meaning there is higher uncertainty in the lime composition which means greater uncertainty associated with determining the CaO content and the CaO and MgO content of the lime produced. Therefore, the highest value in the default range given by the IPCC has been used in the uncertainty assessment.

Uncertainties for the activity data used here are estimated to be ±10% as data used are national production statistics.

4.1.2.2.3. CATEGORY-SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL (2.A.2)

Performed as part of overall quality control and quality assurance by appropriate independent experts involved due to lack of QA/QC plan.

For process-related emissions, the comparison shows good agreement, and graphical comparisons have been successfully used, which leaves no reason to doubt the quality of the inventory data due to inconsistencies of methodological origin.

4.1.2.2.4. RECALCULATIONS BY CATEGORY (2.A.2)

Emissions for 1990 have been recalculated.

4.1.2.2.5. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS (2.A.2)

Improvements are planned for this category to reduce uncertainty in the activity data and improve the accuracy of the Tier 1 emission estimates for lime production. To improve the accuracy of the emission estimate it is necessary to disaggregate lime production statistics into categories of high calcium lime and dolomitic lime. This may require surveys to lime production facilities, and other facilities which may produce lime and consume it for their own operations. Collecting activity data on this 'non marketed' lime production is challenging without facility level reporting.

4.1.2.3. GLASS PRODUCTION (2.A.3)

The statistical data of SSC on glass products in the country cover the years 2000-2022. The glass industry of Azerbaijan produces different types of glass with different chemical composition. In 2019, "ASK Glass" LLC produced 36 types of glass products. In 2020, the company expanded its product range and succeeded in producing 61 types of products. The glass industry of Azerbaijan produces different types of glass with different chemical composition. The main glass raw materials emitting CO2 during the melting process were limestone (CaCO3), dolomite Ca, Mg (CO3) and soda ash (Na2CO3). The information of the SSC was used for activity data. It publishes data on glass production as shown in Table 29.

Years	1990	2020	2021	2022
Glass production	58,539	6,180	4,596	4,885

Table 29. Glass production in Azerbaijan, tons

4.1.2.3.1. METHODOLOGICAL ISSUES (CRT 2.A.3)

As glass production values in Azerbaijan are only available at the national level and are not disaggregated by type of glass produced, carbonates used in processing or production, emissions from glass production are calculated using the Tier 1 method given in the IPCC Guidelines (IPCC (2006a): Vol. 3, Chapter 2.4.1.1) calculated. Therefore, the total values of glass production are multiplied by a standard emission factor based on a "typical" raw material mix (0.20 tons CO_2/ton glass).

Since glass manufacturers in practice use recycled glass cullet in production, in addition to the raw material, the cost of glass cullet was additionally applied to the assessment according to the Tier 1 method. The IPCC 2006 guidelines state that the proportion of glass scrap (the fraction of furnace charge represented by scrap) for container applications, which constitute the bulk of glass production, will be in the range of 0.4-0.6. Since there is no additional information on the use of glass scraps in glass production enterprises in Azerbaijan, the midpoint of this mentioned range was used in the emission calculation.

4.1.2.3.2. UNCERTAINTIES AND TIME SERIES (2.A.3)

The methodology used to calculate emissions from glass production is the same for all time series, but activity data provided by Azerbaijan's DSC show very high glass production figures compared to the most recent years in the time series. It is believed that this is related to the integration of Azerbaijan into the centralized industrial system of the Soviet Union in 1990. Azerbaijan's glass factories were part of a large network that supplied glass to various regions within the USSR. After the collapse of the Soviet Union in 1991, the country faced economic difficulties, which led to a decline in industrial output, including glass production. Aging infrastructure, lack of investment and shift to the oil and gas sector further weakened the glass industry. At present, Azerbaijan's glass production is lower than in 1990, and is primarily directed to domestic consumption.

In addition, statistics on the glass sector in the country are incomplete, and there is no information on the sector's use of raw materials. Data on these activities are subject to statistical confidentiality and cannot be obtained from statistical balance sheets, and therefore it is estimated that uncertainty in activity data may exceed ± 10%.

Since it is not possible to divide the total volume of glass production by glass type, default emission factors were used for emission estimation. The IPCC 2006 Guidelines state that in such cases the uncertainty can be +/- 60%.

4.1.2.3.3. QUALITY ASSURANCE/QUALITY CONTROL (2.A.3)

Since the planned plan for QA/QC was not ready, quality control and quality assurance work was carried out by a relevant independent expert involved in the general measures of the glass category of the industrial sector in accordance with the requirements of the IPCC 2006 guidelines and related documents.

4.1.2.3.4. RECALCULATIONS BY CATEGORY (2.A.3)

Emissions for 1990 have been recalculated.

4.1.2.3.5. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS (2.A.3)

Improvements are planned in this category to improve the accuracy of Tier 1 emission estimates for glass production by reducing uncertainties in activity data and collecting production statistics by type of glass production. This will be done in connection with relevant facilities within Azerbaijan. Disaggregated data by type of glass production and data on the different emission factors used by establishments will enable the reporting of emissions from glass production using the Tier 2 methodology.

4.1.2.4. CERAMICS (2.A.4.A)

The ceramic industry of Azerbaijan is as diverse as the glass industry. Different products with different chemical compositions are produced for many different applications. Clay (the main raw material), sand and other natural raw material mixtures are also used in the country's ceramic industry. In the ceramic sector of Azerbaijan, bricks, tiles, floor and wall tiles, ceramic tableware, etc. is produced. In the processes considered here, CO_2 emissions are released into the atmosphere during the combustion processes in furnaces.

The IPCC guidelines have two main methodologies for estimating emissions from carbonate use for this category. For this category, IPCC Tier 1 assumes that limestone and dolomite are used as carbonate feedstocks and is adjusted to use the standard ratio of limestone to dolomite. Since national statistics do not provide this information on the ceramics industry, emissions from this category were not assessed in this GHG inventory and were not included in the national GHG report. Therefore, the category Ceramics in the mineral industry (2.A.4.a) has not been assessed for GHG emissions and is marked as "NE".

4.1.2.4.1. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS (2.A.4.A)

The IPCC 2006 Guidelines require activity data for calculating process-related CO_2 emissions for the ceramics industry. (IPCC (2006a): Volume 3, As noted, no GHG inventory has been conducted in this category as the available statistics do not meet the requirements of the IPCC guidelines.

In this regard, improvements are envisaged in the area of adaptation of the existing statistical data of the SSC to the requirements of the IPCC guidelines in the ceramics category. Improvements are expected to be completed in the development processes of the 2nd BTR. In that period, appropriate measures will be taken to reflect the amount of carbonate raw materials (limestone, dolomite, etc.) consumed per product unit in the production processes of the mentioned category.

4.1.3. CHEMICAL INDUSTRY (2.B)

Category 2.B includes production of ammonia (2.B.1), production of nitric acid (2.B.2), production of adipic acid (2.B.3), production of caprolactam, glyoxal and glyoxylic acid, (2.B. 4), carbide production (2.B.5), titanium dioxide production (2.B.6), soda ash production (2.B.7), petrochemical and black carbon production (2.B.8) and includes the production of fluorine chemicals (2.B.9). In the other (2.B.10) category, only precursor substances obtained from the production of fertilizers and sulfuric acid are studied. There are only 2 of these activities occurring in Azerbaijan: production of methanol and ethylene, both of which are reported under petrochemical and black carbon production (2.B.8).

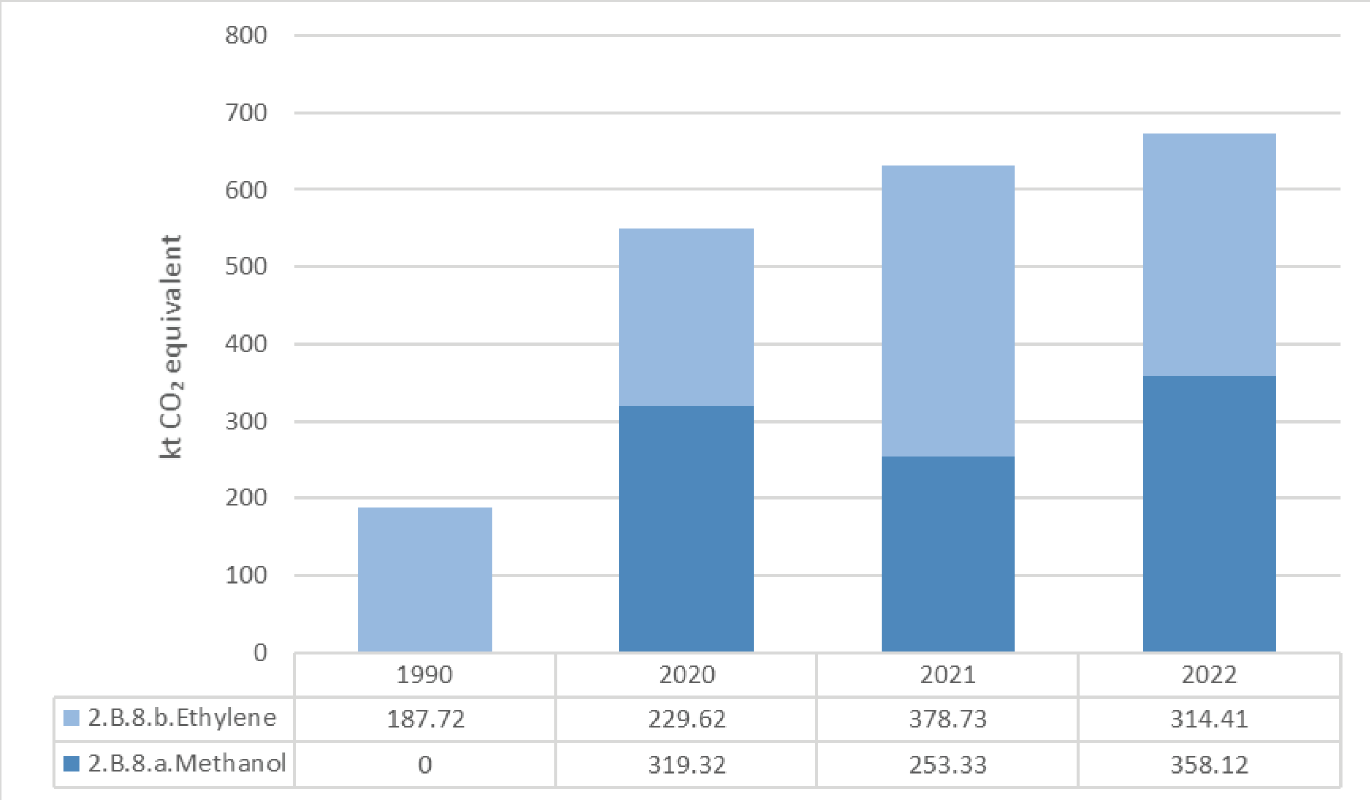
4.1.3.1. PETROCHEMICAL AND BLACK CARBON PRODUCTION (2.B.8)

The petrochemical sector produces basic organic chemicals that are processed from natural gas and oil fractions into various intermediates and end products (mainly polymers). According to section 2.B.8 of the 2006 IPCC Guidelines (IPCC, 2006a), the main chemicals are (a) methanol, (b) ethylene, (c) ethylene chloride and vinyl chloride, (d) ethylene oxide, and (e) is acrylonitrile.

Among the activities in this category in Azerbaijan, there is only methanol and ethylene production, which emits both CO_2 and methane emissions.

Years	1990	2020	2021	2022
Methanol production	NO	476,600	378,100	534,500
Ethylene production	83,468	102,100	168,400	139,800

Table 30. Petrochemical production in Azerbaijan, tons



	1990	2020	2021	2022
2.B.8.b.Ethylene	187.72	229.62	378.73	314.41
2.B.8.a.Methanol	0	319.32	253.33	358.12

Figure 43. GHG emissions in Chemical industry

4.1.3.1.1. METHODOLOGICAL ISSUES (2.B.8 PETROCHEMISTRY)

Emissions for these activities were calculated according to the IPCC 2006 guidelines using the Tier 1 method. (Volume 3, Chapter 3.9). The Tier 1 method calculates emissions from petrochemical processes based on activity data for the production of each petrochemical product and a process-specific emission factor for each petrochemical product (e.g. methanol). Data on the production of methanol (2.B.8.a Methanol) and ethylene (2.B.8.b Ethylene) are taken from official statistics (Table 30).

A default emission factor (0.67 tons of CO_2/ton of methanol produced) is used for methanol production, which assumes that methanol produced in Azerbaijan is carried out without primary production and through a conventional steam production process with natural gas as feedstock. A default factor was applied for CH_4 emissions (2.3 kg CH_4 per ton of methanol produced).

For ethylene, the Tier 1 methodology also includes a Geographic Adjustment Factor (GAF), since the standard CO_2 emission factors for ethylene production are based on data for ethylene steam crackers operating in Western Europe and therefore require an efficiency adjustment in the calculation. Adjustment coefficient for "Asia, Africa, Russia" was used for Azerbaijan. CO_2 emissions are calculated using the standard emission factor for steam cracking with naphtha as feedstock (1.73 tons of CO_2/ton of ethylene produced). CH_4 emissions are calculated using the standard emission factor for ethylene production using naphtha as feedstock (3 kg CH_4/ton ethylene).

Tier 1 estimates for this sector include emissions from combustion processes in the production of petrochemicals and emissions from other processes. Most of the combustion-related emissions in the greenhouse gas inventory in Azerbaijan are already calculated through energy statistics for the energy sector. Therefore, there is potential for double-counting of reported emissions in the IPPU sector and the Energy sector, as the consumption of natural gas and other feedstocks included in the production of methanol and ethylene is included in the Energy sector. Further research is required to understand whether the fuel used in the petrochemical industry is included in the national energy statistics for Azerbaijan. As a result of this study, calculated emissions from petrochemical processes will be subtracted from energy sector emissions to avoid double counting.

4.1.3.1.2. UNCERTAINTIES AND TIME SERIES CONSISTENCY (2.B.8 PETROCHEMICAL INDUSTRY)

Production-related emissions reported for flaring losses from previous years' emissions reports are subject to large uncertainties. In addition, over time, facilities may also make local internal changes in the routing of waste gases from various processes.

Due to limited data, the possibility of double counting of some elements of the energy sector cannot be completely excluded. Consequently, and in line with default values given by the IPCC for the uncertainty in the emission factors, an uncertainty of ±60 % is assumed. Assumptions have also been made within the calculations on the feedstock and the process utilised to produce the petrochemical, and therefore the uncertainty ranges stated in Table 3.27 of Vol. 3, Chapter 3.9 IPCC Guidelines (2006) are relevant.

Data on activities are taken from official statistics, with an assumed ±20% inaccuracies in statistical data collection.

4.1.3.1.3. CATEGORY-SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL (2.B.8)

Overall quality control and quality assurance was performed by appropriately engaged experts in accordance with the requirements of the IPCC 2006 guidelines and related documents.

4.1.3.1.4. IMPROVEMENTS FOR THE CATEGORY (2.B.8)

Further investigation of the potential for double counting emissions in this category and in the energy sector is planned. The study of national statistics is also in the pipeline for improvement, as it is currently unclear whether intermediates that can be directly transformed into other chemicals or produced in integrated plants are included in national statistics. For example, production data for ethylene oxide may be incomplete because ethylene oxide may be directly converted to ethylene glycol or other products (e.g., amines and esters), so product use in activity data may underestimate their actual production levels for other petrochemical products.

4.1.4. METAL PRODUCTION (2.C)

In the CRT tables, category 2.C is divided into subcategories 2.C.1 to 2.C.7. In the Azerbaijan database, iron and steel production (2.C.1) subcategory includes iron production, iron and steel production and ferroalloy production (2.C.2) and aluminium production (2.C.3) (primary aluminium and remelted aluminium) included. Data on metal production are taken from the SSC.

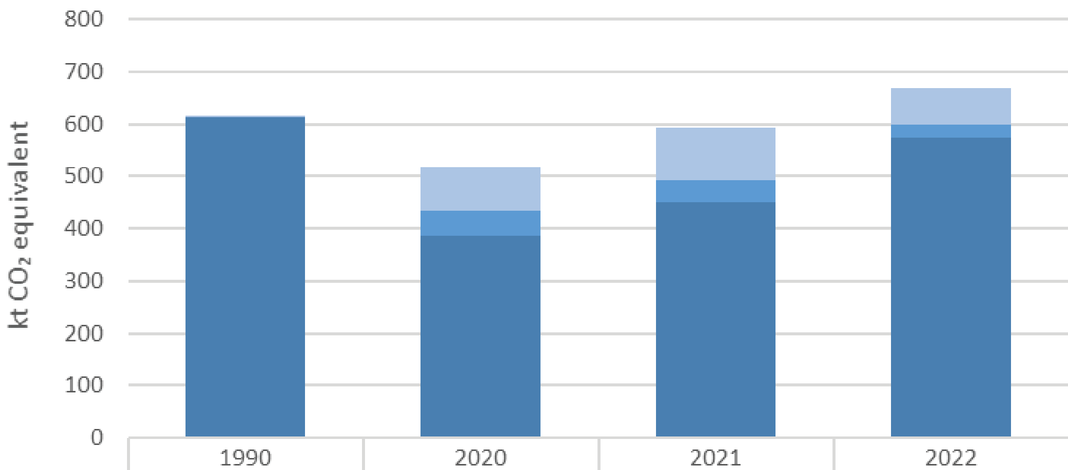
In the industrial sector of Azerbaijan, activities in other categories given in CRT are not carried out and, of course, there are no greenhouse gas emissions.

4.1.4.1. METAL PRODUCTION: IRON AND STEEL (2.C.1)

In the industrial sector, the iron and steel production category is the main source of CO_2 emissions in terms of emission levels and trends. In addition to carbon dioxide, a small amount of methane emissions also occurred in this category. During the last inventory year, there was no iron production activity in the country. This sector includes emissions from primary steelmaking furnaces and steelmaking processes. Process-related CO_2 emissions during primary steelmaking in integrated smelters are primarily due to the use of reducing agents in blast furnaces. The corresponding amount of natural gas used in steel production is included in the steel industry natural gas inputs reported in 1.A.2.a for all years.

Years	1990	2020	2021	2022
Steel production	420,000	264,500	308,400	391,900

Table 31. Steel production in Azerbaijan, tons



	1990	2020	2021	2022
2.C.3.Aluminium production	0.04	86.23	100.43	69.04
2.C.2.Ferroalloys production	0	46.58	42.17	26.95
2.C.1.Iron and steel production	613.2	386.17	450.26	572.17

Figure 44. GHG emissions from metal industry

4.1.4.1.1. METHODOLOGICAL ISSUES (2.C.1)

CO_2 emissions for these activities were calculated according to the IPCC 2006 guidelines using the Tier 1 method. (Volume 3, Chapter 4.2.2.1). CH_4 emissions from steelmaking processes may also be released, but these emissions are assumed to be negligible.

For emissions from iron and steel production, the Tier 1 approach serves to augment default emission factors with national production data. The activity data used is the total steel production (tons) data provided by the SSC. The standard emission factor for steel production in the Basic Oxygen Furnace (BOF) is used (1.46 tons of CO_2 per ton of steel produced).

4.1.4.1.2. UNCERTAINTIES AND TIME SERIES CONSISTENCY (2.C.1)

The time series are consistent because the same methodology was used to estimate emissions in each year of the time series. Activity data shows significantly higher production in 1990 than in 2022. This indicates that in 1990, Azerbaijan became part of the Soviet Union and its steel industry was integrated into the larger Soviet industrial complex. For that time, Azerbaijan had greater industrial potential, steel production was higher due to its role in supplying the wider Soviet market. After the collapse of the Soviet Union in 1991, much of Azerbaijan's heavy industry, including steel production, declined significantly due to economic disruptions, aging infrastructure, and a lack of investment.

Despite this discontinuity, the time series trend appears plausible.
According to the calculation required, the uncertainty for the activity data here is ± 10 %. The IPCC guidelines state that the default emission factors for coke production and iron and steel production used in Tier 1 may have an uncertainty of ± 25 %.

4.1.4.1.3. CATEGORY-SPECIFIC QUALITY ASSURANCE / QUALITY CONTROL (2.C.1)

Since the general and categorical quality control and quality assurance plan is not yet ready, it was implemented by the relevant involved experts in accordance with the requirements of the applicable documents related to it. The data for the respective years seems plausible and no discrepancies are given.

Determining emissions in categories 1.A.2.a and 2.C.1 is a complex matter, as emissions reporting and statistics differ widely in their underlying methods. In the interest of data quality assurance and as circumstances require, industry experts, statisticians and environmental experts conduct regular expert discussions to compare and evaluate data.

Differences, verification of the plausibility of determined emission quantities, using data, is only possible at a highly aggregated level.

4.1.4.1.4. RECALCULATIONS BY CATEGORY (2.C.1)

Calculations were made for 1990 in this category of industry.

4.1.4.1.5. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS (2.C.1)

Since activity data are only available at the national production level, it is necessary to aggregate data by production type to improve emission estimates by category. This will additionally require the collection of data on the total amount of materials used in the country for iron and steel, blast furnace gas, and limestone used for iron and steel production, direct reduced iron production, and sinter production.

4.1.4.2. METAL PRODUCTION: FERROALLOY (2.C.2)

Ferroalloy is a term used to describe concentrated alloys of iron and one or more metals such as silicon, manganese, chromium, molybdenum, vanadium, and tungsten. In ferroalloy production, raw ore, carbonaceous materials, and slag-forming materials are mixed and heated to high temperatures for reduction and smelting. Ferroalloy production in Azerbaijan is a developing sector and is primarily aimed at supporting the country's metallurgical and steel industries. One of the notable projects is the Dashkasan Ferroalloy Plant, which opened in 2022 and began producing various ferroalloys, including ferrosilicon and ferromanganese, mainly for use in domestic steel production. Therefore, the importance of this category is expected to increase.

Years	1990	2020	2021	2022
Ferroalloys production	NO	15,368	13,915	13,270

Table 32. Ferroalloys production in Azerbaijan, tons

4.1.4.2.1. METHODOLOGICAL ISSUES (2.C.2)

Emissions for these activities were calculated using the Tier 1 method according to the IPCC 2006 guidelines. (Volume 3, Chapter 4.3.2.1)

According to the level 1 method, CO_2 and CH_4 emissions were calculated based on the standard emission factors applied to the country's total ferroalloy production.

The activity data used was the total ferroalloy production (tons) provided by the SSC. As production data could not be disaggregated by ferroalloy type (eg ferrosilicon 45%, ferromanganese, etc.), the average of the default emission factors for CO_2 emissions presented in Table 4.5, Chapter 4.3.2.2 of the IPCC guidelines was used to estimate emissions. The same approach was taken for CH_4 emissions using standard emission factors given in the IPCC guidelines (Table 4.6, Chapter 4.3.2.2).

4.1.4.2.2. TIME SERIES CONSISTENCY AND UNCERTAINTIES (2.C.2)

The time series are consistent because the same methodology was used to estimate emissions in each year of the time series.

The uncertainty in emission estimates from this category is expected to be high. The IPCC 2006 guidelines are reported to have an uncertainty of 25-50 percent due to the use of Tier 1 emission factors. The middle point in this range has been selected for the uncertainty analysis. Furthermore, activity data was not available on a disaggregated level, and therefore assumptions were made about the type of ferroalloys produced leading to uncertainty in the activity data (10%).

4.1.4.2.3. CATEGORY-SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL (2.C.2)

Since the general and categorical quality control and quality assurance plan is not yet ready, it has been implemented by the relevant involved experts. The data for the respective years appear plausible and no inconsistencies are detected.

4.1.4.2.4. RECALCULATIONS BY CATEGORY (2.C.2)

No recalculations were made for 1990 in this category.

4.1.4.2.5. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS (2.C.2)

Since activity data are only available at the national production level, it is necessary to collect data separately by ferroalloy type to refine emission estimates within its category.

It should also be noted that, as stated in section 4.3.2.4 of the 2006 IPCC Guidelines (vol. 3, chapter 4), when ferroalloys are produced as the primary use of carbon sources (coal, coke, limestone, dolomite, etc.), emissions are considered industrial process emissions, not combustion emissions. Therefore, there is a risk of double counting when using the first-order approach. In this regard, there is a need for planned improvements to consider the allocation of emissions between IPPU and the Energy sector.

4.1.4.3. METAL PRODUCTION: ALUMINUM (2.C.3)

"Azeraluminium" state company is the main producer of aluminum in Azerbaijan. The company operates a large production facility in Ganja, where local bauxite ore is processed into aluminum, which is then produced. The second plant in Sumgait also produces primary aluminum.

The most important GHG emissions allocated to production processes:

(i) carbon dioxide (CO_2) emissions from the consumption of carbon anodes in the aluminum oxide to aluminum metal conversion reaction;

(ii) Perfluorocarbon (PFC) emissions of CF_4 and C_2F_6 released during anode effects.

The primary aluminum production category is the main trending category for CF_4 emissions in Azerbaijan and continues to be the largest source of PFC emissions. Thanks to extensive modernization measures and decommissioning of production facilities implemented in Azerbaijan's aluminum smelters, waste per product unit has decreased significantly.

Years	1990	2020	2021	2022
Aluminium production	26.8	53,895	62,766	43,152

Table 33. Aluminium production in Azerbaijan, tons

Primary aluminum production continues to be the largest source of PFC emissions in Azerbaijan, despite significant declines in this category as a result of declining production after 1990. Thanks to extensive modernization measures and decommissioning of production facilities in Azerbaijan's aluminum foundries, emissions per unit product have decreased significantly. However, GHG emissions from aluminum plants increased by more than 110% compared to the base year. As for the future development of PFC emissions, a low level of stagnation can be expected.

4.1.4.3.1. METHODOLOGICAL ISSUES (2.C.3)

The relevant production activity data for primary aluminium production by the aluminium industry is submitted to the SSC every year.

Total emissions per ton of aluminium during primary aluminium production were calculated using the Tier 1 method according to the 2006 IPCC Guidelines (IPCC, 2006a). The Tier 1 method for calculating CO_2 emissions uses only broad cell technology characteristics (Prebake or Søderberg) as a lower-level estimate of CO_2 emissions from aluminium production. In Azerbaijan, Aluminium is produced by packaging technology, and therefore the standard emission factor of 1.6 tons of CO_2/ton of Al is used. The default emission factor for Centre Worked Prebake (CWPB) is also used to estimate PFC emissions (Table 4.15 in Volume 3, Chapter 4.4.2.4 IPCC Guidelines 2006).

4.1.4.3.2. UNCERTAINTIES AND CONSISTENCY OF TIME SERIES (2.C.3)

Time series consistency is ensured by using the same time series method for estimating all aluminium production emissions. Due to the use of official national statistics, the uncertainty in activity data is low: around ±10%.

The IPCC guidelines state that the reactions leading to carbon dioxide emissions are well understood and the emissions are very directly connected to the tonnes of aluminium produced through the fundamental electrochemical equations for alumina reduction at a carbon anode and oxidation from thermal processes. Therefore, uncertainty in the emission factor for CO_2 is considered to be relatively low; less than ±10 %. However, the PFC emission factor used within the tier 1 emission estimation is considered to be very uncertain as there is large variability in anode effect performance among operators using similar production technology within production facilities. Uncertainty for the CWPB factors used for Azerbaijan have a stated uncertainty of -99/+380%.

4.1.4.3.3. CATEGORY-SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL (2.C.3)

In accordance with the requirements of the IPCC guidelines and other relevant documents related to it, general and categorical quality control and quality assurance were carried out by the relevant experts involved.

Activity data on primary aluminum production is based on data from the SSC. The collection of such data is assumed to comply with quality assurance criteria.

4.1.4.3.4. CATEGORY RECALCULATIONS (2.C.3)

Category recalculations were made only for the base year 1990.

4.1.4.3.5. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS (2.C.3)

An investigation is required to determine whether any secondary aluminum production data are available in the national aluminum production statistics within the country, as this production quantity will not be relevant to the emissions calculation as mentioned above and may lead to some overestimation of emissions from this category.

4.1.5. USE OF NON-ENERGY RELATED PRODUCTS FROM FUELS AND SOLVENTS (2.D)

4.1.5.1 LUBRICANT USE (2.D.1)

Lubricants are used to reduce friction and wear of machine parts. They can also be used for energy and heat transfer. In addition, lubricants are also used as sealants and they are used to prevent deposit build-up and corrosion protection. Technical oils, which are considered lubricants, are used both as raw materials and as auxiliary and working materials.

The use of lubricating oil is divided into two main areas: a) use in automobiles, including other areas (mobile sources) and b) use in industry related to various calculation methods.

Years	1990	2020	2021	2022
Lubricants production	1,897.44	1,463.28	2,343.66	1,804.98

Table 34. Lubricants production in Azerbaijan, TJ

Many different types of losses can occur during product use. Possible types of loss include:

- evaporation
- (co-) combustion
- leakage
- export (especially for car lubricants)
- transformations into products

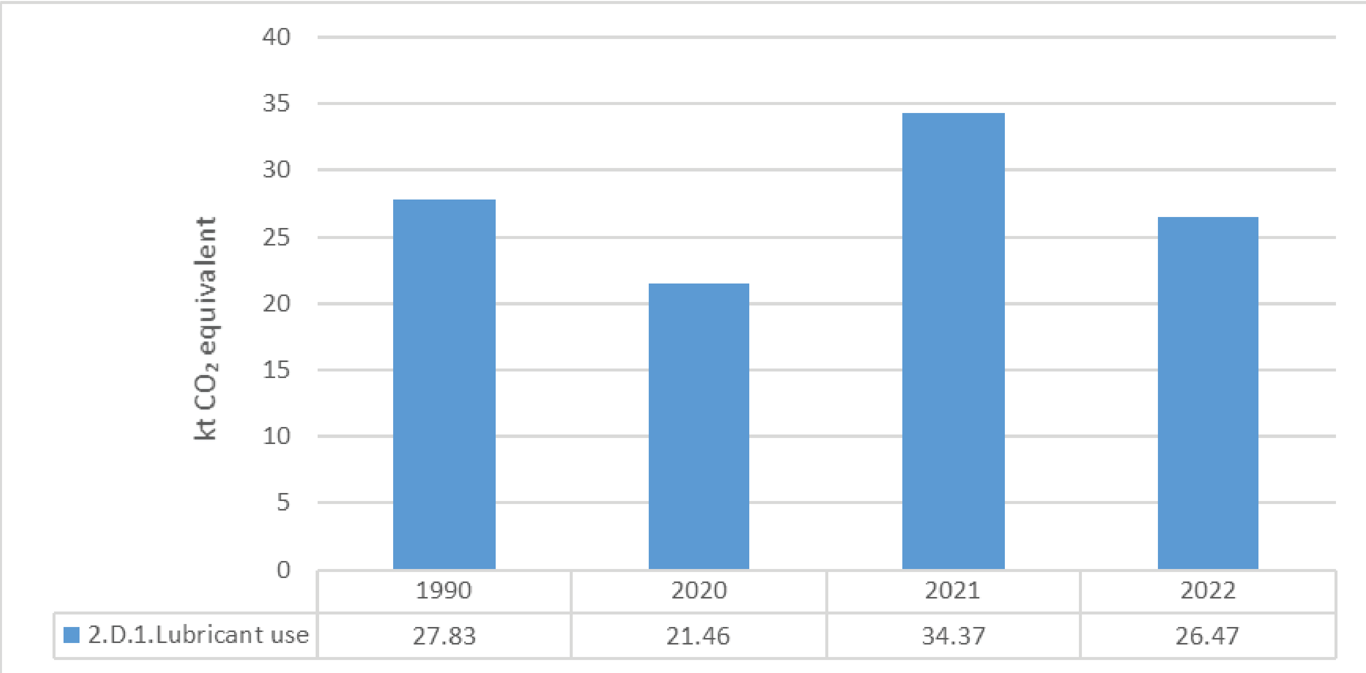


Figure 45. GHG emissions from Lubricant use category

4.1.5.1.1. METHODOLOGICAL ISSUES (2.D.1)

The emissions assessment for this category was carried out in accordance with the Tier 1 methodology as outlined in the IPCC 2006 Guidelines. This method applies emission factors to activity data on the amount of lubricant consumption in a country (in energy units, such as TJ). During the calculation, the standard carbon content and standard ODU (ISO- Oxidized in Use) of lubricating oils and a coefficient of 0.2 were used (Table 5.2, Chapter 5, Volume 3, IPCC Guidelines 2006).

Activity information was provided by the SSC.

4.1.5.1.2. UNCERTAINTIES AND CONSISTENCY OF TIME SERIES (2.D.1)

Uncertainties for specific emission factors for species groups for the stationary lubricant use area are derived from emission factor ranges. The IPCC guidelines state that the standard ODU factors developed are too uncertain because they are based on limited knowledge of typical lubricant oxidation rates. Expert opinion suggests using an uncertainty of 50 percent. In addition, the carbon content coefficients are based on two studies of the carbon content and calorific value of lubricating oils, from which an uncertainty range of approximately ±3 percent is estimated (US EPA, 2004).

Uncertainties for activity data are assumed to be 5%, consistent with the expected uncertainty associated with the use of national datasets. The level of consumption of lubricant oil in Azerbaijan is relatively stable, and consistency of time series is achieved using the same methodology for all time series.

4.1.5.1.3. CATEGORY-SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL (2.D.1)

Overall quality control and quality assurance was performed in accordance with the IPCC 2006 guidelines and the requirements of relevant documents.

When using the standard emission factor given in the 2006 IPCC Guidelines, it is not possible to distinguish between the uses from which CO_2 emissions are generated.

In this regard, if the Tier 1 method is used, CO_2 emissions from the industrial use of lubricants can be doubled.

For mobile use, the same works were carried out in accordance with the requirements of the general instruction on quality control and quality assurance and relevant documents by the relevant experts.

4.1.5.1.4. RECALCULATIONS BY CATEGORY (2.D.1)

A recalculation was made for 1990 for the lubricant use category.

4.1.5.1.5. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS (2.D.1)

No improvements are planned for this category.

4.1.6. USE OF SUBSTANCES THAT ARE SUBSTITUTES FOR OZONE-DEPLETING SUBSTANCES (2.F)

The subcategory of replacement products of ozone depleting substances (ODM) includes Refrigeration and air conditioning systems (2.F.1), Foam production (2.F.2), Fire extinguishing agents (2.F.3), Aerosols (2.F.4). ODM and their substitutes are not produced in Azerbaijan. ODM is imported into Azerbaijan for use in these subcategories. ODM substitutes have been imported into the country since the early 1990s.

In accordance with the requirements of the Montreal Protocol, the import of ODM substitutes into the country will be stopped in 2030. Therefore, for the decommissioning of these substitutes, a relevant project was implemented in the country within the framework of the QEF/UNIDO program in 2015-2018. Thus, zero GHG emissions from this category in 2030 will contribute to the reduction of GHG emissions in the country and the fulfillment of obligations under the PS.

The use of refrigerants in the refrigerators of stationary and mobile vehicles is a source of HFC emissions in this category. Emissions can also come from foams, aerosols, small amounts of fire extinguishers and solvents.

The current report does not calculate Ozone Depleting Substances (ODS) Product Use Emissions for the country. It was decided to fulfill the relevant obligations for the improvement of performance data for the calculation of Azerbaijan's emissions from this sector of data related to refrigeration and air conditioning systems (2.F.1).

4.1.6.1. REFRIGERATION AND AIR CONDITIONING SYSTEMS (2.F.1)

4.1.6.1.1. CATEGORY DESCRIPTION (2.F.1)

This category is divided into commercial refrigeration, domestic refrigeration, industrial refrigeration, transport refrigeration, mobile air conditioning systems and stationary air conditioning systems subcategories.

4.1.6.1.2. METHODOLOGICAL ISSUES (2.F.1)

In Azerbaijan, statistical data are not provided separately for the subcategories given under 2F1, with data only available on the total amount of imported products available at the national level. However, due to the transition to use of the IPCC software for the updated GHG inventory, it has not been possible to calculate emission estimates for this sector within reasonable bounds of uncertainty.

4.1.6.1.3. DESCRIPTION OF ANY FLEXIBILITY APPLIED (2.F.1)

Azerbaijan has elected to use the flexibility provision as outlined in paragraph 48 of the MPGs, which states that developing country Parties that need flexibility in the light of their capacities with respect to this provision have the flexibility to instead report at least three gases (CO_2, CH_4 and N_2O) only. Azerbaijan does not anticipate that emissions from 2F1 would be a key category, but notes that providing emission estimates from this sector in subsequent reporting is included in the improvement plan.

4.1.6.1.4. UNCERTAINTIES AND TIME SERIES CONSISTENCY (2.F.1)

Activity data available for this sector was not utilized for emission calculation as it is was considered to be highly uncertain. This is partly caused by issues of commercial confidentiality within the data set. It was therefore expected that any emission estimates would exceed 50% uncertainty. Uncertainty in the activity data must first be reduced to enable future emission calculation.

4.1.6.1.5. PLANNED IMPROVEMENTS TO THE CATEGORY

It is necessary to obtain activity data which will enable emission estimation from this sector in line with best practice outlined in the IPCC 2006 Guidelines. This is planned for the submission of the second BTR. This is intended to be achieved through further work with the experts of the sector (distributors, etc.) in order to elaborate assumptions to estimate the F-gas emissions by equipment/application. It is also planned to undertake studies (e.g. Market situation for each equipment/application) to improve the estimates of F-gas emissions in the future. In estimating annual sales of new refrigerant, total charge of new equipment and original total charge of retiring equipment, inventory compilers will be able to account for imports and exports of both chemicals and equipment. This will ensure that the actual domestic consumption of chemicals and equipment is captured.

5. AGRICULTURE (CRT SECTOR 3)

The Republic of Azerbaijan was known as an agricultural country until the end of XX century. Since its agricultural field had great opportunities, it was a producer of a wide range of agricultural goods. The development of grain-growing, cotton-growing, viticulture, vegetable and fruit-growing industries in the fertile lands of the country was gaining momentum. The livestock area was also expanding. An increase in the number of cattle, sheep and goats led to an increase in dairy products. In the 1970-80s, the agricultural sector formed 25% of the country's GDP. Currently, this figure is about 5%.

In the 1990s, the country's transition from a planned form of economy to a market economy led to a decline in the agricultural sector, as well as in all economic sectors. Return of land to the population, creation of fertile conditions for the development of an agricultural economy gave impetus to the development of this sector. In state programs and plans, attention is regularly paid to the agricultural sector. Thus, the "Strategy for socio-economic development of the Republic of Azerbaijan in 2022-2026" document adopted in the country includes the direction of activity called "Development of sustainable and competitive agriculture and agribusiness".

The analysis of statistical data shows that a decline in the number of animals in the country has been observed over the past two years.

5.1. CATEGORY DESCRIPTION (1990, 2020-2022)

In the agricultural sector of Azerbaijan, there is information about emissions from enteric fermentation (3.A), manure management (3.B), agricultural land use (3.D) and rice cultivation (3.C). Due to the lack of statistical data on the use of lime (3.G), information on these emissions is not included in the report and is marked as "NE' using notation keys. In Azerbaijan, the burning of agricultural residues in field (3.E) is prohibited by law and land clearing through burning is not practiced ("NO"). There are no activities related to burning of savannahs (3.F) in the country. Although there is significant potential for methane capture from both livestock and agricultural residues in the country's agricultural sector, official statistics do not provide data on these activities.

Azerbaijan applies tier 1 methodology for all agriculture categories. As no disaggregated information is available for all agriculture categories country is unable to estimate at higher tier. Azerbaijan will put forward an improvement plan which will include an action plan with timelines and collection of the necessary data.

Between 1990 and 2022, total emissions from agriculture increased from 4,523.0 kt CO_2eq to 6,717.1 kt CO_2 eq. The largest contributor, enteric fermentation, saw a substantial rise from 3,377.0 kt CO_2 eq in 1990 to 5,102.7 kt CO_2eq in 2022, as a result of significant growth in the cattle population. Emissions from manure management (CH_4 and N_2O) also increased for this reason. Emissions from rice production grew from 7.7 kt CO_2 eq. to 13.3 kt CO_2 eq. due to the expansion of rice cultivation areas.

CRT code	Category	1990		2020	2021	2022	
		kt CO_2 eq.	%	kt CO_2 eq.	kt CO_2 eq.	kt CO_2 eq.	%
3.A	Enteric fermentation	3,377.04	74.7	5,177.38	5,163.6	5,102.67	75.9
3.B	Manure management (CH_4)	324.2	7.2	527.25	529.96	528.87	7.9
3.B	Manure management (direct and indirect N_2O)	238.21	5.3	320.73	319.52	314.81	4.7
3.C	Rice cultivation	7.7	0.0	12.78	13.14	13.33	0.2
3.D	Agricultural soils	575.8	11.0	1,152.92	873.23	757.47	11.3
3.F	Prescribed burning of savannahs and Field burning of agricultural residues	NE	-	NO	NO	NO	-
3.G	Liming	NE	-	NE	NE	NE	-
3.H	Urea application	NE	-	0,16	0,07	0,015	0,0
	Total agriculture	**4,522.95**	**100**	**7,191.22**	**6,899.52**	**6,717.16**	**100**

Table 35. GHG emissions from the Agriculture sector

Emissions from agricultural soils nearly doubled, rising from 575.8 kt CO_2 eq in 1990 to 757.5 kt CO_2 eq in 2022, driven by several factors: an increase in livestock population, leading to more manure applied to agricultural soils and more manure dropped by animals during grazing. However, this growth was somewhat offset by a reduction in the use of synthetic fertilizers on agricultural soils.

Livestock population: Activity data on livestock population number were obtained from the State Statistical Committee. In addition, the data were verified against those reported by the FAOSTAT (chapter 5.2.5). Azerbaijan was not able to apply Equation 10.1 to calculate the annual average population of poultry, due to the lack of accurate data on poultry categories, and therefore the estimates of CH_4 and N_2O emissions from poultry manure management have not been conducted. However, Azerbaijan will make every effort to collect data on poultry population by sub-categories and evaluate annual average population for the entire reporting period. Nevertheless, the average annual population of sheep livestock was calculated using the data reported by the State Statistical Committee on 'Changes of sheep and goats number, by farm categories'. Specifically, the population of the born lambs was used as the basis for calculating the population of ewes. It was assumed that, on average, 1.8 lambs are born per ewe[3]. The population of breeding rams was calculated based on a ratio of 1:25[4] (breeding ram: ewes). Approximately 25% of the born offspring[5] were defined as a replacement herd (with lifespan 1 year). For the remaining population number of offsprings born, it was assumed that all were slaughtered in the same year they were born. These assumptions were confirmed by data on sheep slaughtering. The lifespan of meat sheep was assumed to be 5 months.

Livestock category	1990	2020	2021	2022
Cattle	1,541.1	2,504.0	2,519.7	2,498.2
dairy cows	600.6	1,211.3	1,227.2	1,231.9
other cattle	940.5	1,292.7	1,292.5	1,266.3
Buffalo	290.5	146.7	129.1	119.9
Sheep (annual average population)	2,176	3,668.0	3,613.0	3,526
Goats	194.6	605.9	585.5	580.9
Camels	0.2	0.2	0.3	0.4
Horses	36.8	60.4	58.4	56.6
Mules and Asses	29.9	23.4	21.1	20.1
Swine	156.7	5.9	6.0	5.1
Poultry	NE	NE	NE	NE

Table 36. Livestock population number in 1990 and 2020–2022, thousand heads

Between 1990 and 2022, livestock populations showed diverse trends. Cattle increased by 62%, with dairy cows more than doubling (+105%), while buffalo decreased by 59%. Population of sheep and goats increased by 37% and 62% respectively, and the horse population rose by 54%. In contrast, swine dropped sharply by 97%, and mules and asses fell by 33%. Overall, dairy cows and goats saw the most significant growth, while swine and buffalo experienced the largest declines.

Only Category 3.A Enteric Fermentation (CH_4) of the Agriculture sector (including and excluding LULUCF) was added to the list of key categories in 2022.

5.2. ENTERIC FERMENTATION (CRT 3.A)

5.2.1. CATEGORY DESCRIPTION

Methane emissions from enteric fermentation of livestock comprised 182.24 kt CH_4 of total emissions in the Agriculture sector in Azerbaijan. The emissions increased by 61.63 kt CH_4 (51,1%) compared to 1990, as a result of the increase in the livestock population (Table 36). This category includes emissions from cattle (dairy and other cattle), buffalo, sheep, goats, horses, swine, camels, mules, and asses.

[3] Sheep farmer field schools - A facilitators' guide (fao.org)

[4] Sheep farmer field schools - A facilitators' guide (fao.org)

[5] https://ahdb.org.uk/key-performance-indicators-kpis-for-lamb-sector#:~:text=Studies%20have%20shown%20that%20on,culling%20policy%20and%20ewe%20mortality

Livestock category	1990		2020	2021	2022	
	kt	%	kt	kt	kt	%
Cattle	85.04	70.51	143.13	144.2	143.29	78.63
dairy cows	40.84	33.86	82.37	83.45	83.77	45.97
other cattle	44.20	36.65	60.76	60.75	59.52	32.66
Buffalo	15.98	13.25	8.07	7.1	6.59	3.6
Sheep	17.41	14.43	29.34	28.90	28.21	15.5
Goats	0.97	0.8	3.03	2.93	2.90	1.54
Camels	0.01	0.0	0.01	0.01	0.02	0.01
Horses	0.66	0.55	1.09	1.05	1.02	0.6
Mules and Asses	0.30	0.25	0.23	0.21	0.02	0.1
Swine	0.24	0.2	0.01	0.01	0.01	0.004
Poultry	NA	NA	NA	NA	NA	NA
Total	**120.61**		184.91	184.41	**182.24**	

Table 37. Emissions from enteric fermentation of different livestock categories, CH_4

Within the category, CH_4 emissions from enteric fermentation from cattle (dairy cows and other cattle) and sheep are deemed significant, as the emissions from these categories of livestock account for 78.63% (46.0 Dairy cows and 32.7 Other cattle) and 15.5 %, respectively in 2022. Despite the fact that enteric fermentation is a key category (table 4), the methodological choice for the significant animal species is not in line with the corresponding decision tree of the 2006 IPCC Guidelines as the Party is unable to adopt a higher-tier method for this particular key category owing to lack of resources and data.

Azerbaijan will prioritize for future improvement of the key categories for which the good practice method elaborated in the 2006 IPCC Guidelines cannot be used category owing to lack of resources and data.

5.2.2. METHODOLOGICAL ISSUES

In accordance with the 2006 IPCC Guidelines, for animals that live (and cause emissions) only during certain parts of the year, the annual average population shall be calculated based on equation (10.1.).

Azerbaijan has used a tier 1 method to estimate the emissions from all livestock categories along with the IPCC default CH_4 EFs elaborated for developing countries (i.e. for sheep, goats, horses, camels and swine) and the IPCC default CH_4 EFs developed for other cattle farmed in Asia. Azerbaijan uses the IPCC Software to calculate the emissions. As poultry are monogastric and the IPCC default enteric EF was not developed in the 2006 IPCC Guidelines, the emissions were not calculated.

5.2.3. DESCRIPTION OF ANY FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

5.2.4. UNCERTAINTY ASSESSMENT AND TIME-SERIES CONSISTENCY

The uncertainty rates associated with the activity data on livestock population are insignificant because the data were collected by the State Statistical Committee, which covers a substantial number of farms and, accordingly, a significant portion of the livestock population. The uncertainty rate associated with the IPCC default EFs has also been applied in the uncertainty assessment.

5.2.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

FAOSTAT data was used for verification purpose, as a reference international database (included in the 2006 IPCC Guidelines in the cross-cutting chapter). Number of animals are aligned with FAOSTAT[6] figures (reported as official for the year 2022), except for very small differences. The source of information for the categorization of cattle (dairy and non-dairy) differ from the numbers that can be derived from FAOSTAT. Poultry figure is the chicken one reported in FAOSTAT[7] (turkeys are not included).

Categories	National source	FAOSTAT	
	Number of Animals	Number of Animals	Diff.
Cattle	2,498,200	2,498,179	0.00%
dairy cows	*1,231,900*	*1,287,996*	*-4.55%*
other cattle	*1,266,300*	*1,210,183*	*4.43%*
Buffalo	119,900	119,900	0.00%
Sheep[8]	7,170,800	7,170,828	0.00%
Goats	580,900	580,840	0.01%
Camels	400	357	10.75%
Horses	56,600	56,576	0.04%
Mules and Asses	20,100	20,074	0.13%
Swine	5,100	5,130	-0.59%
Poultry	29,794,900	29,795,000	0.00%

Table 38. Comparison of livestock numbers in 2022, FAOSTAT

In addition, general and category-specific quality control and quality assurance were performed by appropriate experts in accordance with the requirements of the IPCC guidelines and related applicable documents.

5.2.6. CATEGORY-SPECIFIC RECALCULATIONS

The recalculations have been performed for 1990 due to the update in the activity data. The total CH_4 enteric fermentation emissions reported in 4th National Communication is 153.27 kt CH_4.

5.2.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

Azerbaijan will prioritize for future improvement of the key categories for which the good practice method elaborated in the 2006 IPCC Guidelines cannot be used category owing to lack of resources and data.

Moreover, Azerbaijan will make efforts to implement enhance categorization of cattle (dairy and non-dairy) as part of the improvement plan. In addition, as tier 1 was used and average gross energy intake (GE) (MJ/head/day) and average CH_4 conversion rate (Ym) (%) were not estimated owing to lack of resources and data. The collection of disaggregated information on this activity data will be added to the improvement plan. As part of the improvement plan, it's planned to conduct consultations with the Ministry of Agriculture, national agricultural institutes and universities on possible ways to collect this data.

6 https://www.fao.org/faostat/en/#data/QCL

7 FAOSTAT

8 Number of animals and poultry as of 1st January

5.3. MANURE MANAGEMENT (CRT 3.B(a))

5.3.1. CATEGORY DESCRIPTION

Between 1990 and 2022, CH_4 emissions from livestock categories showed substantial changes. Cattle emissions nearly doubled, increasing from 8.75 kt (75.6%) to 17.28 kt (91.5%), with dairy cows contributing the largest share, growing from 7.81 kt (67.4%) to 16.01 kt (84.8%). Other cattle saw a smaller rise in emissions, while buffalo emissions dropped significantly from 1.45 kt (12.5%) to 0.60 kt (3.2%). Emissions from sheep rose slightly from 0.44 kt (3.8%) to 0.71 kt (3.7%), and emissions from goats tripled, though they remained small. Emissions from swine decreased sharply from 0.78 kt (6.8%) to 0.03 kt (0.1%). Overall, total emissions grew from 11.58 kt to 18.89 kt, reflecting increased contributions primarily from cattle, particularly dairy cows.

Livestock category	1990		2020	2021	2022	
	kt	%	kt	kt	kt	%
Cattle	8.75	75.6	17.04	17.25	17.28	91.5
dairy cows	7.81	67.4	15.75	15.95	16.01	84.8
other cattle	0.94	8.1	1.29	1.29	1.27	6.7
Buffalo	1.45	12.5	0.73	0.65	0.60	3.2
Sheep	0.44	3.8	0.73	0.72	0.71	7.1
Goats	0.04	0.4	0.13	0.13	0.13	0.7
Camels	0.001	0.00	0.001	0.001	0.001	0.01
Horses	0.08	0.7	0.13	0.13	0.12	0.7
Mules and Asses	0.04	0.3	0.03	0.03	0.02	0.1
Swine	0.78	6.8	0.03	0.03	0.03	0.1
Poultry	NE	NE	NE	NE	NE	NE
Total	**11.58**		18.83	18.93	**18.89**	

Table 39. CH_4 emissions from livestock manure management systems

Due to the lack of relevant data, in the CRT tables for the category (Table 3.B(a): 3.B.1.a. - dairy cattle, 3.B.1.b. - non-dairy cattle, 3.B.4.c. - goats and 3.B.4.d. - horses), even though some animals live in warm climate regions, their share is unknown and therefore, estimations have been made according to the temperate region for all animals and the “IE” notation key has been used. In the future, the country plans to use disaggregated data to address these aspects.

In the CRT table for poultry category 3.B.4.g., the average annual number of domestic birds in the country is not calculated. As a result, manure management for poultry has not been estimated and the “NE” notation key has been used. In the future, as part of planned improvements, disaggregated data on the average annual number of poultry in the country will be prepared.

5.3.2. METHODOLOGICAL ISSUES

The tier 1 approach was used to calculate CH_4 emissions from livestock manure management in the IPCC Software. The IPCC default parameters developed for Asia with an average annual temperature of 15°C. The annual average temperature of 15° C was used as per several national and international data sources.

5.3.3. DESCRIPTION OF ANY FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

5.3.4. UNCERTAINTY ASSESSMENT AND TIME-SERIES CONSISTENCY

The uncertainty rates associated with the activity data on livestock population are insignificant because the data were collected by the State Statistical Committee, which covers a substantial number of farms and, accordingly, a significant portion of the livestock population. The uncertainty rates associated with the data on manure management systems and emission factors correspond to those reported in the 2006 IPCC Guidelines, as the IPCC software with default data was used to estimate the emissions.

5.3.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

General and category-specific quality control and quality assurance were performed by appropriate experts in accordance with the requirements of the IPCC guidelines and related applicable documents.

5.3.6. CATEGORY-SPECIFIC RECALCULATIONS

The recalculations have been performed for 1990 due to the update in the activity data. The total CH_4 emissions due to manure management reported in 4th National Communication is 11.88 kt CH4.

5.3.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

The improvements described for the Enteric Fermentation category will also affect the improvements for the Manure Management category.

5.4. MANURE MANAGEMENT (CRT 3.B(b))

5.4.1. CATEGORY DESCRIPTION 3.B(b)

Between 1990 and 2022, direct N_2O emissions from livestock categories saw significant changes. Cattle emissions increased notably, with dairy cows' share growing from 13.6% to 22.7% of the total emissions. Other cattle also saw a rise, while buffalo emissions dropped sharply from 20.9% to 7.1%. Swine emissions decreased dramatically from 1.7% to 0.04%. Overall, total emissions grew from 0.793 kt to 0.971 kt, reflecting increased contributions from cattle and a decline in buffalo and swine emissions (Table 40).

Livestock category	1990		2020	2021	2022	
	kt	%	kt	kt	kt	%
Cattle	0.614	77.4	0.913	0.916	0.902	92.9
dairy cows	0.108	13.6	0.217	0.220	0.221	22.7
other cattle	0.506	63.8	0.696	0.696	0.682	70.2
Buffalo	0.166	20.9	0.084	0.074	0.069	7.1
Swine	0.013	1.7	0.001	0.001	0.0004	0.04
Total (direct N_2O emissions)	**0.793**	100	0.997	0.990	**0.971**	100
Total (indirect N_2O emissions)	**0.106**		0.213	0.216	**0.216**	

Table 40. Direct N_2O emissions from livestock manure management systems

Due to the lack of data on nitrogen (N) lost through leaching and discharge in the category-specific CRT table (Table 3.B(b)), N_2O emissions have not been calculated.

5.4.2. METHODOLOGICAL ISSUES 3.B(b)

The Tier 1 approach was used for the calculations. Azerbaijan uses the IPCC Software to calculate N_2O emissions. The estimates of direct N_2O emissions from manure management for cattle, buffalo, and swine were conducted. However, since the IPCC Software does not include default values for the types of manure management systems used to store and handle manure generated by sheep, goats, camels, horses, mules, and poultry, the direct N_2O emissions from manure management systems for these livestock categories were not assessed.

The estimates of indirect N_2O emissions were also carried out using the Tier 1 approach with the IPCC Software. The IPCC default parameters for FracGasMS and EF4 were used in the calculations.

The calculation of indirect N_2O emissions were not performed because the 2006 IPCC Guidelines do not provide default parameters to perform these estimates.

5.4.3. DESCRIPTION OF ANY FLEXIBILITY APPLIED 3.B(b)

See Flexibility Chapter 1.9.

5.4.4. UNCERTAINTY ASSESSMENT AND TIME-SERIES CONSISTENCY 3.B(b)

The uncertainty rates associated with the activity data on livestock population are insignificant because the data were collected by the State Statistical Committee, which covers a substantial number of farms and, accordingly, a significant portion of the livestock population. The uncertainty rates associated with the data on manure management systems and emission factors correspond to those reported in the 2006 IPCC Guidelines, as the IPCC software with default data was used to estimate the emissions. The only gap, and the corresponding impact on the overall uncertainty assessment, may result from the fact that emissions from certain livestock categories were not estimated due to the lack of default data on manure management systems.

5.4.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION 3.B(b)

General and category-specific quality control and quality assurance were performed by appropriate experts in accordance with the requirements of the IPCC guidelines and related applicable documents. In addition, those efforts conducted to verify the livestock population are one of the QA/QC activities for manure management category.

5.4.6. CATEGORY-SPECIFIC RECALCULATIONS 3.B(b)

The recalculations have been performed for 1990 due to the update in the activity data.

5.4.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

N lost through leaching and run-off was not estimated owing to lack of disaggregated data. The collection of disaggregated information on the missing activity data will be added to the improvement plan. As part of the improvement plan, it's planned to conduct consultations with the Ministry of Agriculture, national agricultural institutes and universities on possible ways to collect this data.

5.5. RICE CULTIVATION (CRT 3.C)

5.5.1. CATEGORY DESCRIPTION 3.C

Between 1990 and 2022, methane emissions increased from 0.274 kt to 0.476 kt due to the expansion of rice cultivation area from 1,800 hectares to 3,129 hectares.

5.5.2. METHODOLOGICAL ISSUES 3.C

CH4 emissions from rice cultivation were estimated following Tier 1 approach of the 2006 IPCC Guidelines using the IPCC Software. Data on areas of rice cultivated were obtained from the State Statistical Committee.
In Azerbaijan, an irrigated system with an intermittently flooded (single aeration) water regime is used for rice cultivation.

Type and amounts of organic amendments added during the rice cultivation was not estimated owing to lack of disaggregated data.

Methane emissions from rice cultivation were calculated using the Tier 1 approach and are listed in Table 3.C.1. Regarding other (3.C.2) and (3.C.3) subcategories, the notation key "IE" was used.

5.5.3. DESCRIPTION OF ANY FLEXIBILITY APPLIED 3.C

See Flexibility Chapter 1.9.

5.5.4. UNCERTAINTY ASSESSMENT AND TIME-SERIES CONSISTENCY 3.C

Since data on rice cultivation areas were obtained from the State Statistical Committee, which collects data at the national level, the associated uncertainty rates are considered to be low. The uncertainty rate associated with the IPCC default EFs and scaling parameters have been applied in the uncertainty assessment.

5.5.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION 3.C

General and category-specific quality control and quality assurance were performed by appropriate experts in accordance with the requirements of the IPCC guidelines and related applicable documents.

5.5.6. CATEGORY-SPECIFIC RECALCULATIONS 3.C

Emissions from Rice cultivation category were reported using the notation key "NE".

5.5.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

Type and amounts of organic amendments added during the rice cultivation was not estimated owing to lack of disaggregated data. Therefore, the collection of disaggregated information on the missing activity data will be added to the improvement plan. As part of the improvement plan, it's planned to conduct consultations with the Ministry of Agriculture, national agricultural institutes and universities on possible ways to collect this data.

5.6. DIRECT AND INDIRECT N_2O EMISSION FROM MANAGED SOILS (CRT 3.C)

5.6.1. CATEGORY DESCRIPTION

Between 1990 and 2022, the structure of direct N_2O emissions from managed soils in Azerbaijan changed significantly. In 1990, inorganic nitrogen (N) fertilizer application was the primary source, contributing 41.6% of direct N_2O emissions (0.786 kt). By 2022, its share had dropped to 10.5% (0.259 kt), indicating a significant reduction in its contribution. In contrast, organic N from animal manure saw a notable increase, rising from 29.6% (0.558 kt) in 1990 to 36.3% (0.902 kt) in 2022, becoming one of the dominant sources of emissions. Similarly, emissions from urine and dung deposited by grazing animals more than doubled, growing from 12.0% (0.227 kt) to 18.7% (0.465 kt). Direct N_2O emissions released due to decay of crop residues left on the agricultural soils doubled from 0.317 kt (16.8%) to 0.666 kt (26.9%) due to remarkable increase in crop production in Azerbaijan over this period. Overall, direct N_2O emissions increased from 1.887 kt in 1990 to 1.292 kt in 2022. Indirect N_2O emissions from managed soils slightly declined from 0.285 kt to 0.566 kt over the same period (Table 41).

Category	1990		2020	2021	2022	
	kt	%	kt	kt	kt	%
Inorganic N fertilizer application	0.786	41.6	1.379	0.555	0.259	10.5
Organic N applied as fertilizer (animal manure)[9]	0.558	29.6	0.902	0.906	0.902	36.3
Urine and dung N deposited on pasture, range and paddock by grazing animals	0.227	12.0	0.457	0.463	0.465	18.7
N in crop residues	0.317	16.8	0.683	0.707	0.666	26.9
N mineralization/ immobilization associated with loss/gain of soil organic matter resulting from change of land use or management of mineral soils	NE	-	NE	NE	NE	NE
Cultivation of organic soils	NO	-	NO	NO	NO	-
Direct N_2O emissions from managed soils	1.887	100	3.422	2.631	1.292	100
Indirect N_2O emissions from managed soils	0.285	-	0.929	0.664	0.566	-

Table 41. Direct and indirect N_2O emissions from managed soils

5.6.2. METHODOLOGICAL ISSUES

Direct and indirect N_2O emissions from managed soils were estimated following Tier 1 approach of the 2006 IPCC Guidelines using the IPCC software.

FAOSTAT[10] data was used for Nitrate-based synthetic fertilizer, as a main database due to lack of national data for 2022. However, it should be noted that FAOSTAT does not report data on the amounts of fertilizers applied to agricultural soils in 1990, as reporting begins in 1992. Therefore, it was assumed that the amounts of fertilizers applied in 1990 was the same as in 1992, since Azerbaijan had not yet undergone significant economic changes. The Party will prioritize for collection of the national data for Nitrate-based synthetic fertilizer as part of the improvement plan.

Azerbaijan does not have information regarding whether sewage sludge is used on agricultural soils for the reporting years; therefore, the notation key 'NE' was used. However, this category will be included in the improvement plan for further examination.

The estimates of N_2O emissions due to animal manure applied to soils, and urine and dung deposed by grazing animals were estimated using the IPCC Software. Hence, the activity data on animal population and the default data on manure management systems, as well as ratios of manure used for construction and fuels were applied (i.e., 0).

Direct N_2O emissions from crop residues left on the fields were calculated using a tier 1 and default parameters embedded in the IPCC software (i.e., the 2006 Guidelines' defaults). The data on annual crop areas and yields have been obtained from the national statistics (Table 42).

[9] N_2O emissions from application of sewage sludge to agricultural soils was reported using the notation key "NE"

[10] https://www.fao.org/faostat/en/#data/RFN

Years	Rye	Barley	Wheat	Oats	Grain maize	Millet	Pulses
1990	1.1	190.0	368.6	3.1	12.9	-	6.6
2020	0.3	345.0	588.4	5.8	33.7	0.1	12.7
2021	0.3	373.7	572.3	6.4	32.2	0.2	10.4
2022	0.1	386.3	547.2	6.3	30.5	0.2	11.8

Table 42. Cultivation area of annual crops, kha[11]

The data on production areas and yields for perennial crops (i.e., grass) have not been considered in the current submission, due to lack of complete dataset needed to conduct the estimates.

Direct N_2O emissions due to N mineralization/immobilization associated with the loss/gain of soil organic matter resulting from changes in land use or management of mineral soils for 2022 were assessed using the IPCC software, ensuring consistency in activity data with the LULUCF sector. Direct N_2O emissions for this sub-category were reported as 'NO' because there were no carbon losses due to management changes in cropland remaining cropland and grassland remaining grassland for agriculture.

The estimates of indirect N_2O emissions from the management of the agricultural soils were estimated using tier 1 using the IPCC Software. For the Total N loss from MMS FraclossMS the default values were applied from Table 10.23, Chapter 10, Volume 4 AFOLU of 2006 IPCC guidelines. For similar animals the same fraction was applied (Dairy/Other Cattle/Buffalo). MMS FraclossMS amounted to 30 was applied for Dry lot Manure Management system type for swine to estimate the N2O emissions. Owing to limited time constraints and lack of disaggregated data, the N_2O emissions for swine were not estimated partially. As a result of the lack of these data, it can be assumed that the amount of N manure available to be applied to agricultural soils is slightly overestimated.

5.6.3. DESCRIPTION OF ANY FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

5.6.4. UNCERTAINTY ASSESSMENT AND TIME-SERIES CONSISTENCY

The uncertainty rates associated with the IPCC default EFs and IPCC fractions have been applied in the uncertainty assessment. As for the uncertainty rates associated with the activity data, the data on the amounts of fertilizers applied to agricultural soils are the most uncertain, as they were taken from an international source (FAOSTAT).

5.6.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

General and category-specific quality control and quality assurance were performed by appropriate experts in accordance with the requirements of the IPCC guidelines and related applicable documents.

5.6.6. CATEGORY-SPECIFIC RECALCULATIONS

The recalculations were performed for 1990. N_2O emissions from agricultural soils were reported using the notation key 'NE' in the 4th NC.

5.6.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

Nitrate-based synthetic fertilizer: The Party will prioritize for collection of the national data for Nitrate-based synthetic fertilizer as part of the improvement plan.

[11] Agriculture, forestry and fishing | The State Statistical Committee of the Republic of Azerbaijan

Sewage sludge: Sewage sludge applied to soils and Crop residues were not estimated owing to lack of disaggregated data. The collection of disaggregated information on the missing activity data will be added to the improvement plan. As part of the improvement plan, it's planned to conduct consultations with the Ministry of Agriculture, national agricultural institutes and universities on possible ways to collect this data.

Total N loss from MMS FraclossMS: MMS FraclossMS, amounting to 30, was applied for the Dry Lot Manure Management system type for swine to estimate N_2O emissions. Due to time constraints and a lack of disaggregated data, N_2O emissions for swine were only partially estimated, which affected the amount of N in manure available to be applied to agricultural soils. The collection of disaggregated information on total N losses (in fraction, FraclossMS) from manure management system will be added to the improvement plan. This information will be used to calculate the amount of N manure available to be applied to agricultural soils. As part of the improvement plan, it's planned to conduct consultations with the Ministry of Agriculture, national agricultural institutes and universities on possible ways to collect this data.

5.7. PRESCRIBED BURNING OF SAVANNAHS (CRT 3.E) AND FIELD BURNING OF AGRICULTURAL RESIDUES (3.F)

CH_4 and N_2O emissions from prescribed burning of savannahs are not occurring in the country. According to law on waste[12] and law on atmospheric air protection[13] burning activities are prohibited in the country. Therefore, the notation key "NO" was used to indicate the emissions due prescribed burning of savannahs in 2022. However, since the law on waste came into effect in 1998 and law on air protection came into force in 2001, no activity data is available for 1990, Azerbaijan used the notation key "NE".

The same law implies field burning of agricultural residues category and all activity data underlying the estimates for this category. Hence, the same notation keys were used for 1990 and 2022. Azerbaijan will prioritize future improvements in identifying if field burning of agricultural residues takes place.

5.8. CO_2 EMISSIONS FROM LIMING, UREA APPLICATION AND OTHER CARBON-CONTAINING FERTILIZERS (3.G-J)

5.8.1. CATEGORY DESCRIPTION

CO2 emissions due to urea application to the agricultural soils made up 0.014 kt in 2022.

5.8.2. METHODOLOGICAL ISSUES

Liming: CO_2 emissions from liming were not estimated owing to lack of disaggregated data on liming activities. Azerbaijan will prioritize future improvements in identifying liming activities take place.

Urea application: CO_2 emissions from urea application were estimated following Tier 1 approach of the 2006 IPCC Guidelines.

Years	National source	FAOSTAT
	Amount of urea	Amount of urea imported
2022	20.3	374.23
2021	95.7	1,435.49
2020	212.4	11,173.84
1990	NO	NO

Table 43. Comparison of urea application numbers

[12] https://e-qanun.az/framework/3186

[13] https://e-qanun.az/framework/3515

Other carbon-containing fertilizers: The 2006 IPCC Guidelines do not provide a specific method and EF for this category and therefore it is not considered as a mandatory category.

5.8.4. UNCERTAINTY ASSESSMENT AND TIME-SERIES CONSISTENCY

The activity data on the amounts of urea applied to agricultural soils have a low uncertainty rate, as the data were obtained from the State Statistical Committee, which collects data at the national level. The uncertainty rate associated with the IPCC EFs have been applied in the uncertainty assessment.

5.8.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

FAOSTAT data was used for verification purpose, as a reference international database: amount of urea applied in the country is not aligned with FAOSTAT[14] figures (reported as official for the year 2022) of imported urea applied for agricultural use. In the next submission, Azerbaijan will make efforts to improve data collection for urea application as part of the improvement plan.

İn addition, general and category-specific quality control and quality assurance were performed by appropriate experts in accordance with the requirements of the IPCC guidelines and related applicable documents.

5.8.6. CATEGORY-SPECIFIC RECALCULATIONS

No recalculations have been performed for this category.

5.8.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

Azerbaijan will make every effort to collect the missing data needed to estimate emissions from this category.

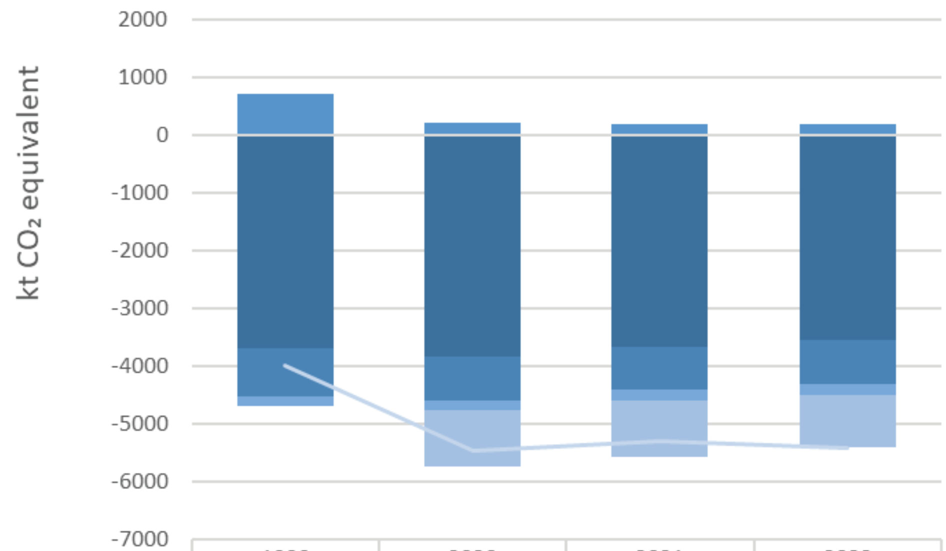
[14] https://www.fao.org/faostat/en/#data/RFB

6. LAND USE, LAND USE CHANGE AND FORESTRY (CRT SECTOR 4)

6.1. SECTOR OVERVIEW (CRT SECTOR 4)

In the LULUCF sector (CRT 4), reporting includes both emissions and removals to the atmosphere.

The analysis of the key categories was conducted considering the LULUCF and without it, using the base year of 1990 and the most recent inventory year of 2022. The Forest Land (4.A.1) was indicated as a key category. However, due to resource constraints and time limitations, the country is not capable of applying a higher-tier methodology for these categories. Azerbaijan applied the 2006 IPCC Guidelines Tier 1 approach for emission and removal sources in all land use categories. Emissions and removals from the LULUCF sector have been calculated using the IPCC software. Nevertheless, it should be noted that significant efforts will be required to ensure that the GHG inventory in the LULUCF sector of Azerbaijan meets the requirements of the TACCC quality principles stipulated in the 2006 IPCC Guidelines and to collect country-specific AD for the entire historical period, as well as relevant EFs and underlying key parameters. Namely, in the future, Azerbaijan will prioritize further improvements, gathering the necessary data and taking appropriate measures to estimate emissions/removals using higher-tier methodologies.



	1990	2020	2021	2022
4.G.Harvested wood products		-974.13	-987.77	-909.27
4.E.Settlements	-177.87	-177.87	-177.87	-177.87
4.C.Grassland	703.53	215.21	194.5	200.02
4.B.Cropland	-832.98	-751.1	-754.58	-760.05
4.A.Forest land	-3692.68	-3843.69	-3661.49	-3558.69
Total	-4000	-5479	-5306	-5432

Figure 46. CO_2 emissions/removals by land use category

As shown in Figure 46, significant changes in carbon emissions/removals have occurred due to land use changes between 1990 and 2022. The removals in 1990 amounted to -4,000.5 kt CO_2, which gradually increased to -4,523 kt CO_2 by 2022. As the activity data on HWP was not available for the 1990, removals for the HWP category were not estimated, so this category was not considered when comparing removal levels between 2022 and 1990. The most noticeable changes were observed in Forest land and Cropland land use categories. There was a slight increase in removals by Forest land from 1990 (-3,693.18 kt CO_2) to 2020 (-3,844.17 kt CO_2). However, this decreases slightly in 2021 (-3,665.33 kt CO_2) and 2022 (-3,567.47 kt CO_2), indicating forests may be absorbing slightly less carbon in recent years. The removals by cropland (mineral soils) decreased from 1990 (-832.9 kt CO_2) to 2020 (-751.1 kt CO_2), and it remains relatively stable from 2020 to 2022. Grassland land use category (mineral soils) demonstrated a decrease in emissions over time. In 1990, it contributed 703.5 kt CO_2 of carbon emissions, but by 2020, this dropped to 215.2 kt CO_2, and continues to decrease to 200.0 kt CO_2 by 2022.

It is important to note that one of the main reasons for the significant changes in the amount of CO_2 emissions and removals related to land management and use in the cropland and grassland categories is due to the application of the approach 1 to determine the land use representation. Thus, this approach encompasses all emissions/removals during land reclassification. This may result in double or underestimation of emissions or removals for grassland and cropland categories. However, these inconsistencies can be fully balanced in inventory and are expected to be improved in future submissions.

6.2. LAND USE CONCEPTS AND APPROACHES FOR LAND REPRESENTATION AND THEIR CONSISTENCY WITH LULUCF CATEGORIES

The total area of the country is 86,600 thousand hectares (kha). Azerbaijan used the approach 1 for land representation.

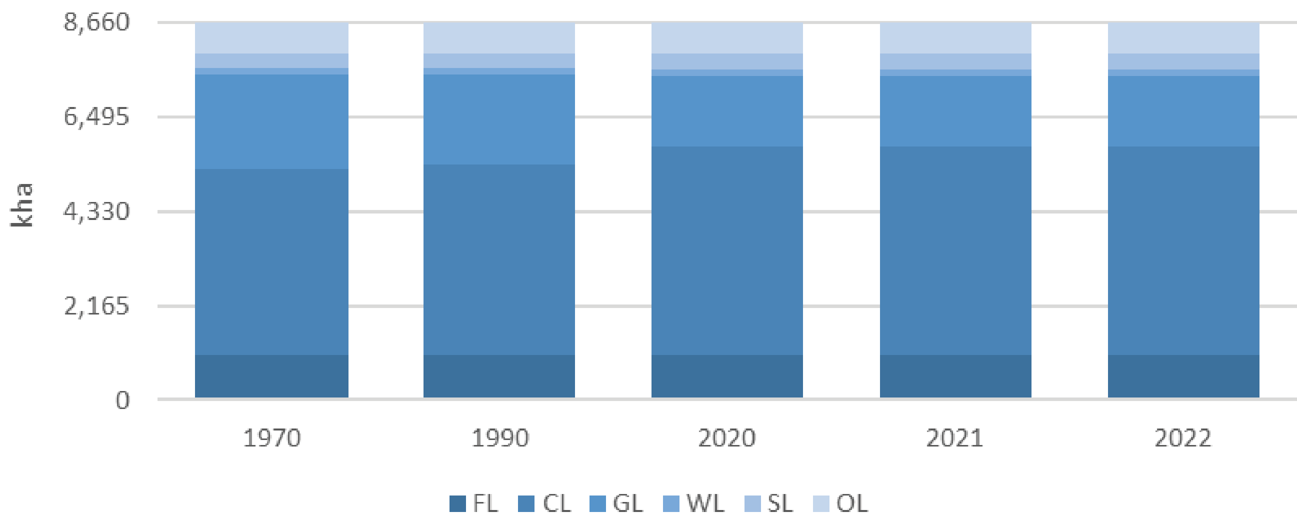


Figure 47. Areas of land use categories in 1970-2022

The data on land categories used in the inventory was taken from the data provided by the SSC, which is consistent with the land use definitions of the 2006 IPCC guidelines. The national understanding of the LULUCF sector is compliant and compatible with the categories of the LULUCF sector from the IPCC 2006 Guidelines.

6.3. COUNTRY-SPECIFIC APPROACHES

6.3.1. APPROACHES USED TO DETERMINE LAND REPRESENTATION AND LAND USE DATABASES USED IN INVENTORY PREPARATION

The primary source of information was the State Statistical Committee. These entities provide collected statistical data on cropland areas (by land use sub-category) and forest land for the period from 1970 to 2023. Data sources for settlement areas are described in Chapter 6.8. Data on areas of Wetlands and Other Land (by land use sub-category) for the reporting years were interpolated and extrapolated using values from a dataset developed by the Statistical Committee[15] for 2000 and 2015. Additionally, information from online resources[16] was examined to confirm the evaluated trends. The areas of the Grassland category (by sub-category) were also obtained based on data published by the Statistical Committee[17] for 2000 and 2015, which were further extrapolated and interpolated considering the collected data on cropland and forest land areas.

The national definitions and data on areas were mapped to those developed and reported in the 2006 IPCC Guidelines to ensure consistency in the reporting. It should be noted that the national concepts for the LULUCF sector are almost similar and consistent with the subcategories of the IPCC LULUCF sector. The data presented in Table 44 represent the mapping table developed for 2022.

[15] Land cover accounts of the Republic of Azerbaijan, ha (based on Earth observation data)

[16] World Bank Document and National Encyclopedia of Azerbaijan

[17] Land cover accounts of the Republic of Azerbaijan, ha (based on Earth observation data)

	Forest land	Cropland	Grassland	Wetlands	Settlements	Other land
Forest land	1,040.7					
Arable land		2,052.8				
Fallow land		39.1				
Permanent crops (fruit trees)		273.6				
Hayfields and pastures (used for agricultural purpose)		2,415.0				
Shrub cover/ bush/ heathland			1,467.0			
Heterogeneous natural vegetation & transitions			113.3			
Other vegetation areas			38.7			
Open wetlands				2.6		
Inland water[18]				147.9		
Built-up areas					362.6	
Bare rocks/ sand/ burnt areas						670.2
Permanent snow and glaciers						0.2
Archipelagos						36.4

Table 44. National definition for land use categories and relevant land use categories defined by the 2006 IPCC Guidelines in 2022, kha

However, it should be noted that due to resource constraints and time limitations during the current reporting period, the land representation does not ensure the application of minimum stratification (i.e., forest lands) as per the 2006 IPCC Guidelines. Improvement plans for ensuring stratification are described in the improvement section of the report. Azerbaijan is situated in warm temperate dry climate according to the 2019 IPCC Refinement (Figure 3A.5.1 of Chapter 3, Volume 4).

Moreover, Azerbaijan is in the process of developing data on conversion from one land use category to another (i.e., Tier 2 approach for land representation), which will allow for a more accurate estimates of emissions and removals. This activity has been included in the improvement plan.

There have not been provided any statistical data on organic land conversions and drainage/re-irrigation activities in the country. Due to time constraints and lack of data, emissions from organic soils and drainage/reirrigation activities have not been estimated. All areas were defined as those located on mineral soils. Azerbaijan will investigate the availability of organic soils in the country and categorize them based on land use. This activity will be included in the improvement plan. As part of the improvement plan, it is planned to conduct consultations with the Ministry of Agriculture, national agrarian universities, and research centers on possible ways for collecting this data.

Since Tier 1 approach was applied to classify and identify land use areas and to estimate the GHG inventory in the LULUCF sector, hence, all emissions and removals have been reported under a relevant 'land remaining land' category (e.g., Forest land remaining Forest land) in the same land use category. The concept of land use change related to unmanaged land has not been found in national statistics. However, the 2006 IPCC Guidelines clarified that natural rivers and lakes should be classified as unmanaged lands (p.3.6 of chapter 3, volume 4). Azerbaijan will review these areas in the future and will consider reclassifying some areas reported in this submission as wetlandsbe unmanaged lands. In general, the refinement of land representation for the next period is regarded as part of the improvement plan.

[18] The category includes inland rivers and reservoirs

6.3.2. INFORMATION ON APPROACHES USED FOR REPORTING HARVESTED WOOD PRODUCTS

See section 6.10 for harvested wood products (HWP) (CRT 4.Gs1).

6.3.3. SECTOR-SPECIFIC PLANNED IMPROVEMENTS

There is a list of planned improvements relevant to the entire LULUCF sector. Information regarding these improvements is provided in Chapter 10.

Classification of land use:

Azerbaijan is going to develop a sustainable classification system taking into account national conditions.

To facilitate the application of the Tier 2 or Tier 3 approach in accordance with the 2006 IPCC Guidelines it is planned to deploy the FAO soil collection tool with an appropriate methodological approach for soil presentation in the next reporting period.

Stratification:

Because of resource constraints and time limitations, in the current report, land representation does not encompass the application of minimum stratification based on climate, ecological zone, soil, and management regime according to the 2006 IPCC Guidelines. Azerbaijan plans to stratify the country's total area in accordance with the 2006 IPCC Guidelines and will present this in the next BTR report.

Organic soils and drainage/re-irrigation activities:

Due to data gaps and time constraints, statistics of organic soils and drainage/re-irrigation activities have not been calculated. These issues are planned to be addressed through updated land representation and reporting on relevant emissions/removals for organic soils, and drainage/re-irrigation activities are envisaged, if applicable. To apply the Tier 1 methodology in the subcategory, necessary data will be collected, ensuring compliance with the 2006 IPCC Guidelines and standardizing data collection protocols.

Trainings:

- Conducting trainings on the methods of data collection, analysis, and reporting for government agencies, scientific institutions, researchers, and stakeholders.
- Organization of seminars and trainings on IPCC methodologies and best practices for land management.

6.4. FOREST LAND (4.A)

6.4.1. CATEGORY DESCRIPTION

In Azerbaijan, forest land is a net sink. GHG emissions from this land use category primarily occur due to forest biomass harvest and forest fires.

According to the SSC, forests covered approximately 12% of the country’s territory in both 1990 and 2022. The calculations for the area of land use categories are described in detail in Section 6.2. Data regarding forest land is provided in Table 45.

Years	1990	2020	2021	2022
Area	1,038.8	1,040.3	1,040.7	1,040.7

Table 45. Data on forest land, ha

Despite the fact that Tier 1 approach was used for land representation, Azerbaijan would like to provide some facts/information on the conversion from/to forest land, which will be polished in the future submission. Namely, it is noteworthy that, according to the data from the MENR, no forest areas were converted to cropland areas or other land types between 2000 and 2016. The results indicate that there is very little forest loss in Azerbaijan, particularly with a zero conversion to croplands. This is attributed to the natural regeneration occurring in forests destroyed during the occupation period (over 54 kha), abandoned habitations and croplands, and Azerbaijan's forest policy implemented, including forest protection, afforestation, and reforestation activities.

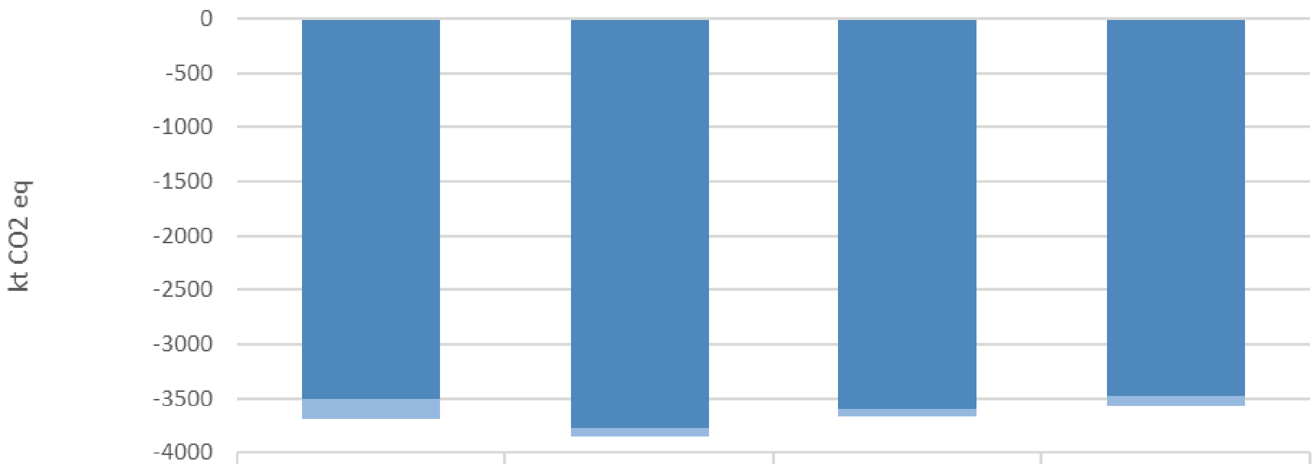
The results of the GHG inventory of the forest land category indicate a decline in net CO_2 removals from forest lands in the country between 1990 and 2022. The total CO_2 removals by forest lands were -3,693.2 kt CO_2 in 1990. However, this figure has slightly decreased over the past 30 years, reaching -3,567.5 kt CO_2 in 2022, despite the increase in the area of forest land. Overall, it can be noted that living biomass was the most significant sink over the considered period, followed by mineral soils (Figure 48).

GHG emissions in the Forest category were calculated using the IPCC 2006 guidelines'. The results of the GHG inventory for the Forest Land category indicate a declining trend in net CO_2 removals in forest land between 1990 and 2022.

According to calculations based on the IPCC 2006 guidelines, total CO_2 removals by forest land were -3,693.2 kt CO_2 in 1990. However, despite an increase in forest areas over the last 30 years, this figure has declined to -3,567 kt CO_2 in 2022. Furthermore, CO_2 removal by biomass decreased from -3,510.5 kt CO_2 in 1990 to -3,478.5 kt CO_2 in 2022. Experts note that this decrease does not fully reflect current realities and attribute it to an increase in the scale of forest fires in 2022. Issues related to large-scale carbon losses due to fires against the backdrop of an increase in total forest area by thousands of hectares in the country will be further explored in the future.

Despite the growth in forest areas, removals in this category have slightly decreased over the last 30 years, reaching -3,567 kt CO_2 in 2022. Overall, it can be said that living biomass has been the most significant source of removals during the period under consideration, followed by mineral soils.

According to the calculations, CO_2 sequestration by mineral soils has shown more variation. In 1990, removals were -182.6 kt CO_2, which significantly declined to -69.7 kt CO_2 by 2020. However, without any major cause, this figure rose again in 2022, reaching -88.93 kt CO_2 equivalent (see Figure 48).



	1990	2020	2021	2022
SOC, mineral soils	-182.666	-69.7015	-74.5085	-88.9295
Living biomass	-3510.518855	-3774.471649	-3590.824159	-3478.54463

Figure 48. Removals from Forest land

It is observed that the forest lands are not converted into agricultural lands for farming purposes. The results show that forest loss in Azerbaijan is minimal, with particularly no conversion into agricultural lands. This is due to Azerbaijan's forest policy, which includes forest protection, afforestation, and forest restoration activities.

Although the Level 1 approach has been used for land reporting, Azerbaijan plans to collect data related to forest land/forest land conversion, which will be considered in future reports.

6.4.2. METHODOLOGICAL ISSUES

GHG emissions in the forest land use category have been estimated using a tier 1 within the IPCC software. Since approach 1 of the 2006 IPCC Guidelines and the IPCC software have been deployed to classify land representation and further to estimate GHG emissions from forest lands, all emissions/removals are reported solely for the category "Forest Lands Remaining as Forestland." The area of organic soils and changes in net carbon stocks in organic soils are not estimated, as there is no specific data available regarding organic soils within forest areas. Changes in Tier 1 carbon stock are assumed to be zero in dead trees and woody debris, hence the use of the notation key "NA" ("Not Applicable"). The gain-loss method was applied to assess annual changes in living biomass.

Azerbaijan's forests consist of a mix of broadleaf and coniferous species, with various growing stock levels depending on the forest types and regions. The forest types include:

- **Temperate broadleaf and mixed forests;**
- **Coniferous forests;**
- **Semi-arid forests.**

However, due to resource constraints and time limitations, stratification by forest type has not been applied in the current report (the entire forest area is considered as a single stratum). As a result, the calculations did not take into account different incremental reserve values. According to Azerbaijan's Global Forest Resources Assessment 2020 Report (FRA)[19], the average incremental stock level was 172 m3/ha. In the future reporting period, it is planned to estimate the average incremental reserve level depending on forest types based on IPCC guidelines and available regional data.

The average annual increment has been assumed to be 3 m^3/ha/year, in accordance with the 2006 IPCC Guidelines (Volume 4, AFOLU, Chapter 4: Forest Lands, Table 4.11B). This figure is considered relevant for the forest types found in Azerbaijan. Based on the forest types available in Azerbaijan, which include both temperate and some boreal elements, the average annual increment can be roughly estimated within the following ranges:

- Broadleaf forests: about 2-4 m^3/ha/year
- Coniferous forests: about 3-6 m^3/ha/year
- Semi-arid forests: about 1-3 m^3/ha/year

Consequently, country-specific average annual increment indicators have not been used in the calculations. However, the average annual increment will be assessed in future reporting periods in accordance with the IPCC general guidelines and available regional data.

According to the 2006 IPCC methodology, Volume 4, Chapter 2, Table 2.6, a default parameter of 0.45 for the fraction of biomass lost in the disturbance has been selected for all "other" temperate forests.

The data on forest biomass harvest have been obtained from national statistics. Namely, three datasets were used to create a consolidated table of the volume of wood harvested from forests: industrial roundwood supply, fuelwood supply (including statistics on fuelwood supply and removal, as well as information on illegal logging), and data on tree residues collected as a result of sanitation measures (Table 46).

[19] Global Forest Resources Assessment (FRA) 2020 Azerbaijan - Report (fao.org)

	1990	2020	2021	2022
Roundwood and fuelwood biomass	183.7	82.6	133.3	141.1
Tree parts collected from forest	62.3	62.5	60.7	67.4

Table 46. Data on industrial and fuelwood supply and tree parts collected from forests, thousand m^3

The estimation of carbon sequestration/emissions from mineral soils has been conducted using Formula 2.25 and default values of the 2006 IPCC Guidelines, with the support of the IPCC Software. The data on country-specific SOC values for mineral soils have been obtained from the FAO GloSIS resourse[20]. The data were overlapped with the land cover map developed by national experts and published in a scientific journal[21]. SOC was taken to range from 60 tC/ha to 191 tC/ha, taking into account the area relevant to the different SOC values (e.g., 20% of the forest mineral soil area has an SOC content of 60 tC/ha, while only 7% has 191 tC/ha. The remaining area falls within intermediate values in this range).

6.4.3. DESCRIPTION OF THE FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

6.4.4. UNCERTAINTY ESTIMATION AND TIME SERIES CONSISTENCY

Since the data are obtained from international sources, the uncertainty levels in the existing biomass stock, biomass growth rate, and activity data related to wood supply are considered relatively high. However, the uncertainty levels regarding forest land areas are classified within an average uncertainty range because the data is sourced from national databases. As the 2006 IPCC Guidelines and IPCC software were used to estimate emissions, the uncertainty levels for various parameters and emission factors correspond to those specified in the 2006 IPCC Guidelines.

6.4.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

Category-specific quality control and quality assurance have been conducted by relevant experts based on the requirements of the IPCC Guidelines and associated documentation.

6.4.6. CATEGORY-SPECIFIC RECALCULATIONS

Recalculations were made in connection with updating activity data for 1990.

6.4.7. RECALCULATIONS WERE MADE IN CONNECTION WITH UPDATING ACTIVITY DATA FOR 1990.

Planned improvements for the country are described in the relevant section for the Forest land category:

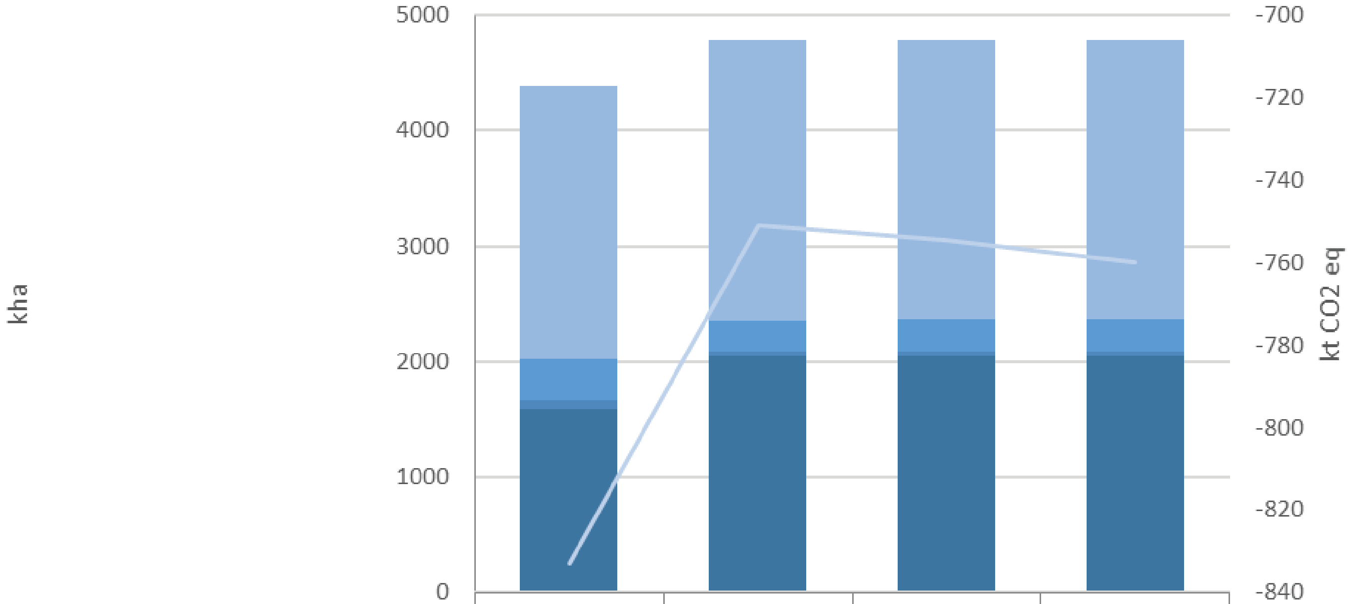
- **Investigating additional detailed data for forest land stratification by forest types.**
- **Obtaining national data on various growing stock levels and average annual growth values (depending on forest types).**

6.5. CROPLANDS (4.B)
6.5.1 CATEGORY DESCRIPTION

From 1990 to 2022, the area of croplands was steadily increased: from 4,382.9 kha (51% of the total land area) in 1990 to 4,780.5 kha (55% of the total land area) in 2022 (Figure 49). The increase in areas occurred primarily due to the expansion of the hayfield and pasture land use category, as well as arable land. The changes in land use resulted in net CO_2 removals by mineral soils: from -832.9 kt CO_2 in 1990 to -760.1 kt CO_2 in 2022 (Figure 49).

[20] FAO GloSIS

[21] (11) (PDF) Site selection for solar photovoltaic system installation using analytical hierarchy process model in Azerbaijan (researchgate.net)



	1990	2020	2021	2022
Hayfields and pastures	2365.7	2423	2417.5	2415
Permanent crops (fruit trees)	347.4	272.7	274.1	273.6
Fallow land	80.8	39.2	39.2	39.1
Arable land	1589	2045.2	2049.8	2052.8
CO2 emissions(+) / removals (-), kt	-832.9775667	-751.0950333	-754.57965	-760.0490333

Figure 49. Cropland area and associated CO_2 emissions/removals

6.5.2. METHODOLOGICAL ISSUES

A Tier 1 approach of the 2006 IPCC Guidelines is applied to estimate CO_2 emissions or removals by mineral soils under cropland land use category. The changes in biomass of fruit trees were not evaluated due to the lack of data and the time constraints. Hence, CO_2 emissions/removals related to changes in other carbon sources are reported using the notation keys “NE” (Not Estimated) and “NA” (Not Applicable).

According to the SSC, cropland areas are divided into four subcategories (as it was demonstrated in Figure 49):

- Arable land
- Fallow land
- Perennial crops (fruit trees)
- Hayfields and pastures used for agriculture purposes

The 2006 IPCC guidelines were served as a reference to assign relative stock change factor due various management practices to estimate CO_2 emissions/removals (Table 47). The FAO GloSIS resourse[22] together with the land cover map developed by national experts and published in a scientific journal[23] were consulted to obtained country-specific SOC values. SOC was taken to range from 27.26 tC/ha to 50.13 tC/ha, taking into account the area relevant to the different SOC values.

[22] FAO GloSIS

[23] (11) (PDF) Site selection for solar photovoltaic system installation using analytical hierarchy process model in Azerbaijan (researchgate.net)

Parameter	Arable land	Reference[24]	Fallow land[25]	Fruit trees	Reference[26]	Hayfields and pastures	Reference[27]
Land use (F_{LU})	0.8	Long-term cultivated - Temperate/Dry	0.8	1.0	Perennial/ Tree Crop - All	0.82	Set aside (< 20 yrs)
Tillage (F_{MG})	1.0	Full - All	1.0	1.0	The same values as for Arable land	1.00	The same values as for Arable land
Input (F_I)	1.04	High – with manure	1.0	1.0		1.00	

Table 47. Key parameters used for estimating CO_2 emissions/removals resulting from changes in cropland management practices

These parameters are derived from stock change factors provided for in the 2006 IPCC Guidelines (Table 5.5, Chapter 5, Volume 4). However, Azerbaijan is planning to collect more information on cropland land use management practices, which will subsequently influence the factors (values) reflected in the table above. Specifically, the results will be refined based on alternative data and expert opinions. It is planned to closely cooperate with the State Service on Property Issues and the State Statistical Committee to clarify the situation regarding land use changes in the harvested lands under the improvement plan.

The area of organic soils and the change of net carbon stock in organic soils have not been estimated.

6.5.3. DESCRIPTION OF THE FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

6.5.4. UNCERTAINTY ESTIMATION AND TIME SERIES CONSISTENCY

The uncertainty levels associated with croplands are classified in the high uncertainty range. As standard emission factors for key parameters were used to estimate emissions from the 2006 IPCC Guidelines and IPCC software in the calculations, uncertainty levels are consistent with those reported in the 2006 IPCC Guidelines.

6.5.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

General and category-specific quality control and quality assurance were carried out by experts in compliance with the requirements of the IPCC guidelines and relevant documents.

6.5.6. CATEGORY-SPECIFIC RECALCULATIONS

Recalculations were performed in connection with updating activity data for 1990.

6.5.7. RECALCULATIONS WERE PERFORMED IN CONNECTION WITH UPDATING ACTIVITY DATA FOR 1990.

As part of the improvement plan, it is planned to closely cooperate with the State Service on Property Issues and the State Statistical Committee in order to clarify the situation regarding the land use change in cropland areas (including the land use change in harvested lands) and to collect information on the country.

6.6. GRASSLANDS (4.C.1)

6.6.1. CATEGORY DESCRIPTION

In Azerbaijan, grasslands are divided into summer grasslands (located at altitudes above 1500 m above sea level) and winter grasslands (located at altitudes up to 100 m above sea level), which sharply differ from each other due to the mineralization of their soil. The pastures (grasslands) used for grazing can be natural and artificial (sown or seeded).

[24] Table 5.5 of chapter 5, volume 4

[25] FLU and FMG are the same as for Arable land. FI – Medium - All

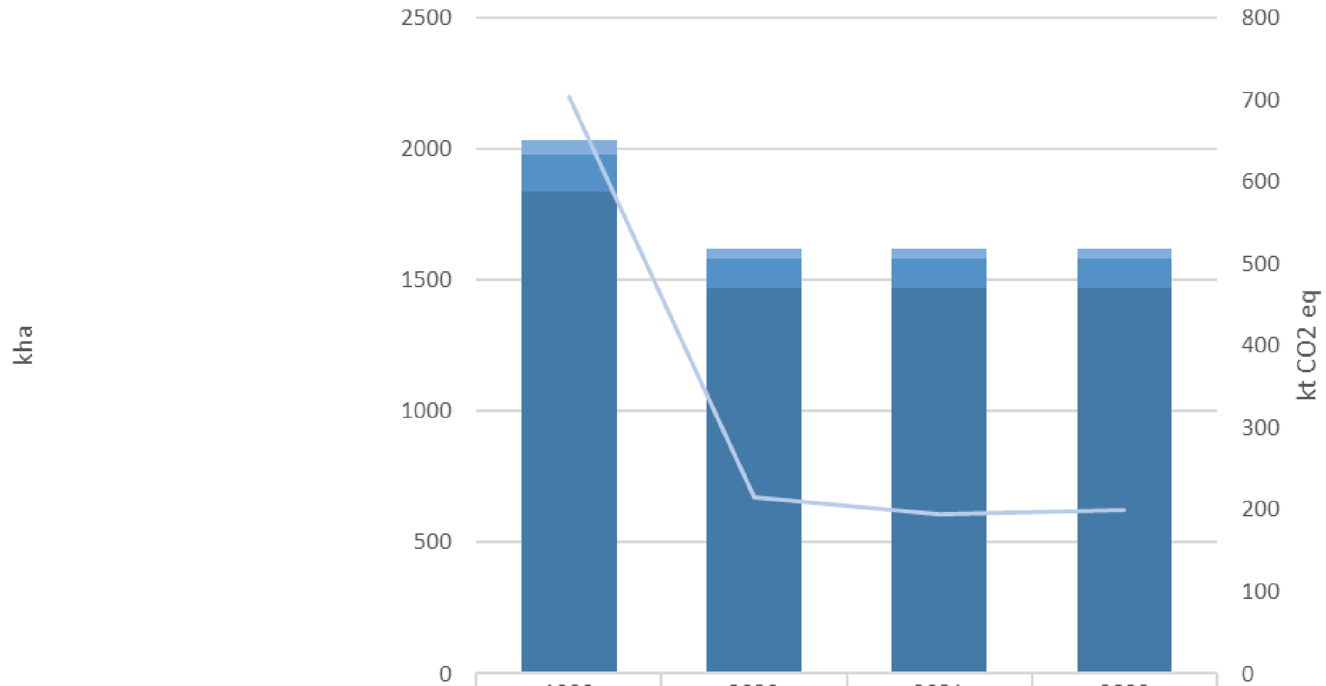
[26] Table 5.5 of chapter 5, volume 4

[27] Table 5.5 of chapter 5, volume 4 and Table

Natural grasslands consist of perennial grass-steppe, semi-desert grasses, ephemeral plants, and semi-shrubs and bushes. Artificial grasslands are created based on a mix of perennial and annual cereal grasses and legume plants. In Azerbaijan, natural meadows and pastures are mainly located in Gobustan, Jeyranchol, Ajinohur, Shirvan, Mil, Karabakh, and Salyan plains, covering 67% of natural pastures, and in the mountains, such as the Greater and Lesser Caucasus and Talysh, covering medium mountainous, subalpine, and alpine zones, making up 33% of natural grasslands. Summer pastures are located after the forest zone of the Greater and Lesser Caucasus mountains, at an altitude of about 1500–2500 m. And winter pastures are mainly located in the lowland regions. Although no assessment has been made for carbon stocks in grasslands, it is visually apparent that summer pastures have higher carbon stocks.

Recently, as a result of the uncontrolled cattle grazing in summer pastures, the grasslands are subjected to intensive erosions, which prevent these lands from adequately supplying livestock with necessary forage. During heavy rainfall, severe water runoff occurs in these areas, washing away and degrading the soil. Overgrazing in summer pastures has also caused erosions of the grasslands at varying levels. The main part of the Lesser Caucasus summer pastures (350,319 ha), which is the second fodder base of livestock breeding in Azerbaijan, has been under Armenian occupation for more than 30 years. The impossibility of utilizing these pastures has undoubtedly had a negative impact on the effective use of other summer pastures. Research findings indicate that the relocation of livestock from regions that previously used summer pastures in occupied areas to the summer pastures in the Greater Caucasus has degraded the vegetation cover and accelerated erosion processes in those areas.

From 1990 to 2022, there occurred considerable changes in grassland areas. The total grassland area decreased from 2,031.8 kha in 1990 to 1,618.9 kha in 2002. These changes have led to significant alterations in CO_2 emissions within the category. While CO_2 emission from the grassland use and management was 703.5 kt in 1990, it sharply decreased to 200.1 kt in 2022 (Figure 50).



	1990	2020	2021	2022
Sparse vegetation areas	53.99262102	38.74719712	38.70656833	38.69222876
Heterogeneous natural vegetation & transitions	141.7367741	113.4260298	113.3070957	113.265119
Shrub cover/ bush/ heathland	1836.111605	1469.096773	1467.556336	1467.012652
CO2 emissions (+) / removals (-)	703.5326833	215.2054667	194.4998	200.02125

Figure 50. Grassland area and associated CO_2 emissions/removals

However, as mentioned in section 6.1, the Tier 1 approach was applied for the estimation of emissions in the Grasslands section of the total land area. In the land use change report, only emissions/removals from the "remaining land as cropland" subcategory are considered under the Tier 1 approach. In this case, emissions or removals from the Grassland and Cropland subcategories may be double-counted or incorrectly assessed. These discrepancies will be clarified during the full inventory process and improved in the future.

6.6.2. METHODOLOGICAL ISSUES

The Tier 1 approach of the 2006 IPCC Guidelines was applied to estimate GHG emissions from grasslands. Estimated emissions and removals are reported for Grasslands remaining Grassland (4.C.1.). The approach selected by Azerbaijan can lead to potential under- or over-estimation of emissions or removals from the Grassland and Cropland subcategories. However, these discrepancies will be clarified during the full inventory processes and improved in the future.

Emissions for mineral soils were produced using the 2006 IPCC default relative carbon stock change parameters and data on SOC values reported in the FAO GloSIS resourse[28] together with the land cover map developed by national experts and published in a scientific journal[29]. SOC was taken to range from 27.78 tC/ha to 37.7 tC/ha, taking into account the area relevant to the different SOC values. The values from Table 6.2 (Chapter 6, Volume 4) were used: FLU was applied as 1.00 (developed for All level – All climate), FMG – calculcated as a weighted average for non-degraded and moderately degraded grassland, and FI – for developed for Medium level – All climate.

There is no information on changes in carbon stocks in living biomass in grasslands. Therefore, changes in living biomass have not been assessed. Moreover, due to the lack of data on the area of organic soils and their species composition, carbon stock changes in organic soils are not estimated. Azerbaijan will make efforts to collect data and conduct relevant estimates in the future submissions.

6.6.3. DESCRIPTION OF THE FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

6.6.4. UNCERTAINTY ESTIMATION AND TIME SERIES CONSISTENCY

Uncertainty levels related to cropland areas have been classified within an average uncertainty range, as activity data has been obtained from national sources. Uncertainty levels for various key parameters and emission factors are consistent with those reported in the 2006 IPCC Guidelines because IPCC default emission factors and IPCC software have been used to estimate emissions.

6.6.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

General and category-specific quality control and quality assurance have been carried out by experts in accordance with the requirements of the IPCC guidelines and related documents.

6.6.6. CATEGORY-SPECIFIC RECALCULATIONS

Recalculations have been performed in connection with updating activity data for the year 1990.

6.6.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

As part of the improvement plan, it is intended to closely cooperate with the State Service on Property Issues and the State Statistical Committee to clarify the situation regarding land use changes and collect activity data across the country.

6.7. WETLANDS (4.D.1)

6.7.1 CATEGORY DESCRIPTION. (4.D.1)

All public sources indicate that no land in Azerbaijan is classified as peatland. In the article “Mires and Peatlands of Azerbaijan,” published by “Thiele et al," it is stated that during the years 2005-2007 there were conducted research works on peat lands in the country. According to the results of the research, peatlands cover a very small area and therefore are considered completely insignificant. Consequently, it is assumed that methane gas emissions from these areas are negligible. Since there is no CH_4 present in waterlogged areas, the notation key “NE” has been applied to this category.

[28] FAO GloSIS

[29] (11) (PDF) Site selection for solar photovoltaic system installation using analytical hierarchy process model in Azerbaijan (researchgate.net)

Industrial peat extraction (4.II).

This field of activity is not found in Azerbaijan (NO).

Peat fires (4.V).

This field of activity is not found in Azerbaijan (NO).

However, Azerbaijan will make all efforts to gather relevant data and perform necessary calculations regarding waterlogged areas (if applicable to the national conditions).

Additionally, as it was indicated in table 44, the Wetlands category includes areas of natural rivers and lakes, and reservoirs. Azerbaijan will review these sub-categories in the future submissions and will consider to re-classify the natural rivers and lakes as unmanaged lands.

6.8. SETTLEMENTS (4.E.1)

6.8.1. SETTLEMENTS (4.E.1)

In calculating GHG emissions for this category, data on the areas of settlements (residential areas) was obtained from the State Statistical Committee (see Table 48).

Years	1990	2020	2021	2022
Residential areas	338	361.1	361.9	362.6

Table 48. Changes in the areas of residential areas, thousand ha

There is high level of uncertainty in settlements data. In light of this, it is planned to conduct further research to obtain more accurate data.

However, since the data of the SSC were obtained early, the inventory work was carried out based on the available information. The level of CO_2 removals in mineral soils under the residential areas of the country was estimated at -177.87 kt CO_2 over the whole reporting period.

6.8.2. METHODOLOGICAL ISSUES

Azerbaijan applies the 2006 IPCC Guidelines using the Tier 1 approach for the assessment of emissions from residential buildings. Thus, all calculations of emissions and removals have been conducted for residential buildings remaining as residential areas (4.E.1).

Unlike other land use categories, all residential areas are classified under a warm, temperate, humid climate. To establish a minimum stratification of residential areas based on climate, ecological zones, soil types, and management regimes, it is planned to implement relevant measures within the framework of future improvements.
To calculate CO_2 emissions/removals from mineral soils resulting from changes in land use or management practices, relevant emission factors have been used as default baseline values of the 2006 IPCC Guidelines as well as the IPCC software.

Due to the lack of data regarding organic soils in residential areas, the area of organic soils and changes in net carbon stocks of these soils have not been estimated. Similarly, there is no available data on carbon stock changes in living biomass in residential areas.

In residential areas of Azerbaijan, the above-ground biomass stock is usually lower than that in natural forests because the density of vegetation is less.

The average above-ground biomass stock applied in residential areas is 15 Ton DM/ha, with a ratio of below-ground biomass to above-ground biomass set at 0.229. These values for average above-ground biomass and the ratio of below-ground to above-ground biomass have been calculated based on national conditions.

Due to the presence of infrastructure and managed green spaces (such as parks, gardens, and roadside vegetation), residential areas typically exhibit lower biomass density compared to natural forests. Above-ground biomass refers to all living plants above the soil, including trees, shrubs, and other vegetation. The IPCC suggests using lower biomass density values for tree-covered residential areas, which can be approximately 15–25 Ton DM/ha.

The 2006 IPCC Guidelines provide default values for aboveground biomass stocks for various land use categories. However, specific values for residential areas are not directly provided. In this case, references have been made to the values for similar land categories, such as sparse and low-density forest areas.

Although the IPCC does not present specific values for residential areas, it can be concluded that due to urbanization and land use changes, the above-ground biomass stocks are significantly lower than natural forests. Given that residential areas have much less vegetation cover compared to natural forests and include their mixed uses (as well as buildings, parks, etc.), above-ground biomass is conservatively estimated to be 15 Ton DM/ha as the lowest value.

Due to resource constraints and time limitations during the current reporting period, a value for typical forest land was used for the ratio of belowground biomass to aboveground biomass, according to the 2006 IPCC Guidelines (Table 4.4). Tree-covered areas in residential buildings differ from woody areas in temperate natural broadleaf forests, where the above-ground biomass exceeds 125 t/ha. According to the 2006 IPCC Guidelines (Table 4.4), the ratio of belowground biomass to aboveground biomass in greenery within residential areas is 0.229.

In the estimation of emissions from residential areas, the values of the 2006 IPCC Guidelines for typical forest lands were used due to the lack of other information. In future reporting periods, it is planned to improve the estimation of average above-ground biomass and the ratio of below-ground to above-ground biomass for Azerbaijan based on the types of residential areas in accordance with the IPCC general guidelines and available regional data. The improvement plan includes close collaboration with the Forest Development Service of the MENR to clarify the situation regarding land use changes in residential areas.

The carbon fraction value of biomass used is set at 0.5 t C/Ton DM according to the 2006 IPCC Guidelines.

6.8.3. DESCRIPTION OF THE FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

6.8.4. UNCERTAINTY ESTIMATION AND TIME SERIES CONSISTENCY

As activity data are obtained from national sources, uncertainty levels have been classified within an average uncertainty range. Uncertainty levels for various key parameters and emission factors are consistent with those reported in the 2006 IPCC Guidelines, as default values of the 2006 IPCC Guidelines and IPCC software have been used to estimate emissions.

6.8.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

General and category-specific quality control and quality assurance have been carried out by experts in accordance with the requirements of the IPCC guidelines and related documents.

6.8.6. CATEGORY-SPECIFIC RECALCULATIONS

Recalculations have been performed in connection with updating activity data for 1990.

6.8.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

As part of the improvement plan, it is planned to collaborate closely with the Forestry Development Service of the MENR, SSC and SSPI to clarify the situation regarding land plots used for residential space and greenery in the residential areas. Besides, in the future reporting period, it is planned to estimate country-specific parameters for assessing changes in living biomass sources, to verify residential buildings depending on their types and to implement them in accordance with the IPCC Guidelines and existing regional data.

6.9. OTHER LANDS (CRT 4F)

Generally, the “other lands” category consists of non-vegetated areas (see table 44 in chapter 6.3.1). As part of the improvement plan, it is intended to closely cooperate with the State Service on Property Issues and the SSC to clarify the situation regarding land use changes within the “other lands” category.

6.10. HARVESTED WOOD PRODUCTS (CRT 4.GS1)

6.10.1. CATEGORY DESCRIPTION

The category represents a net source with a stable level of CO_2 emissions, exceeding 900 kt CO_2 annually.

6.10.2. METHODOLOGICAL ISSUES

To calculate emissions related to the use of harvested wood products, the Tier 1 approach was applied, using the IPCC software. It should also be noted that due to the lack of relevant national data, FAOSTAT (https://www.fao.org/faostat/en/#data/FO) data have been used, alongside the tool (MS-Excel file) of the IPCC Harvested Wood Products (HWP).

6.10.3. DESCRIPTION OF THE FLEXIBILITY APPLIED FLEXIBILITY

See Flexibility Chapter 1.9.

6.10.4. UNCERTAINTY ESTIMATION AND TIME SERIES CONSISTENCY

Uncertainty levels for various key parameters and emission factors comply with those provided in the 2006 IPCC Guidelines as IPCC software with default data was used to estimate emissions.

6.10.5. CATEGORY-SPECIFIC QA/QC AND INSPECTION

General and category-specific quality control and quality assurance have been carried out by experts in accordance with the requirements of the IPCC guidelines and related documents.

6.10.6. CATEGORY-SPECIFIC RECALCULATIONS

Recalculations have been performed in connection with updating activity data for 1990.

6.10.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

As part of the improvement plan, the country will prioritize the collection of more up-to-date activity data related to the utilization of trees for their intended use, including their felling, harvesting, and sanitary logging.

Azerbaijan intends incorporating carbon stock changes into HWP areas using the minimum Tier 1 approach, in accordance with the 2006 IPCC Guidelines. The assessment of carbon stock changes in HWP areas is planned as one of the improvement activities.

6.11. NON-CO_2 EMISSIONS (CRT 4(I), 4(II), 4(III), 4(IV))

6.11.1. CATEGORY DESCRIPTION

Non-CO_2 emissions have been evaluated and reported solely as a result of biomass burning in forest lands, as outlined in the LULUCF chapter. In 2022, emissions reached their highest level for the reporting period due to a expansion of wildfires (Figure 51).

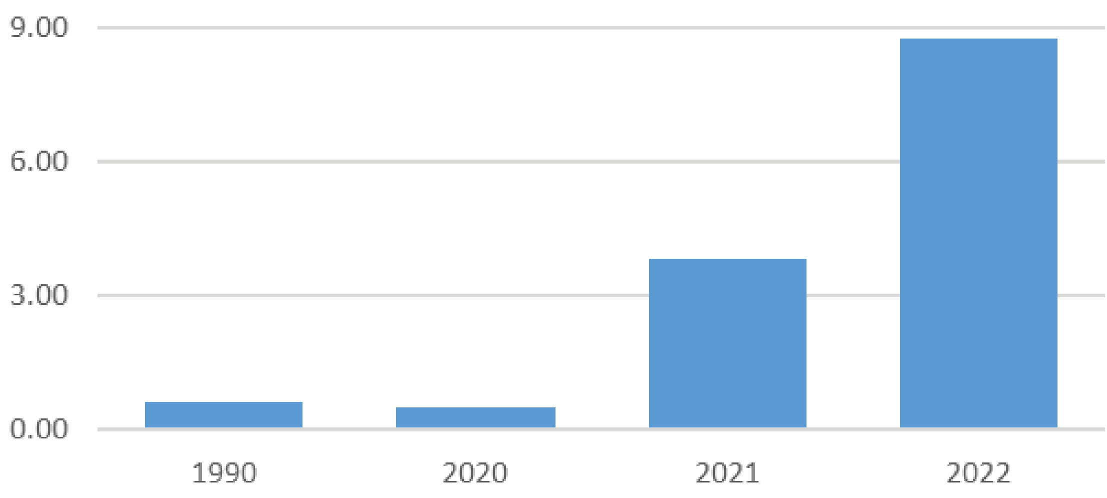


Figure 51. GHG emissions related to forest fires in Azerbaijan, kt CO_2 eq.

6.11.2. METHODOLOGICAL ISSUES

Direct and Indirect N_2O emissions from the application of nitrogen (N) fertilizers on managed lands (CRT 4(I)). Due to the lack of disaggregated data on fertilizer application by land use category, all emissions resulting from fertilizer application have been reported in the Agricultural sector.

No statistical data have been provided regarding organic land conversion and drainage/re-irrigation activities for the subcategory of emissions and removals (CRT 4(II)) from drainage, re-irrigation, and other management of organic and mineral soils. Azerbaijan will exert every effort to investigate whether drainage, re-irrigation, and other management activities of organic and mineral soils exist in the country and, if so, to collect relevant information.
Direct and indirect N_2O emissions resulting from nitrogen mineralization/immobilization (CRT 4(III)) due to soil organic matter loss/generation as a result of land-use change or mineral soil management have been calculated and considered in the Agricultural sector (immobilization process) related to mineral soil loss/generation caused by land use changes in croplands and pastures or mineral soil management.

However, assessment of direct and indirect N_2O emissions due to N mineralization/immobilization associated with mineral soils in residential areas has not been carried out, given the lack of appropriate IPCC standard parameters and the negligible nature of these emissions.

Biomass burning (CRT 4(IV)) subcategory - according to national legislation, burning activities are prohibited in the country to prevent uncontrolled fires that could spread to neighboring areas and other land use categories. Consequently, the notation key "NO" has been used to report GHG emissions for the Cropland (4(IV).B.) and Grassland (4(IV).C.) subcategories.

National statistical data have been used for activities related to forest areas affected by fire (Table 49). The calculation of emissions has been conducted using the IPCC software, applying the default values of the 2006 IPCC Guidelines (e.g., combustion coefficient, CH_4 EF).

Years	1990	2020	2021	2022
Areas affected by fire	186	48.0	380.1	869.2

Table 49. Areas of fire-affected forests in Azerbaijan, ha

6.11.3. DESCRIPTION OF THE FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

6.11.4. UNCERTAINTY ESTIMATION AND TIME SERIES CONSISTENCY

Standard data have been deployed following the 2006 IPCC Guidelines on uncertainty levels for various key parameters and emission factors, and IPCC software has been used to estimate emissions.

6.11.5. CATEGORY-SPECIFIC QA/QC AND INSPECTION

General and category-specific quality control and quality assurance have been carried out by experts in accordance with the requirements of the IPCC guidelines and related documents.

6.11.6. CATEGORY-SPECIFIC RECALCULATIONS

Recalculations have been performed in connection with updating activity data for 1990.

6.11.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

Every effort will be made to improve the collection of country-specific data and the estimation of non-CO_2 emissions.

7. WASTE AND WASTE WATER (CRT SECTOR 5)
7.1. OVERVIEW OF THE WASTE AND WASTEWATER SECTOR (CRT SECTOR 5)

The waste sector, which is the fourth sector adopted in the IPCC (2006) methodology, is represented as the fifth sector in the CRT tables, following LULUCF. The main GHGs in this sector are methane (CH_4), and nitrous oxide (N_2O). In the waste sector, municipal solid waste and wastewater are the primary sources of GHG emissions.

The problem of municipal solid waste management has become one of the most acute economic and environmental issues. As the amount of waste grows, so do the GHG emissions generated by them. According to the SSC's data, organic food waste, plastic products, polyethylene bags, construction materials and other waste are on the rise due to the country's rapid industrial and population growth. The latest data gathered in compilation of this inventory submission indicates per capita MSW generation has reached approximately 267 kg/capita/year in 2022, the highest value estimated to date. For context, the estimated value was under 200 kg/capita/year in 2018.

Treatment and disposal of industrial and municipal solid waste in industrial and urban areas leads to the generation of GHG emissions. Solid waste can be eliminated through disposal, recycling or energy conversion (where waste is directly used as fuel).

The two main sources of methane generation, the most important gas in this sector, are landfills and wastewater treatment.

The quantitative and qualitative composition of biogas depends on the climatic and geological conditions of the landfill, the morphological and chemical composition of waste, disposal conditions (area, volume, density), moisture, compaction and other factors. Gas emissions produced in landfills result from the biological breakdown of the organic waste. The source of biogas is the biodegradable waste fractions, which make up 60-80% of solid waste, including garbage, waste from public catering facilities, paper and other organic waste.

Azerbaijan applies the Tier 1 methodology for all waste categories, using available data. In the coming years, category-specific improvement plans will be developed to increase country-specific data collection and develop higher-level methods (focusing on key categories). Information on these improvements is provided in the relevant subsections of the waste category below.

Domestic and industrial wastewater is discharged into appropriate sewers through sewage systems. When treated or disposed of anaerobically, they can be a source of CH_4 and N_2O. CO_2 emissions from wastewater are not considered in the IPCC methodology, as their quantity is insignificant.

Sewer collectors in Baku and other large cities and regions of Azerbaijan are usually closed and located underground. Wastewater in closed, underground sewer collectors is not considered to be a significant source of CH4 emissions.

After treatment, domestic wastewater generated by human activities is discharged into the aquatic environment (river, lake, sea, etc.). Direct N_2O emissions can occur during nitrification and denitrification of nitrogen.

In 1972, given the prospective population growth, the "Great Sanitation" project of Baku was developed and construction work began. During this period, the Hovsan Aeration Station, sewage pumping stations, the "Industrial Zone", "Shaharkanari-Tunnel" and "Sahil" tunnel collectors were built and put into operation. As a result, approximately 85% of the wastewater generated in Baku was collected and discharged into the sea after treatment at purification facilities. However, in 1991, construction under the "Great Sanitation" project was halted due to financial shortages. It was only in 2006-2007 that reconstruction projects in the capital's sewerage network were restarted.

The hugest project undertaken on these works was the “Project of reconstruction and ensuring of Hovsan Treatment Plant Stations, Zig Pumping Station No.2 and Basic Conductor Sewerage collectors”. As a result, the capacity of the Hovsan Treatment Plant was increased from 480,000 m3/day to 640,000 m3/day. At present, there is a separated (isolated) sewage system in Baku. The total length of household sewage lines is 1,500 kilometers. Besides, there are rainwater sewer lines with a total length of 156 kilometers in Baku. To facilitate wastewater management and improve operational efficiency in the capital, there has been started the construction of tunnel-type sewer collectors based on new technology.

Overall, the volume of wastewater discharged from the sewage lines of Baku city exceeds one million cubic meters per day. The daily capacity of the 72 existing sewage pumping stations in Baku is close to one million cubic meters.

Waste water treatment facilities in Baku:

- Hovsan biological treatment facilities - capacity of 640 thousand cubic meters/day
- Sahil biological treatment facilities - capacity of 17.5 thousand cubic meters/day
- Buzovna biological treatment facilities - capacity of 10 thousand cubic meters/day
- Zigh mechanical treatment facilities - capacity of 70 thousand cubic meters/day
- Khojahasan mechanical treatment facilities - capacity of 18.6 thousand cubic meters/day
- Mardakan-Shuvelan mechanical treatment facilities - capacity of 18.6 thousand cubic meters/day

Currently, sewage lines and treatment facilities are being built in all cities and towns.

Waste incineration has been occurring since 2013. At this stage, minimal data is available. However, it is understood that biogenic food waste is the predominant waste type incinerated. As such, resultant CO_2 emissions are biogenic and do not contribute to national totals. Negligible emissions of CH_4 and N_2O are reported from this source.

Table 50 provides information on GHG emissions from the Waste sector.

Categories	1990	2020	2021	2022	1990-2022, difference %
5.A. Disposal of solid waste	1,512.7	1,512.7	1,550.3	1,598.1	141.9
5.B. Biological treatment of solid waste	NO	NE	NE	NE	NA
5.C. Incineration and open burning of waste	**NO**	9.3	8.8	8.3	NA
5.D. Wastewater treatment and discharge	1,902.2	2,912.4	3,3277	2,599.4	36.2

Table 50. GHG emissions from the Waste sector, kt CO_2 eq.

7.2. SOLID WASTE DISPOSAL ON LAND (5.A)

The category of solid waste disposal is a key category of CH4 emissions in terms of emission levels and trends. In Azerbaijan, proper management of landfills and dumpsites is only provided at the Balakhani landfill of the capital city of Baku. Here are carried out processes such as biological treatment, sorting and incineration of waste. This category includes the calculation of CH_4 emissions resulting from the anaerobic decomposition of waste accumulated in municipal solid waste disposal sites (SWDS).

Areas such as intra-city roads, streets, squares, parks, boulevards, public buildings and structures, settlements, etc. are considered the main sources of household (domestic) waste discharged into the environment. Municipal solid waste is the main type of waste polluting the environment.

The organized management of dumpsites in the country began in the 1950s. The first managed waste landfill in the country was established in the Balakhani settlement of the capital city of Baku.

In connection with the implementation of the "Comprehensive Action Plan for the Improvement of the Environmental Situation in the Republic of Azerbaijan for 2006-2010", the Order "On improving household waste management in Baku" was signed and "Tamiz Shahar" OJSC was established for the management of the city's waste.

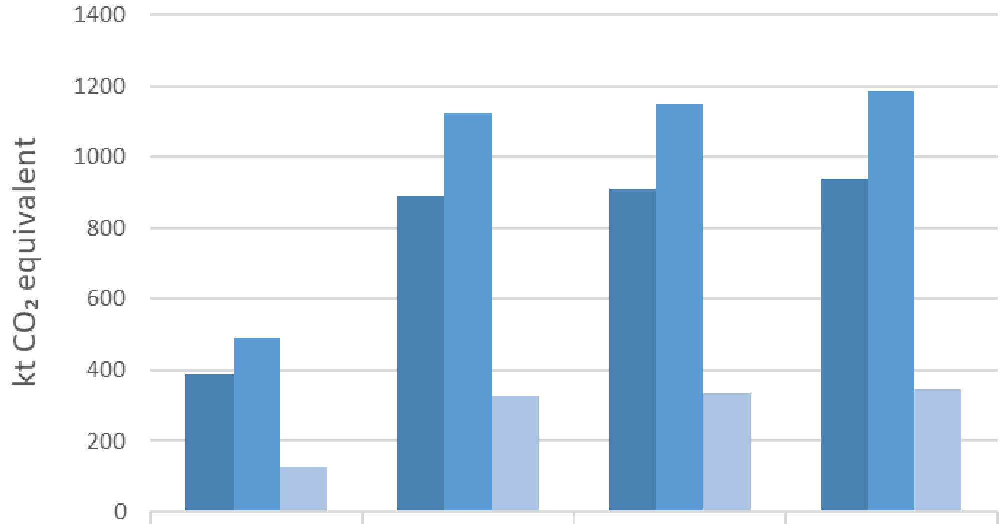
In the activities of the company, the Balakhani city waste disposal landfill, one of its economic fields, holds special significance. The landfill was rehabilitated and transformed into a sanitary landfill within the framework of the "Integrated Solid Waste Management (Unified Management of Solid Waste)" project, implemented on the basis of the loan agreement between the Ministry of Economy and the World Bank. The total area of the landfill is 120 ha. As a result of the works performed, grounding works were carried out in an area of about 60 hectares, and respectively, 2.9 million m^2 of the area was completely covered with various special-purpose isolation layers (geogrid, geotextile, geomembrane, etc.). A total of 26 special cells were built for waste disposal at the landfill and the area was equipped to handle the disposal of approximately 10 million tons of waste. Additionally, a special treatment plant operating with reverse osmosis technology was installed to treat the wastewater collected at the landfill. Here, the wastewater separated from waste is converted into technical water through special filters and used for irrigation purposes. The biogas generated from the decomposition of organic waste is used to produce electricity through a special generator with a capacity of 2 MW/hour. In order to promote waste sorting and develop the recycling business in the country, a semi-automatic Balakhani municipal solid waste sorting plant with an annual capacity of 200,000 tons, operating with German technology, was built in Balakhani settlement. As a result of sorting at the plant, recyclable materials such as paper, glass, plastic, metal and other raw materials are separated, which reduces the total volume of waste, forms a market for cheap raw materials, creates a basis for the establishment of recycling industries in the country, saves energy, and most importantly, reduces the negative impact of waste on the environment.

7.2.1. LANDFILLING OF HOUSEHOLD WASTE AND MANAGED UTILIZATION IN LANDFILLS – (5.A.1, 5.A.2)

7.2.1.1. CATEGORY DESCRIPTION (5.A.1, 5.A.2)

Since 1990 (and to some extent even before), a number of legal documents related to the domestic (household) waste management sector have been adopted and the implementation of relevant organizational measures has begun. These steps have had a strong impact on emission trends resulting from landfilling.

The sources of solid waste disposal category include municipal solid waste landfills, official and unofficial dumpsites. During the collection and disposal of industrial and municipal solid waste in cities, methane is generated due to the decomposition of waste at landfills and dumpsites. Figure 52 provides information about the emissions arising from the category of municipal solid waste.



	1990	2020	2021	2022
5.A.1.Managed waste disposal sites	387.81	888.31	910.41	938.51
5.A.2.Unmanaged waste disposal sites	488.35	1122.72	1150.79	1186.79
5.A.3.Uncategorized waste disposal sites	129.27	325.09	334.24	345.49

Figure 52. GHG emissions from solid waste

The utilization of waste from households and the commercial sector includes the collection of recyclable materials such as glass, paper/cardboard, metals and plastics, along with the separate collection and recycling of packaging and the mechanical and biological treatment of residual waste. Despite these measures, the growing population and demand for material consumption has led to continued increases in the generation of solid waste at the national level.

7.2.1.2. METHODOLOGICAL ISSUES

Azerbaijan applies the Tier 1 approach of the 2006 IPCC Guidelines for all waste categories. Due to the lack of separate composition data for all waste categories for the years 1990-2022, the country is unable to estimate a higher level. In this sense, Azerbaijan will propose an improvement plan containing the timelines and collection of necessary activity data.

For 5.A.1 (managed waste sites), 5.A.2 (unmanaged waste sites) and 5.A.3 (uncategorized waste sites), the first-order decay (FOD) method was applied to calculate emissions from municipal and industrial solid waste disposal. The total solid waste collected at waste disposal sites are divided into unmanaged shallow, deep, uncategorized and managed anaerobic waste in line with IPCC Defaults.

Data on total national waste production by year from 2009-2022 was acquired from SSC. For years prior to 2009, the MSW timeseries was extrapolated using the relationship between total waste and population for the known period as a proxy. For industrial waste, this approach of extrapolation was applied back to 2002 only. For years previous, the alternative IPCC default approach of deriving industrial waste from national GDP has been applied. A GDP coefficient 0.03 has been applied to better reflect the economic state (and hence low industrial waste generation) in years following collapse of the Soviet Union.

Statistical bulletins were available to split total national waste into municipal solid waste (MSW) and industrial waste for the period 2020-2022. For years prior to 2020, the same split for 2020 was applied.

The composition of municipal solid waste is divided into food waste, paper and cardboard, textiles and wood types using the standard indicators of IPCC waste types.

For later years in the timeseries, it is likely that use of these default MSW composition parameters lead to an overestimate for food waste due to the separation of some food waste in Azerbaijan for incineration at the energy recovery facility since 2017. However, as no country-specific composition data is currently held for landfilled waste, no manual adjustment to the composition data has been applied. Due to the high biogenic content of food waste this issue would potentially lead to an overestimate of methane emissions in more recent inventory years (in comparison to the base year).

The fraction of MSW to solid waste disposal sites has been adjusted for the years 2013 – 2022 to account for the quantity of food waste incinerated.

Key data for 2020-2022 is presented below (Table 51). It is possible to derive an implied value for MSW generation per capita using the SSC waste and population statistics. The value for 2022 of 262.4 kg/capita/yr is lower than the IPCC regional default value for Eastern Europe (380 kg/capita/yr).

Year	Total waste (Gg)	% MSW	% Industrial	% MSW to SWDS	MSW per capita (kg/cap/yr)
2020	3,778.2	68.3	31.7	80.6	256.4
2021	3,984.1	66.7	33.3	81.5	262.4
2022	4,086.1	66.6	33.4	81.9	267.3

Table 51. Solid waste disposal activity data for category

Default IPCC model parameters, including fractions of degradable organic carbon (DOC) for all waste types, were applied based on the "Eastern Europe" climate.

7.2.1.3. UNCERTAINTIES AND TIME SERIES CONSISTENCY (5.A.1, 5.A.2)

The activity data timeseries has been reviewed and found to be largely consistent. The quantity of MSW entering the SWDS reduces in the year 2013 and onwards due to the introduction of the waste incineration facility. The visible impact of this change on the emissions timeseries is minimal due to the nature of the FOD model in that methane emissions are generated and reported across several years following deposition.

The timeseries of industrial waste generation has been adjusted for the period 1990 – 2002 to better reflect the economic situation following the fall of the Soviet Union. As a result, industrial waste activity jumps significantly following 2002. This does not have a major visible impact on the methane timeseries due to the nature of the FOD model (as above) as well as the relatively low emissions contribution of industrial waste in comparison to MSW.

Default IPCC uncertainty ranges have been considered for this category in terms of activity data and emission factors.

7.2.1.4. DESCRIPTION OF THE FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

7.2.1.5. CATEGORY-SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL AND INSPECTION (5.A.1,5.A.2)

Quality control and quality assurance for general and category-specific data have been carried out by relevant experts involved in accordance with the requirements of the 2006 IPCC Guidelines and related applicable documents.

7.2.1.6. CATEGORY-SPECIFIC RECALCULATIONS

The following recalculations affecting the CH_4 values by category have been applied:

- Historical waste production has been derived on the basis of new SSC data and statistical bulletins to derive the percentage of MSW and industrial wastes. Extrapolations have been updated in line with this new information and population data.
- Recalculations were made due to the updating of previously incorrect MCF (methane correction factor) values in the IPCC software.
- The percentage applied in the First Order Decay (FOD) model for the ratio of municipal solid waste to solid waste disposal sites has been updated. Previously, it was set at 90% based on expert opinion. However, to better estimate the amount of municipal solid waste, this value has been adjusted to account for the portion of MSW (food waste) incinerated since 2013.
- The overall effect of these recalculations clarifies the decreases/increases in CH_4 emissions across the time series.

7.2.1.7. PLANNED IMPROVEMENTS

Due to lack of resources and data, country-specific waste composition data has not been estimated. Consultations for these values will be added to the improvement plan. Meantime, improvements such as training on IPCC methodology and advanced international practices are planned for staff of relevant institutions.

It is also planned to review the national data to ensure it is complete and understood for use in the FOD model. Further consultation may allow for improved data and/or assumptions to be made regarding the historical timeseries of MSW and industrial waste generation pre-2009.

The amount of methane recovered has not been calculated due to the lack of disaggregated data. The collection of disaggregated data for this activity will be included in the improvement plan. As part of the improvement plan, consultations are planned with waste management operators and industry representatives regarding potential ways for collecting this data.

Chapter 10 provides an improvement plan that includes timelines and an action plan with the necessary information.

7.3. BIOLOGICAL TREATMENT OF SOLID WASTE (5.B)

7.3.1. CATEGORY DESCRIPTION

In Azerbaijan, the anaerobic treatment of waste for electricity production is conducted only at Balakhani landfill. Due to the very small amount of biogas produced in the process, the amount of electricity generated is relatively low.

It should be noted that, according to the 2006 IPCC Guidelines, anaerobic treatment of organic waste accelerates the natural decomposition of organic matter without oxygen by maintaining temperature, humidity and pH at optimal levels. The generated methane gas can be used for the production of heat or electricity. Methane and carbon dioxide emissions from the process are of biogenic origin and are reported as a data unit in the Energy sector. For now, Azerbaijan reports these emissions as not estimated (NE).

Category 5.B provides information on emissions from composting systems (5.B.1) and the digestion of biowaste in biogas facilities (5.B.2). In Azerbaijan, biodegradable waste is collected and treated separately only at Balakhani landfill. Measures are also being implemented in the cities of Ganja and Sumgayit for the regulation of activities in this area. At the moment, composting (particularly for the agricultural sector) activities are not being conducted at municipal waste landfills in Azerbaijan.

In addition to the centralized composting of separately collected bio-waste, the composting sector also includes composting conducted by residents in their own gardens (home composting). However, there are no statistical data available on this practice.

7.3.1.1. COMPOSTING FACILITIES (5.B.1)

Data on composting in Azerbaijan is not available, and considered to be a minor practice at this time. Accordingly, it is noted as “NE” in Table 5.B.1 of CRT.

7.3.1.2. DIGESTION PLANTS (5.B.2)

Data on digestion plants (5.B.2) in household waste management is not available, and considered to be a minor practice at this time. Accordingly, it was entered as “NE” in the Table of CRT (5.B.2).

7.4. INCINERATION AND OPEN BURNING OF WASTE (CRT 4.C)

7.4.1. CATEGORY DESCRIPTION

The construction of the waste incineration plant was carried out based on the “Comprehensive Action Plan on improving the environmental situation in the Republic of Azerbaijan for 2006-2010.” The Ministry of Economic Development held an open tender for the selection of a contractor and the winner of the tender was the French company “Constructions Industrielles de la Méditerranée S.A.” According to the contract signed on December 15, 2008, between the Ministry of Economy and “Constructions Industrielles de la Méditerranée S.A.” (CNIM” S.A.), the design, construction and operation of the municipal solid waste incineration plant in Baku were fully implemented by “CNIM S.A.”

The plant, having an annual incineration capacity of 500,000 tons of municipal solid waste and 10,000 tons of medical waste, produces up to 200 million kWh of electricity per year, which is transmitted to the general network of Baku city. The plant started operating in December 2012. On November 30, 2023, within the framework of Baku “Waste to Energy” project, Tamiz Shahar OJSC signed a purchase agreement on emission reduction with B.B Energy (ASIA) PTE LTD.

Simultaneously, in order to promote recycling in the country, the Balakhani Industrial Park was established by Decree No. 1947 of the President of the Republic of Azerbaijan, dated December 28, 2011. The proximity of the industrial park to the Balakhani landfill and waste incineration plant, as well as to a major transport hub, provides a favorable opportunity for raw material and energy supply and easy access to the market for the obtained raw materials or manufactured products. The area of the park is 10.15 ha.

It is worth pointing out that the construction project of the Municipal Solid Waste Incineration Plant has been registered under the Clean Development Mechanism (CDM); however, Certified Emission Reductions (CERs) have not yet been achieved.

Open burning of solid waste is prohibited by law, emissions are not calculated, hence, the notation key “NE” was used.

7.4.2. METHODOLOGICAL ISSUES

Calculations have been conducted based on the official statistical activity data from Tamiz Shahar OJSC and the SSC. For the assessment of emissions resulting from food waste incineration, the default Tier 1 approach and the emission factors and assurance program of the 2006 IPCC Guidelines have been used. Category-specific emissions of CO2, CH4, and N2O have been estimated.

7.4.3. UNCERTAINTIES AND TIME SERIES CONSISTENCY

Since the main activity data is provided by Tamiz Shahar OJSC and the SSC, the degrees of uncertainty are relatively low.

The degrees of uncertainty related to category-specific emission factors are consistent with those reported in the 2006 IPCC Guidelines, as the IPCC software with standard data was used for estimating emission.

7.4.4. DESCRIPTION OF THE FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

7.4.5. CATEGORY-SPECIFIC QA/QC AND INSPECTION

Quality control and quality assurance for general and category-specific data have been carried out by experts involved in accordance with the requirements of the IPCC guidelines and relevant documents. The preparation of a plan for sector-specific QA/QC activities will enhance the quality of the inventory in this area in the next reports.

7.4.6. CATEGORY-SPECIFIC RECALCULATIONS

Calculations have been made on the basis of latest national data.

7.4.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS

It is planned to conduct analysis on the exact nature of all waste streams currently incinerated in Azerbaijan, as only food waste is accounted for at this stage. Energy recovery has been in place since 2017, so an improvement would also be to include emissions from this category in the energy sector instead of waste. However, the exact nature of the energy recovery process is not yet understood, so emissions have been reported under waste incineration for this inventory submission.

7.5. WASTE WATER TREATMENT AND DISCHARGE (CRT 4.D)

7.5.1. CATEGORY DESCRIPTION

This category consists of domestic (4.D.1) and industrial (4.D.2) wastewater treatment and discharge subcategories.

Wastewater can be a source of CH_4 and N_2O emissions when treated or utilized through anaerobic methods. CO2 emissions from wastewater are not accounted for in the IPCC Guidelines because they are of biogenic origin and shall not be included in total emissions at national level.

In Azerbaijan, over 99% of all household wastewater (based on the annual volume of wastewater) is treated through centralized wastewater treatment facilities. Generally, nearly 95% of the urban population (in terms of population ratio) is connected to such facilities through public sewage systems.

The remaining 5% of the population is served by other types of wastewater treatment systems (small wastewater treatment facilities and autonomous wells). All the mentioned forms of wastewater treatment (centralized wastewater treatment plants, small wastewater treatment facilities and wells) fall under the category of domestic wastewater treatment. Industrial and commercial wastewater (about 30% of the total wastewater), as well as rainwater, is also treated at these wastewater treatment facilities.

As for the total GHG emissions of Azerbaijan, they are relatively insignificant, with a small portion (about 0.1%) attributed to the household wastewater treatment. In calculating GHG emissions for this category, the Tier 1 approach of the 2006 IPCC methodology was used, based on a correlated unit factor for domestic and industrial wastewater. Figure 53 provides information on the GHG emissions generated from wastewater in the country during the reporting period.

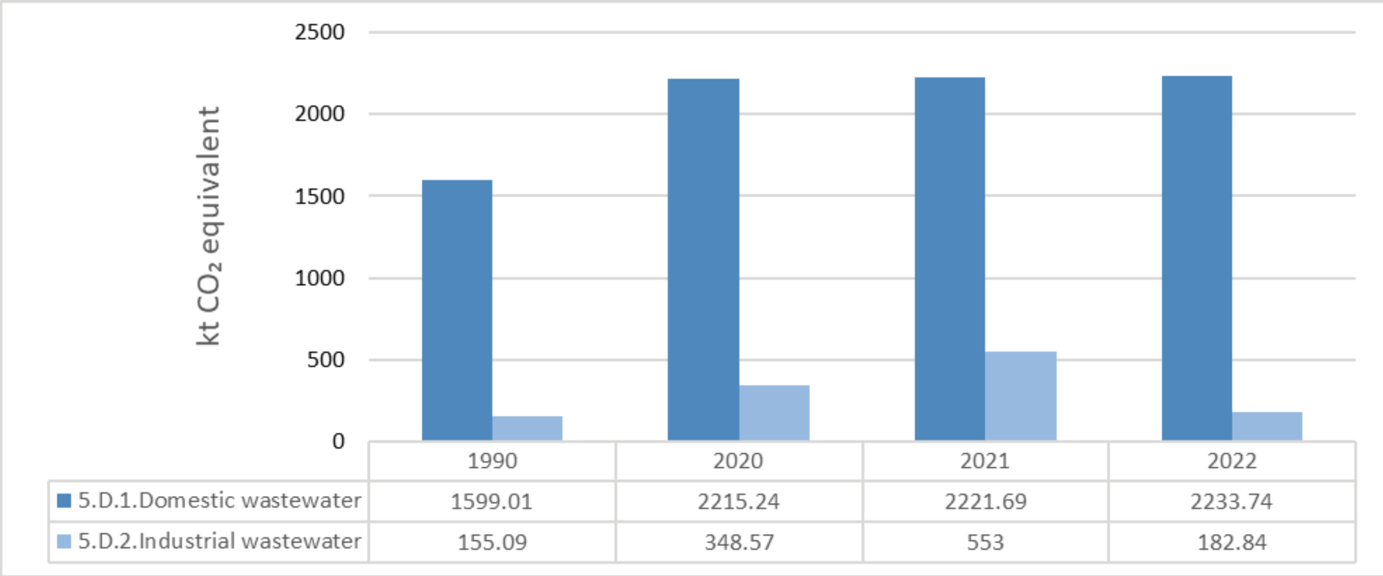


Figure 53. GHG emissions from wastewater

Domestic wastewater (4.D.1) is defined as wastewater generated from household water use, while industrial wastewater (4.D.2) refers to wastewater produced solely from industrial activities. Treatment and sanitation systems can vary significantly from country to country, and even within a country, systems designed for rural versus urban users, as well as for high-income versus low-income urban users, may differ. Azerbaijan State Water Resources Agency is a centralized supplier of drinking water and sanitation services to consumers in Azerbaijan. The agency provides the collection, processing, transportation and sale of water from sources and carries out waste water treatment. The agency also handles the design, construction and operation of water treatment facilities, reservoirs, pumping stations, water pipelines and sewer collectors.

The company manages 20,000 km of water supply lines and 6,000 km of sewerage and rainwater lines.

Given the above and the information in Table 6.1 of the IPCC 2006 Guidelines on "CH_4 and N_2O Emission Potentials for Wastewater and Sludge Treatment and Discharge Systems", sewer collectors are not considered a source of methane and nitrous oxide emissions as sewage collectors are closed and underground.

Sometimes, household and other waste waters are discharged from houses via special pipes into the sewage network (sewerage system), but in many settlements, the sewage pipes flow directly into rivers, streams, lakes, seas, etc.

Developing environmentally friendly treatment methods for the storage and recycling of household wastewater is an essential issue, as wastewater exposes the environment to physical, chemical and biological pollution, posing a threat to the health of living organisms.

Nitrous oxide (N_2O) in wastewater is associated with the breakdown of nitrogen components such as urea, nitrates and proteins.

Centralized wastewater treatment systems can involve a range of processes, from the discharge of nitrogen compounds into channels for their removal to modern tertiary treatment technologies. After treatment, wastewater is usually discharged into a receiving water body (e.g., river, lake, sea, etc.). Direct N_2O emissions can be generated from nitrification and denitrification of existing nitrogen. Both processes can occur both at the treatment facility and in the water body receiving the wastewater.

In Azerbaijan, next-generation (4G) environmentally friendly technology is being implemented at Hovsan Aeration Station, the largest treatment plant in the South Caucasus.

7.5.2. METHODOLOGICAL ISSUES

7.5.2.1. CH_4 EMISSIONS (4.D.1)

CH_4 emissions from domestic wastewater have been calculated using the Tier 1 approach method of the 2006 IPCC Guidelines, applying the relevant emission factors and IPCC assurance program for estimating emissions from waste water treatment and discharge into all aquatic environments (biological oxygen demand - BOD). However, detailed and disaggregated activity data required to classify the effluents by the type of treatment system or water body are currently unavailable. To account for different wastewater treatment scenarios, the population has been divided into rural and urban groups. For the entire rural population, a stagnant sewer system (MCF = 0.5) has been applied as the wastewater treatment scheme. For the urban population, an anaerobic reactor (MCF = 0.8) has been chosen as the wastewater treatment model.

These coefficients are expert judgments and are considered conservative choices (such as values with relatively high MCF) that may overestimate rather than underestimate CH_4 emissions.

To account for industrial wastewater discharged into the system, a standard adjustment factor of 1.25 is applied, as recommended in page 22 of Volume 5, Chapter 6 of the 2019 IPCC Guidelines on Wastewater Treatment and Disposal.

A standard coefficient of 40 g/person/day has been applied for calculating Organically Degradable Carbon (ODC). In the future, the country will evaluate Türkiye's standard OBT (Oxygen Biological Demand) value of 38 g/person/-day as the value of a nearby comparable country, in line with Table 6.4 of the IPCC Guidelines, Volume 5, Chapter 6, Wastewater section.

7.5.2.2. N_2O EMISSIONS (4.D.1)

Azerbaijan has estimated both direct and indirect N2O emissions from the treatment and discharge of domestic wastewater using the Tier 1 approach method and standard parameters according to the 2006 IPCC Guidelines.

The percentage of using of modern, centralized waste water treatment plants for the assessment of direct N_2O emissions is set at 75%. This value is based on expert opinion.

7.5.2.3. CH_4 EMISSIONS (4.D.2)

Azerbaijan has calculated CH_4 emissions from industrial wastewater using the Tier 1 approach and emission factors of the 2006 IPCC Guidelines. For industrial production types, activity data classified according to wastewater discharge have been applied. Industrial wastewater is discharged into centralized sewage systems.

To calculate emissions more accurately within this category, it is considered relevant to collect data on wastewater treatment and discharge depending on the type of industry.

Data from the SSC regarding the total industrial output (tons/year) of industry sectors such as alcoholic beverage production, dairy products, wine and vinegar, vegetables, fruits and juices have been used. The standard values for Chemical Oxygen Demand (COD) of the generated wastewater (kg COD/m^3) have been applied according to the 2006 IPCC Guidelines (Table 6.9, Volume 5, Chapter 5, Wastewater). Table 6.9 does not provide COD values for the fish and sugar processing industries. Besides, the chemical oxygen demand (COD) value for vegetable oils is not given in Table 6.9. Furthermore, emissions have not been estimated due to the lack of disaggregated data. The collection of disaggregated data for this activity will be included in the improvement plan.

The amount of sludge treated (kg BOD/year) and the amount of methane produced (kg CH_4) were not estimated due to the lack of disaggregated data. The collection of disaggregated data on this activity will also be included in the improvement plan.

7.5.2.4. N_2O EMISSIONS (4.D.2)

It is mentioned that methodologies for estimating N_2O from industrial wastewater are available in the 2019 Refinement to the 2006 IPCC Guidelines; however, such methodologies have not yet been evaluated for inclusion in Azerbaijan's inventory. Therefore, N_2O emissions from this category are not estimated and the notation key "NE" has been used.

7.5.3. UNCERTAINTIES AND TIME SERIES CONSISTENCY

Uncertainty levels of category-specific emission factors are consistent with those specified in the 2006 IPCC Guidelines. Thus, emissions have been estimated using standard data based on emission factor coefficients of the 2006 IPCC Guidelines and IPCC software.

7.5.4. DESCRIPTION OF THE FLEXIBILITY APPLIED

See Flexibility Chapter 1.9.

7.5.5. CATEGORY-SPECIFIC QA/QC AND VERIFICATION

General and category-specific quality control and quality assurance were carried out by experts in accordance with IPCC guidelines and requirements of relevant documents.

7.5.6. CATEGORY-SPECIFIC RECALCULATIONS

Recalculations by category were made for 1990.

The fraction of non-consumable protein on N_2O emissions (4D1) was changed from 1.4 to 1.1. This value corresponds to the IPCC default value for developing countries and is considered more relevant for Azerbaijan, as most households in the country no longer have food waste management technologies (2006 IPCC, Chapter 6, p. 25).

During the calculations, minor changes in population data were made due to verification and updates related to the use of consistent activity data.

7.5.7. CATEGORY-SPECIFIC PLANNED IMPROVEMENTS.

1. CH_4 emissions (4D1) are not estimated due to the lack of disaggregated data on treated sludge (kg BOD/year) and the amount of methane produced (kg CH4 The collection of disaggregated data for this activity will be included in the improvement plan. As part of the improvement plan, it is planned to conduct consultations with waste management operators and industry representatives on potential ways for gathering this data.

2. CH_4 emissions (4D2) have been partially estimated due to the lack of disaggregated data on methane emissions from industrial wastewater treatment and discharge. Improvements to disaggregated data collection for this activity will be included in the improvement plan. Improvements to disaggregated data collection for this activity will be included in the improvement plan. As part of the improvement plan, it is planned to conduct consultations with industry representatives on possible ways to collect disaggregated data for each type of industry.

3. It is noted that there is potential inconsistency of approach in defining treatment pathway utilization between the methane and direct N_2O methodologies under category 4D1. An assumption of treatment pathway based on urban/rural split is applied for methane, whereas an assumption of 75% utilization of modern treatment plants has been applied across all inventory years for 4D2. The 75% assumption is likely to be an overestimate, however no data has been identified at this stage to properly refine the understanding of treatment pathways under the category at this stage. This item, and harmonization of the inconsistency, will be prioritized as part of the improvement plan.

4. Due to the fact that industrial effluent coefficients for the fish and sugar processing sectors are not available in the 2006 IPCC Guidelines (IPCC 2006 Table 6.9, Volume 5, Chapter 5) and also due to the lack of disaggregated data, the values shown are underestimated. The collection of disaggregated data for this activity will be included in the improvement plan. As part of the improvement plan, it is planned to conduct consultations with industry representatives on possible ways for gathering disaggregated data for each type of industry.

5. The chemical oxygen demand for plant-based (vegetable) oils is not available in the 2006 IPCC Guidelines (2006 IPCC, Table 6.9, Volume 5, Chapter 5). Due to the lack of disaggregated data, the value shown is underestimated. The collection of disaggregated data for this activity will be included in the improvement plan. As part of the improvement plan, it is planned to conduct consultations with industry representatives on possible ways for gathering disaggregated data for each type of industry.

8. OTHER (CRT SECTOR 6) INDIRECT GREENHOUSE GASES

According to Article 51 of the MPG, each Party shall provide information about indirect greenhouse gases, such as carbon monoxide (CO), nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOCs), and sulfur oxides (SOx).

NOx emissions occur in all combustion processes, while CO emissions arise from incomplete combustion and NMVOC emissions are generated in the oil and gas industry and during metal production processes. CF4 and C2F6 emissions come from aluminum production, sulfur oxides are emitted from cement production and other sulfur-containing chemical processes.

As mentioned, these gases, being local pollutants, also create an indirect heating effect in the atmosphere.

Since these gases are indirect GHGs, the IPCC recommends their inventory, as well. However, due to time constraints and the lack of highly qualified personnel, no inventory has been conducted in this area so far.

In the future, plans are in place to address these shortcomings and conduct assessments in this area. The inventory of indirect greenhouse gases has been included in the improvement plan for future actions.

9. INDIRECT CARBON DIOXIDE AND NITROUS OXIDE EMISSIONS

According to paragraph 52 of the MPG, Parties are required to report information on indirect CO_2 and N_2O emissions.

These are indirect CO_2 emissions resulting from the use and/or evaporation of NMVOCs and CH4, as well as indirect N_2O emissions from NOx. Apart from the evaporation of CH_4 and NMVOC, CH_4, CO and NMVOC resulting from fuel combustion, evaporative fuel emissions from vehicles and NMVOC from burning CH_4, CO and fossil fuel-derived waste are oxidized to CO_2 in the atmosphere. Meantime, NOx emissions emitted from the agriculture and LULUCF sectors are oxidized in the atmosphere, turning into N_2O.

As a developing country, Azerbaijan has not yet developed an assessment method in the GHG inventory structure that reflects the actual status of these gases and due to time constraints, the current report does not provide information on these gases. In the future, the inclusion of an inventory of these gases in the improvement plans will be discussed at the State Commission on Climate Change.

10. RECALCULATIONS AND IMPROVEMENTS

Although the process of planning, preparation and management of GHG inventory in Azerbaijan, while not ideal, it is partially well-established. The responsibility for managing the GHG inventory rests with the State Commission on Climate Change and, in particular, MENR. However, the responsibility for calculations (accountability) and decision-making authority are assigned to relevant institutions and, in some cases, certain specialists.

The core team of the GHG inventory ensures compliance of the inventory with the relevant reporting guidelines of the UNFCCC (UNFCCC 2019, 2022a), timely preparation, review and approval of methodological changes, data selection and recalculations. The SSC is primarily responsible for data collection related to these activities.

In the 4th National Communications submitted by Azerbaijan to the UN Framework Convention on Climate Change, the inventory process covers the years 1990-2016. This report includes recalculated data for the years 1990-2010, while new calculations encompass the years 2011 to 2016.

In the 3rd BUR report, the recalculation will cover rounded years (1990, 2000 and 2010) and 2016 as the last inventory year, whilst the years 2017-2020 will be recalculated.

The calculation was made according to the 2006 IPCC methodology. Azerbaijan recalculated the emissions only for 1990 as the base year, using the flexibility provided by the MPG. The purpose of the recalculation is to identify missing data in source categories from previous inventories, verify the accuracy of applied factors and units, and analyze the results of the calculations conducted.

At the same time, updated coefficients of the IPCC 5th Assessment Report (AR5) have been used as coefficient units for Global Warming Potential (GWP) (previous country reports referred to IPCC 2nd Assessment Report (AR2)).

This highlights that the recalculation process should be conducted regularly to enhance the accuracy of the past inventory processes and improve future inventories.

10.1. EXPLANATIONS AND JUSTIFICATIONS FOR RECALCULATIONS, INCLUDING IN RESPONSE TO THE REVIEW PROCESS

As per the provisions of the MPG and the 2006 IPCC Guidelines, each country will report recalculations of the inventory time series for the initial year and all subsequent years, indicating the relevant changes and their impact on emissions, along with explanatory information and justification for the recalculations.

This is explained by applying these new assessment methods, adding new categories for emissions and removals, updating or refining data, etc.

Periodic changes and improvements in methodology are important for improving inventory quality and reducing uncertainties. Methodological changes in the category primarily involve the transition from the previously used level to another. They typically occur when new or different data become available. An example of such a change in methodology might be the shift from the Tier 1 method to the use of a higher-tier method during inventory preparation and other improvements. On the other hand, methodological improvements occur when an inventory organization deploys the same tier to estimate emissions, but applies it using a various data source or a different collection level.

As per the IPCC methodology, the following cases are considered best practices in changing or improving methods:

- Positive changes in data availability are the most important factor in selecting an appropriate method, meaning that alterations in available data can lead to changes or improvements in methods.
- It is good practice to change or improve previously used methods when they are not transparent enough.
- Over time, staffing levels and funding for inventory preparation may rise. If it is possible to expand the amount of data required for inventory, it is crucial to enhance existing methods to achieve more accurate, complete and transparent assessments, particularly for key source categories.
- Certain data required for Agricultural and LULUCF categories (like forest inventories) may not be accessible for all years due to resource constraints. In this scenario, using interpolation between years with available data or extrapolation for years beyond the last year may be the most appropriate method.

Emissions and removals from the LULUCF sector are generally dependent on land use activities. Therefore, data should cover a wide historical period (20-100 years), and the quality of such data will change over time. In these instances, partial records, interpolation or extrapolation methods and recalculations may be necessary. Implementing Quality Assurance/Quality Control and Assessment procedures can lead to the detection of errors or inaccuracies in the inventory, which represents good practice for correcting errors in previous assessments.

All these are described in Chapters 3-7 of the current report under the "Category-specific recalculations" by sectors (energy; industrial processes and product use; agriculture; LULUCF and waste). Besides, in accordance with the MPGs, the values for the submitted inventory report are calculated based on the Global Warming Potential (GWP) values as described in the IPCC Fifth Assessment Report (AR5). In previous submissions, calculations were based on the "NAILIS" Inventory Assurance Program recommended by the UNFCCC and the GWP factors provided in the IPCC Second Assessment Report (AR2). Thus, recalculations were necessary due to changes in GWP.

The Republic of Azerbaijan, as a developing country, has decided to submit the GHG inventory reports for 1990 as the base year and for the last three reporting years (2020-2022) as part of the first BTR report, given the resource and time constraints and utilizing the flexibility provided by paragraphs 57-58 of the MPG on GHG inventory.

In subsequent BTRs, Azerbaijan will conduct recalculations of GHG inventories for other previous years and include them in its reports.

At the moment, the State Statistical Committee is collecting a lot of information necessary for the preparation of the GHG inventory. However, some data are either not collected or not in the format needed for inventory purposes.

Therefore, data collection templates will need to be modified to conform to the 2006 IPCC Guidelines, and in this sense, capacity-building of SSC staff engaged in data collection is of utmost importance. All departments involved in data collection for the SSC shall follow quality control procedures. A quality control plan shall be developed and made binding for all departments. All data used for inventory purposes shall be validated and verified. Thus, it is important to have well-trained personnel in QA/QC in each existing department.

10.2. IMPLICATIONS FOR EMISSION AND REMOVAL LEVELS

As per the results of the inventory conducted for the current report, the total amount of GHG emissions released into the atmosphere in the last inventory year 2022 has reduced by 17.85% compared to the total emissions of the base year 1990 (including the LULUCF sector) (Table 1). Excluding the LULUCF sector, this difference amounted to 15.7%.

Various factors have influenced the levels of GHG emissions generated between the mentioned years. The effects were a result of reduced oil production, the coronavirus (COVID-19) pandemic, increased energy efficiency and the rise of alternative and renewable energy sources.

10.3. IMPLICATIONS FOR EMISSION AND REMOVAL TRENDS, INCLUDING TIME-SERIES CONSISTENCY

Since 2015, Azerbaijan has been conducting recalculations in its GHG inventory. A comparative analysis of the changes between the 2022 inventory, the last inventory year of the current reporting period and the 1990 report indicates that the recalculations have significantly improved the time series consistency. Specifically, due to changes in GWP, the total national emissions increased in 1990 as a result of the recalculation for 1990.

The pandemic had the greatest impact on the time series. In 2020, which was particularly affected by the pandemic, the reduction in national emissions was 18,608 kt CO_2 equivalent compared to 1990.

It should be noted that rising demand for energy and other resources due to population growth over the period since the base year has been a major determinant in the overall level of emissions.

10.4. AREAS OF IMPROVEMENT AND/OR CAPACITY-BUILDING IN RESPONSE TO THE REVIEW PROCESS

Improvements are continuously implemented and incorporated into the GHG inventory development process accordingly. The key aspects of continuous improvements are outlined below:

- Review of assessment methods, activity data, emission factors and other elements.
- Holding meetings of the working group of the State Commission on Climate Change to discuss methods for estimating GHG emissions;
- Continuous improvement of assessment methods, activity data, emission factors and other elements.
- Prioritizing the implementation of issues related to the key categories and those mentioned in the previous review reports;
- Adding necessary information on methodologies, assumptions, data and other elements in the inventory report to further enhance and improve inventory transparency by investigating gaps.
- Studying the methodology for estimating indirect GHG emissions for all sectors and incorporating them in the next inventory reports;
- Enhancing the capacity of government agencies and the private sector for the widespread application of GHG inventory methodologies and making relevant amendments to national legislation to increase their authority and responsibilities.

It should be noted that the implementation of Quality Assurance, Quality Control and Assessment procedures, related to the correction of errors (revision) in the LULUCF category, has resulted in the identification of inaccuracies in previous years' inventories, contributing to improving its quality and reducing uncertainties.

10.5. IMPROVEMENTS IMPLEMENTED AND PLANNED WITHIN THE CURRENT INVENTORY REPORT

The planning, preparation and management process of the GHG inventory covers virtually all major areas of activity of the country. The management responsibility rests with the MENR.

In the reporting process within the UNFCCC framework there are regularly made improvements and summarizations to reduce uncertainties.

The main leading institutional organizations of the GHG inventory system are MENR and SSC. Various subordinate agencies of MENR, such as the Forest Development Service, the Biodiversity Conservation Service, the State Environmental Security Service, the State Environmental Expertise Agency and the Regional Ecology and Natural Resources Departments, serve as information sources for a number of sectors under the IPCC methodology. GHG emissions are calculated based on their data.

The SSC, another key organization, collects data from all departments, organizations and enterprises operating in all areas of activity in the country. GHG emissions are calculated using the information provided in their annual reports. By comparing the GHG emissions reported by these two organizations, uncertainties are determined and appropriate adjustments are made to improve accuracy.

In 2014, at the initiative of the MENR, a section related to GHG inventory was added to the annual official statistical report form No. “2-TG (Air)” “On atmospheric air protection” for obtaining direct data from industrial enterprises for the establishment of the MRV system regarding the GHG inventary in the country. It should be noted that the mentioned reports are entered into the electronic portal of the SSC by enterprises in agreement with MENR, which are then included in the SSC's annual reviews.

However, due to the lack of an approved unified methodological approach in this field across the country, the uncertainty level of the collected data is considered high. Besides, the lack of domestic procedures for verifying the submitted data slows down the process of establishing a sustainable GHG inventory system. Thus, improving coordination is highly needed in this respect.

10.5.1. AREAS OF IMPROVEMENT IMPLEMENTED WITHIN THE CURRENT INVENTORY REPORT

In the current National Inventory Report prepared under BTR 1, GHG emission and removal sources have been extensively analyzed, with comparisons made between the 2006 IPCC Guidelines and national statistical sources. As a result, a number of improvements have been implemented within the report and a preliminary list of future improvements has been developed.

№	Sector/category	Improvements implemented
1	All sectors	The country-specific EFs of the 2006 IPCC Guidelines for all sectors have been widely used in the process of preparing the GHG inventory.
2	All sectors	For the first time in Azerbaijan, various aspects of GHG inventory were carried out in collaboration and exchange of ideas with experts from international organizations such as UNFCCC, FAO, and UNEP as part of the preparation process for the submission of the 1st BTR.
3	All sectors	Compared to previous reports to the UNFCCC, Azerbaijan for the first time has conducted an assessment of key categories for the GHG inventory, both with and without the LULUCF sector, and applied the Tier 1 approach of the 2006 IPCC Guidelines.
4	Energy	As a result of the QA/QC measures implemented for the first time in the country, the outcomes of the inventory of fuel combustion in the Energy sector for the years 1990 and 2020-2022 were compared with international source data – IEA’s calculation results.
5	Energy	The capabilities of Azerbaijan's Energy balance document were extensively utilized for the first time within the reports submitted to the UNFCCC.

6	Energy	Due to the use of new GWP values (AR5), recalculations were performed for a number of relevant categories of the Energy sector.
7	Energy	Since no activities were carried out under the CO_2 transport and storage (1.C) category, its subcategories were marked as “NO.”
8	Energy	As there are no activities under the category Other (fugitive emissions related to geothermal energy production) (1.B.2.d) in Azerbaijan, they are marked with “NO”.
9	Energy	Industrial peat production (4.II) and peat fires (4.V), which are not implemented in the country, have been marked with “NO” for the first time.
10	Energy	In the previous reports, Azerbaijan used the Global Warming Potential values from the IPCC Second Assessment Report, while the current report includes the GWP values from the IPCC Fifth Assessment Report. The recalculations show an increase in emissions, which is mainly due to the introduction of the new GWP value for methane.
11	Industrial Processes and Product Use (IPPU)	Since the processes of other uses of soda ash (2.A.4.b), other non-metallurgical magnesia production (2.A.4.c) and other limestone and dolomite uses (2.A.4.d) are not implemented in Azerbaijan, these categories are marked with “NO”.
12	Industrial Processes and Product Use (IPPU)	Due to time and resource constraints, flexibility options have been applied for gases, and emissions for substitutes of ozone-depleting substances have not been calculated.
13	Industrial Processes and Product Use (IPPU)	Since the country’s statistics did not provide data regarding the ceramics industry, the Ceramics category in the mineral industry (2.A.4.a) has not been estimated for GHG emissions, hence, is marked as “NE”.
14	Industrial Processes and Product Use (IPPU)	Emissions for the Ferroalloy category (2.C.2) have been calculated for the first time.
15	Agriculture	For the first time, the notation key “NE” was used when no data were available for emissions from sources for the application of lime to soil (3C2) and the use of uric acid (urea) (3C3).
16	Agriculture	Field burning of agriculture (crop) residues is prohibited by law. Consequently, as such activities are not carried out in the country, they have been marked with the relevant notation key (“NO”).
17	LULUCF	A value of 0.69 was used for long-term cultivated annual crops for temperate/boreal climates, in accordance with the default stock conversion factors specified in the 2006 IPCC Guidelines (Table 5.5, Chapter 5, Volume 4) for estimating carbon stocks of annual crops.
18	LULUCF	Azerbaijan has, for the first time, provided detailed information regarding land areas used in the GHG inventory for the LULUCF

19	LULUCF	In the recalculations for the base year 1990, emissions and removals for the categories of Grasslands, Residential settlements, Wetlands and Croplands have been calculated for the first time and included in the general national inventory.
20	LULUCF	For the first time, Azerbaijan has applied the 20-year IPCC standard transition period for reporting years (i.e., for both 2022 and 2002) in the LULUCF sector.
21	LULUCF	In order to provide a complete, accurate and consistent representation of land, inconsistencies in previous reports were addressed and it was ensured that the sum of reported areas for different land categories in each year of the inventory time series equalled to the total area of the country, achieving a net change of zero for different land categories between the GHG inventory years.
22	LULUCF	Inaccuracies in past reports on Grasslands (4.C) have been partially resolved, statistical data on emissions and removals have been refined and estimated in accordance with the IPCC Guidelines.
23	LULUCF	The data and calculations for the Cropland (4.B), Residential settlements (4.E) and Other lands (4.F) categories have been reviewed, ensuring that emissions and removals are calculated in accordance with the IPCC Guidelines.
24	LULUCF	For the average annual increase in forests, Azerbaijan has applied a first-time assumption of 3 m^3/ha/year according to the 2006 IPCC Guidelines (Volume 4, AFOLU, Chapter 4: Forest Lands, Table 4.11B.).
25	LULUCF	Necessary measures have been taken to collect data on whether or not wood cutting (logging) activities (including legal, illegal, protective management, etc.) are considered in all forest- related activities.
26	Waste	Since no activities related to composting facilities (5.B.1) were conducted in Azerbaijan, this category has been marked as “NO.”

Table 52. Improvements implemented in the current Inventory

10.5.2 AREAS OF IMPROVEMENT PLANNED FOR THE NEXT YEARS IN NIR

Azerbaijan considers it essential to implement a number of improvements in the preparation of future GHG inventories to align its national GHG inventory with the MPG and 2006 IPCC Guidelines. Planned improvements for the enhancement of the GHG inventory are described in Table 53.

№	Sector	Planned improvements	Last implementation year
1	All sectors	Development of national legislation and relevant legal-normative acts on the inventory of GHG emissions.	2026
2	All sectors	Redesigning the SSC's data collection templates to align with the 2006 IPCC Guidelines (incorporating QA/QC, aspects such as gaps in activity data and their causes, uncertainties, etc.	2026
3	All sectors	Developing a comprehensive QC/QA plan that includes the organization, planning and monitoring of QC/QA measures to ensure transparent and effective oversight of the implementation of activities, in accordance with the 2006 IPCC Guidelines (Volume 1, Chapter 6) and paragraph 19 of the UNFCCC reporting guidelines (24/CP.19).	2026
5	All sectors	Conducting a national inventory of indirect greenhouse gas emissions in the country.	2027
6	All sectors	Organization of trainings for studying the IPCC and UNFCCC Guidelines on inventory of GHG emissions	Regular
7	Energy	To estimate energy emissions there will be used an improved energy balance in the preparation of the next BTR reports. This procedure will lead to significant improvements, thereby reducing the differences between intermediate (medium) and final energy data.	Every year
8	Energy	The activities required for timely access to the final energy balance will be reflected in the QA/QC action plan, and thus, the collaboration between the GHG inventory developers, the Working Group on energy balance development and the SSC will ensure the timely availability of the improved energy balance necessary for the final inventory year.	Every year
9	Energy	Implementing planned improvements to ensure statistical data collection, including analysis of carbon content values and low calorific value of fossil fuels.	Every year
10	Industrial Processes and Product Use (IPPU)	Ensuring the inclusion of activity data on clinker (based on brands) used in statistical data to reduce uncertainties following the IPCC methodology in the cement sector; collection of data on clinker production at the plant level, as well as on clinker imports and exports to ensure that emissions from clinker production are taken into account.	2025
11	Industrial Processes and Product Use (IPPU)	Conducting studies in lime production facilities and other enterprises capable of producing lime in order to split lime production statistics into high calcium lime and dolomite lime categories to improve the accuracy of emission calculation	Every year
12	Industrial Processes and Product Use (IPPU)	Collection of data disaggregated by type of glass production and on various waste factors utilized by enterprises to enable future use of the Tier 2 methodology.	2025
13	Industrial Processes and Product Use (IPPU)	Reflecting information on the amount of available statistical data of the SSC (carbonate raw materials consumed per unit of product in the production processes for the ceramics category), making improvements in their adjustment to the requirements of the 2006 IPCC Guidelines.	2026

15	Industrial Processes and Product Use (IPPU)	Ensuring the collection of statistical data on food and beverage production in accordance with the 2006 IPCC Guidelines	2025
16	Industrial Processes and Product Use (IPPU)	Implementing relevant measures to refine activity data for the ferroalloy sector.	2025
17	Industrial Processes and Product Use (IPPU)	Obtaining activity data that will allow for the assessment of emissions from the ODM sector in accordance with the best practices outlined in the 2006 IPCC Guidelines.	2026
18	Industrial Processes and Product Use (IPPU)	Taking measures to refine activity data for calculating emissions arising from waste management in the field of fire protection.	2026
19	Industrial Processes and Product Use (IPPU)	Ensuring the collection of data on the amount of raw materials and other materials deployed to improve the assessment of emissions for the iron and steel category.	2026
20	Industrial Processes and Product Use (IPPU)	Conducting research on the inclusion of data on primary aluminium production in national statistics.	2025
21	Agriculture	Ensuring improvements in the classification of cattle (dairy and non-dairy) as part of the improvement plan for the key category of emissions from enteric fermentation	2027
22	Agriculture	Providing activity data in accordance with the 2006 IPCC Guidelines to improve accuracy in manure management.	2026
23	Agriculture	Refining the classification of cattle (dairy and non-dairy).	2026
24	Agriculture	Improving statistical data for the classification of perennial and annual crops in agriculture according to the 2006 IPCC Guidelines.	2026
25	Agriculture	Adjusting all statistical data on category-specific activities in the Agricultural sector to the requirements of the IPCC 2006 Guidelines.	2026
26	Agriculture	Improving the statistics of organic soil and drainage activities to provide statistical data on drainage/re-irrigation activities of organic soils in the country.	2026
27	Agriculture	Building the capacity to use higher-level methods for estimating emissions and removals in the key categories of agriculture.	2026
28	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural (agrarian) universities and research centres on potential ways of gathering data on sewage sludge and plant residues applied to land as part of the improvement plan.	Regular
29	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural universities and research centres on potential ways of gathering data on average total energy intake and average CH_4 conversion rate as part of the improvement plan.	Regular
30	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural universities and research centres on possible	Regular

31	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural universities and research centres on possible ways to collect data on nitrogen release from the manure management system as part of the improvement plan.	Regular
32	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural universities and research centres on possible ways to collect the missing data on the amount of nitrogen lost due to leaching and discharge (runoff) as part of the improvement plan.	Regular
33	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural universities and research centres on possible ways to collect data on the type and amount of organic additives used in rice cultivation as part of the improvement plan.	Regular
34	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural universities and research centres on possible ways to collect disaggregated data on emissions from liming and other carbon-containing fertilizer activities.	Regular
35	Agriculture	Conducting analyses to accurately determine whether or not field burning of agricultural residue occurred	2025
36	Agriculture	Improving the collection of data on urea application	2025
37	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural universities and research centres on possible ways to collect disaggregated data regarding the amount of nitrogen lost due to leaching and runoff.	2026
38	Agriculture	Taking appropriate measures to ensure the reduction of uncertainties in methodological selection data for main animal species, enabling the country to accept a higher level for its GHG inventory according to the 2006 IPCC Guidelines.	2026
39	Agriculture	Improving national data collection for nitrate-based synthetic fertilizers in line with the 2006 IPCC Guidelines.	2026
40	Agriculture	Conducting consultations with the Ministry of Agriculture, agricultural universities and research centres to collect data on nitrogen losses from the manure management system and on the calculation of the amount of nitrogen fertilizer to be applied to agricultural lands based on those data	Regular
41	LULUCF	Collaboration with the State Service on Property Issues and the State Statistical Service to clarify the situation regarding the change of use of the rested (fallow) lands.	Regular
42	LULUCF	Conducting research on stratification of the total territory of the country according to the minimum climate, ecological zone, soil types and management regimes in accordance with the 2006 IPCC Guidelines.	Regular
43	LULUCF	Taking necessary measures to estimate emissions/removals from key categories/sub-categories/carbon sinks in the AFOLU sector using higher-level methods.	2026
44	LULUCF	Creating a database regarding changes in organic soils and drainage/re-irrigation works to determine changes in emissions/removals due to land-use changes.	2026
45	LULUCF	Providing complete, accurate and consistent information on land use, taking into account national conditions for the development of a sustainable land use classification system.	Every year

46	LULUCF	Estimating the average growing stock level of forests in Azerbaijan based on forest species, according to the general IPCC guidelines and available regional data.	2026
47	LULUCF	Studying the climate, humus, soil types and mineralization rates of soil in summer and winter grazing systems.	2026
48	LULUCF	Establishing a land use classification system for the provision of spatial data to facilitate the application of 2006 IPCC Guidelines in land management.	2026
49	LULUCF	Refining statistical data on wetlands and improving the quality of data exchange between relevant organizations.	Regular
50	LULUCF	Conducting monitoring to refine area-based carbon and nitrogen reserves in mineral soils within the land use category.	Regular
51	LULUCF	The land representation given in the current report starts from 1990. For this period, it is assumed that no land use/management changes occurred 20 years ago. Retrieving 1970 data during the next inventory period or filling data gaps using statistical methods or assumptions.	2026
52	LULUCF	Improving data in accordance with the requirements of the IPCC guidelines on GHG inventory in the AFOLU sector.	2026
53	LULUCF	Improving the uncertainty assessment of activity data and emission factors to implement uncertainty assessment of GHG inventory for the LULUCF sector in accordance with the MPG and 2006 IPCC Guidelines.	2026
54	LULUCF	Ensuring the stratification of the total territory of the country according to the minimum climate, ecological zones, soil types and management regimes in accordance with the 2006 IPCC Guidelines.	2026
55	LULUCF	Conducting assessments of the average growing stock level of forests based on species in the upcoming reporting period, based on the 2006 IPCC Guidelines and available regional data.	2026
56	LULUCF	Considering all activities leading to logging (wood removals from forests) in the assessment of carbon stock changes.	2025
57	LULUCF	Conducting assessments of the average growing stock level of forests based on species in the upcoming reporting period, based on the 2006 IPCC Guidelines and available regional data.	2026
58	LULUCF	Considering all activities leading to logging (wood removals from forests) in the assessment of carbon stock changes.	2026
59	LULUCF	Conducting assessments of the average growing stock level of forests based on species in the upcoming reporting period, based on the 2006 IPCC Guidelines and available regional data.	2026
60	LULUCF	Considering all activities leading to logging (wood removals from forests) in the assessment of carbon stock changes.	2026
61	LULUCF	Conducting assessments of the average growing stock level of forests based on species in the upcoming reporting period, based on the 2006 IPCC Guidelines and available regional data.	Regular

63	LULUCF	Conducting assessments of the average growing stock level of forests based on species in the upcoming reporting period, based on the 2006 IPCC Guidelines and available regional data.	2026
64	Waste	Considering all activities leading to logging (wood removals from forests) in the assessment of carbon stock changes.	2026
65	Waste	Conducting assessments of the average growing stock level of forests based on species in the upcoming reporting period, based on the 2006 IPCC Guidelines and available regional data.	2026
66	Waste	Considering all activities leading to logging (wood removals from forests) in the assessment of carbon stock changes.	2026
67	Waste	Conducting assessments of the average growing stock level of forests based on species in the upcoming reporting period, based on the 2006 IPCC Guidelines and available regional data.	2026
68	Waste	Considering all activities leading to logging (wood removals from forests) in the assessment of carbon stock changes.	2026

Table 53. Planned improvements

CHAPTER II

Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement

1. NATIONAL CONDITIONS AND INSTITUTIONAL REGULATIONS

1.1. NATIONAL CONDITIONS

1.1.1. GEOGRAPHICAL PROFILE

The territory of the Republic of Azerbaijan is approximately 400 km from north to south and 500 km from west to east, located between 38°25' - 41°55' north latitudes and 44°50' - 50°51' east longitudes. The first written information about Azerbaijan was given in the "Geography" book by Strabo, a Greek scientist who lived in the 1st century BC. In this work, he emphasizes that the plains along the Kura river are more productive than the Babylonian and Abyssinian plains. Ptolemy, who lived in the II century, shows the geographical coordinates of 29 cities in Albania.

The fact that Azerbaijan is located on the Great Silk Road, at the junction of the West and the East, and its rich nature have always attracted interest. Azerbaijani geographers H. Shirvani, G. Mirzazada, I. Gutgashenli, H. Zardabi, M. Baharli conducted researches in various directions.

Azerbaijan, with a total area of more than 200,000 km2, was divided into two parts between Iran and Russia in 1813 and 1828 based on the Gulustan and Turkmenchay treaties. Currently, the total area of the Republic of Azerbaijan is 86.6 thousand km2.
Extreme points in each of the four cardinal directions

In the north - the Guton mountain
2. In the south - Astara river
3. In the west - Jandargol or Sadarak settlement
4. In the East - Oil rocks (or Shahdili cape)

The total length of its borders is 3,472 km, it borders with 5 countries:

In the North - with Russia (391 km) - the Main Caucasian Watershed Range, the Samur River, the Sudur Range;
In the North-West - with Georgia (471 km) - Alazan (Kanikh) and Iori (Gabirri) river valleys;
In the West - with Armenia (1,007 km) - Murguz, Shahdag, Eastern Goycha, Mehri ranges, Karabakh volcanic plateau.
In the South-West - with Turkey (11 km) - Araz river;
In the South - with Iran (765 km) - Talysh mountains, Araz, Astara and Bolgarchay rivers.
Azerbaijan is surrounded by the Caspian Sea for 825 km in the East. Here it borders with Kazakhstan, Turkmenistan, Russia and Iran.

Pirallahi, Chilov, Boyuk Zira, Dash Zira, Khara Zira, Gil Zira, Sangi Mugan, Zanbil Islands, Baku and Absheron archipelagos, Sari and Kurdili peninsulas belong to Azerbaijan. Azerbaijan is located on the border of the European and Asian continents. Azerbaijan has an inland, but coastal position. Azerbaijani ships can go to the Atlantic Ocean through the Volga-Don and Volga-Baltic canals, and to the Arctic Ocean through the Baltic-White Sea canal.

Having a unique geography and geographical position, Azerbaijan has maintained its importance for world economic and cultural relations since ancient times.

1.1.2. GOVERNMENT STRUCTURE

Executive power in the country belongs to the President of the Republic of Azerbaijan, legislative power is exercised by the Parliament of the Republic of Azerbaijan - Milli Majlis of the Republic of Azerbaijan, and judicial power is exercised by independent courts.

The head of state of the Republic of Azerbaijan is the President of Azerbaijan and he is elected by the people of Azerbaijan. The President of Azerbaijan appoints the vice presidents of Azerbaijan and the first vice president of Azerbaijan. The head of Azerbaijan state is the President of the Republic of Azerbaijan.

The President of the Republic of Azerbaijan is the Supreme Commander of the Armed Forces of the Republic of Azerbaijan. The President organizes the Executive Office of the President in order to ensure conditions for the implementation of the Constitutional powers and appoints its head. The President of the Republic of Azerbaijan establishes the Cabinet of Ministers for the purpose of organizing the implementation of executive powers. The Cabinet of Ministers is the supreme executive body of the President, subordinate to the President and accountable to him. The Milli Majlis of the Republic of Azerbaijan, which exercises legislative power in the Republic of Azerbaijan, consists of 125 deputies.

Deputies of the Milli Majlis of the Republic of Azerbaijan are elected by independent, personal and anonymous voting based on the majoritarian electoral system, general, equal and direct voting rights. Elections of the Milli Majlis of the Republic of Azerbaijan are held every five years on the first Sunday of November. The term of office of deputies of the Milli Majlis of the Republic of Azerbaijan is limited to the term of office of the convocation of the Milli Majlis of the Republic of Azerbaijan.

To ensure national strategic programs and projects related to the prevention of the negative effects of global and regional climate changes, as well as the inventory of GHG released into the atmosphere, monitoring of those gases, staff training in this field and fulfillment of other obligations arising from the convention, as well as to organize scientific and technical support, financial resources and the purchase of modern technologies for these purposes, the State Commission on Climate Change was established in 1997. The Commission directs the work planned and performed in the field of climate change and carries out inter-structural coordination in accordance with its powers and directions of activity.

1.1.3. POPULATION PROFILE

According to the information as of the beginning of 2023, the population of the Republic of Azerbaijan is 10127.1 thousand people. 52.9% of the population lives in cities. The densest population is observed in the Absheron peninsula, and the sparsest population is in the middle and high mountain areas.

Historically, population growth in Azerbaijan has been high. For the last 125 years, the population has increased more than 5 times. In the last 33 years, the population has increased more than 1.4 times. However, the growth rate has started to decrease in recent years.

The primary source of population data is population censuses. The current calculation of the population was based on the results of the last population census, and every year the number of people born in this area and those who came to live permanently were added to the population, and the number of deaths and those who moved from this area were subtracted from the population. Based on the final data of the last population census conducted in 2019, appropriate clarifications were made in the number and structure of the population for the periods after the census, as well as in some relative indicators. The population is divided into urban and rural populations according to their place of residence. Cities and settlements are considered urban areas, and other settlements are considered rural areas.

1.1.4. ECONOMIC PROFILE

Although Azerbaijan hit a complex historical period at the end of the last century, it managed to ensure a stable, safe and modern standard of living by passing a great path of evolution in its socio-economic and cultural life. The international reputation of the country has increased significantly, the statehood traditions in the society have been strengthened, and the construction of modern socio-economic infrastructure has been successfully implemented. High financial opportunities resulting from economic development have made an important contribution to macroeconomic stability and growth for many years, and created a strong potential for ensuring security.

The socio-economic reforms that have been successfully carried out in Azerbaijan for many years have led to the continuous development of the national economy, the strengthening and modernization of its financial stability, the acceleration of modern socio-economic infrastructure construction processes, as well as the solution of many social problems and the improvement of the material well-being of the people, the rapid adoption of innovations and the continuous development of human capital. Azerbaijan has become a state with a stable and sustainable economy on a global scale, as well as a state, occupying an important geopolitical and geoeconomic position, and playing a strategic role in ensuring global energy security with large financial resources. Azerbaijan makes significant contributions to international and regional cooperation, successfully implements global projects with the initiative and participation of our country. Growing economic power and international influence made it possible for Azerbaijan to act as an initiator of large projects capable of changing the landscape of the economies of the South Caucasus and surrounding regions.

Successful socio-economic and political achievements, national and multicultural values create confidence that the power of Azerbaijan, which serves as a junction of the East and the West, will increase even more in the coming years. These opportunities guarantee the strengthening of Azerbaijan's economic sovereignty and its transformation into a powerful state with a high social welfare society based on modern living standards in the period up to 2030. The state of Azerbaijan has chosen the path of developing a socially oriented market economy in order to further increase the welfare of the population in the country.

The reintegration of liberated territories into the general economy of the country, benefiting from the opportunities of new international and regional transport-logistics corridors will give a great impetus to the development of Azerbaijan. In this framework, the formation of security, stability, prosperity and mutually beneficial cooperation in the region, as well as the development of economic and trade relations, will further strengthen the role of Azerbaijan in defining the general architecture of the regional economy.

In order to continuously increase the level of national social welfare, the acceleration of economic growth backed by high, sustainable, inclusive and mainly private initiatives, ensuring the return of the population to the liberated territories constitute the ideological core of Azerbaijan's new development highway. For the long-term sustainable and rapid development of our country, the successful relationships of society, business and the state will be strengthened. Effective and efficient management of the state's role in the economy through market-oriented reforms, strengthening of private property institutions, business-friendly public administration and further liberalization of trade regimes in order to increase the access of local products to foreign markets will be the basic factors of economic growth. The development of private initiatives in the country on a creative and innovative basis will ensure that economic resources are directed to areas creating higher added value.

The realization of these goals requires the formation of an effective macroeconomic policy framework that serves sustainable macroeconomic stability, the strengthening of medium and long-term "driving forces" of economic development - modernization of human capital, expansion of digital economy, and full maintenance of economic sovereignty. The following five National Priorities for the socio-economic development of the country should be realized in the next decade:

1. sustainable growing competitive economy;
2. a society based on dynamic, inclusive and social justice;
3. competitive human capital and modern innovations space;
4. great return to the liberated territories;
5. clean environment and “green growth” country.

At the same time, the afore-mentioned National Priorities are of special importance in the direction of the implementation of the obligations arising from the UN "Transformation of our world: Agenda for sustainable development until 2030".

In the past period, the capital of our country developed faster than its regions. In the long term, our main goal is to adapt the development of the regions to the level of development of the capital. For this purpose, all necessary economic and social infrastructure has been created in the regions.

In order to be ready for the increased competition in the world in the coming years, the formation of highly competitive human capital became the priority for every country.

Due to the assurance of the territorial integrity of Azerbaijan, the return of people displaced from their native land is ensured. This Great Return will be a bridge for the stable settlement of our citizens in the liberated territories and the joining of these territories to the economic activity of the country.

Considering the scale of global climate change, a significant place should be given to the application of environmentally friendly technologies, at the same time, the use of clean energy sources, recycling of waste and restoration of polluted areas should be encouraged. This will be an important contribution to the efforts towards the reduction of greenhouse gas emissions.

Together with the prospective economic development of the country, environmental enhancement, rapid restoration and increase of greenery, efficient use of water resources and sustainable energy sources should be ensured.

Quality and clean ecological environment in the country should be protected and efficient use of resources should be ensured. A comprehensive solution to environmental problems that have arisen over many years and sustainable development in this field should be in focus.

Environmental risks from economic and demographic growth to the environment should be reduced in the coming years. Economic growth and the ecological environment should be balanced. Our existing resources should be restored by involving unused land plots in the country. The country's demand for quality water should be met by effective use of water resources.

In the strategic period, the use of alternative and renewable energy sources will increase in advanced countries. Taking this into account, energy should be used effectively in the country and new sustainable energy sources should be preferred.

In order to fully meet the needs of current and future generations, the application of environmentally friendly "green" technologies should be expanded. Based on the scientific and technical potential, the impact on climate change should be reduced by increasing the share of alternative and renewable energy sources in primary consumption in all areas of the economy. Using environmentally friendly vehicles will have a positive impact on the environment and air quality.

Despite the significant impact of the pandemic on the country's export revenues in recent years, as a result of timely measures, the national economy was adapted to the new global realities in a short time, macroeconomic stability was ensured, and Azerbaijan has become one of the countries least affected by this crisis. In the post-pandemic and post-conflict period, the state of Azerbaijan has entered a qualitatively new stage of strategic development, covering the years of 2022–2030. In this strategic period, Azerbaijan is able to implement new goals towards the building of a society of high welfare through new generation structural and institutional reforms, modern and sustainable sources of economic growth set in motion, further strengthening of innovation direction and financial stability of the national economy, and effective integration of the country's economy into the global value chain. It is for this purpose that "Azerbaijan–2030: National Priorities for socio-economic development" was approved and "Socio-Economic Development Strategy for 2022–2026" based on these priorities was developed. The realization of this Strategy will lead to major changes in the country's economy by the end of 2026, economic growth will be formed on the basis of completely new quality factors, growth rates will be accelerated especially in priority areas, and the stability of the economy and employment will be strengthened.

1.1.4.1. ACHIEVEMENTS ON NATIONAL PRIORITIES ON SOCIO-ECONOMIC DEVELOPMENT

Five fundamental priorities stemming from the "Azerbaijan–2030: National Priorities for socio-economic development" characterize the country's 10-year socio-economic development achievements. These achievements will greatly contribute to the formation of a qualitatively new face of socio-economic development for the country's economy in the long term. The achievements are the result of reforms aimed at large-scale goals implemented in the last 10 years. The restoration of the historical territorial integrity of the country has created the basis for the realization of the ideas of perspective development of the economy. In the last 10 years, macroeconomic stability and sustainability have been ensured in the country's economy, and economic growth supporting social welfare has been achieved. Solid political and social stability and security in the country, visionary domestic and foreign policy played a decisive role in the achievement of complex socio-economic goals set, as well as in the restoration of territorial integrity of the country in the last 10 years. As a result of wider application of modern technologies in the leading sectors of the national economy and the attraction of quality human capital, productivity has increased significantly, the economy has rapidly diversified, and domestic production has been effectively integrated into the global value chain. As one of the active centers of the 4th Industrial Revolution, Azerbaijan has become a place of great opportunities for foreign investors. During this period, the national economy grew by 15%, and the non-oil-and-gas GDP increased by 1.4 times. As compared to 2011, non-oil-and-gas exports increased by 78.3%. In the last 10 years, the economy has successfully emerged from two global financial crises, and the country's economy has been resistant to external influences. In 2014-2015, the sharp drop in the oil price in the global commodity market and the pandemic crisis created serious threats to macroeconomic stability in the country. Despite all the afore-mentioned, macroeconomic stability in the country, as well as the well-being and health of the population have been preserved due to flexible economic management. By the end of 2021, our foreign exchange reserves were approximately equal to the volume of GDP, which reflects the full resilience of the national economy against external and internal influences. As a result of the fundamental structural-institutional reforms, the structure of the national economy has changed, and the share of the non-oil sector has increased significantly. In 2012-2021, the non-oil-and-gas GDP increased by an average of 3.5% annually, from 25.4 billion manats in 2011 to 57.8 billion manats in 2021, the share of non-oil-and-gas sector reached 62.2% in 2021 as compared to 48.8% in 2011. During this period, the non-oil-and-gas industry, which is the sectoral driving force of economic growth, grew by 2.3 times, agriculture by 1.5 times, and the information and communication sector by 2.4 times. The number of tourists visiting the country increased from 1.6 million in 2011 to 2.9 million in 2019. As a result of the targeted policy, the share of the private sector in the non-oil sector has grown significantly. As a result of successful structural-institutional reforms, the share of the private sector in GDP was 85% in 2019, and although this indicator decreased to 80.8% in 2020 due to the pandemic, it has exceeded 83% in 2021 so far. Non-oil-and-gas private investments have been the main driver of private sector development. In 2021, the share of non-oil-and-gas private investments reached 44.6% in total non-oil/gas investments. The dominance of small and medium-sized enterprises in the economy has increased significantly. Especially the modern economic infrastructure created at the expense of state investments has supported the development of small and medium enterprises (SMEs). The number of SMEs registered during this period increased by 3.1 times, and their share in non-oil-and-gas GDP amounted to 23.7%. 25.5% of non-oil-and-gas exports are carried out by SMEs. The loan portfolio for supporting the activity of SMEs has increased by 1.5 times since 2018 and reached 4.4 billion manats in 2021. In order to strengthen the country's food security, local production potential and infrastructure have been improved. The indicator of self-sufficiency due to the local production of primary agricultural products based on the available land, water and climate resources is generally at an acceptable level. Along with the local production potential, the base created for the development of the warehouse infrastructure and processing industry for storing food stocks in the country is of exceptional importance in the perspective of food security. Thus, the establishment of a local processing industry and infrastructure for products that are relatively highly dependent on imports due to the lack of natural resources allows us to stably ensure the country's food security. Foreign investments have played an important role in the rapid development of non-oil-and-gas sectors, especially of private initiatives. In 2011-2021, foreign direct investment in the amount of USD 11.1 billion was invested in the country's non-oil-and-gas economy. Foreign investments are directed to the development of a competitive value chain in high-productivity areas and the creation of modern infrastructure.

Active attraction of foreign investors was contingent upon a favorable business environment and macroeconomic stability. The state budget has been active both in supporting social welfare and providing investments for economic activity. Although the changes in the global and domestic economic environment affect the revenues of the state budget, the expenses of the state budget increased by 1.8 times in nominal terms in 2011–2021. The internal and external segments of public debt supported the goals of macroeconomic stability and budget sustainability. As of December 31, 2021, the total public debt was 18.2% of GDP, which is an acceptable level in terms of fiscal sustainability. In the last 10 years, inflation in the country has been maintained at an acceptable level for economic activity. During this period, the annual inflation averaged 5.3%. Monetary conditions are regulated within the framework of macroeconomic stability goals. In order to support the recovery of economic growth, the refinancing rate was reduced from 15% to 6.25% in 16 stages from the beginning of 2018 to December 2020. However, in the first half of 2021, in response to the processes taking place in the external environment, a pause was made in the direction of changing the refinancing rate, and starting from the second half of the year, the refinancing rate was gradually increased, considering the acceleration of inflationary processes. Liquidity in the economy was efficiently managed under the conditions of maintaining macroeconomic stability. The stability and liquidity of all segments of the financial sector provided significant support to the financing of economic growth. The level of capitalization and liquidity in the banking sector, which is an important part of the financial sector, exceeds the norms up to 2 times. In these conditions, the share of bank assets in GDP increased from 26.8% to 44.3% in the last 10 years, the volume of credit investments in the economy increased from AZN 9.9 billion to AZN 17.1 billion. The measures taken to improve the financial sector have increased confidence in the sector. The volume of deposits (excluding the financial sector) increased by 3.9 times from AZN 6.9 billion in 2011 to AZN 27.1 billion in 2021. Economic growth has improved the social welfare of all citizens. During this period, the minimum wage in the country increased by 2.7 times, the average monthly wage by 2.0 times, and the minimum amount of pensions by 2.3 times. In the last 10 years, the amount of the need criterion used to determine targeted state social assistance to low-income families has increased by 2.3 times. Within this period, the number of the employed population increased by 14.0%, the number of wage earners increased by 22.9%, and the unemployment rate, despite fluctuations due to the pandemic, was 6.0% in 2021. Targeted state social assistance aimed at meeting the needs of the poor in the country has been expanded, and the provision of low-income families has been strengthened. In the last 10 years, the average monthly amount of social assistance given to low-income families has increased by 2.6 times. As a result of the implemented measures, the specific weight of the population living below the national poverty line decreased from 9.1% to 4.8% in 2019 compared to 2010. In 2020, due to the COVID-19 pandemic, the specified indicator increased to 6.2%, but in 2021, it decreased to 5.9%. Indicators have improved in pre-school education, which is an important stage in the process of preparing quality human capital. Indicators of preschool education comprehensiveness in cities and villages have improved significantly, the specific weight of children educated in preschool educational institutions and involved in school preparation in general schools in the total number of 1–5-year-old children has increased by 16% and reached 32% in the last 5 years. In order to improve the quality of education, there was a focus on the development and motivation of the teaching staff. The competitions conducted among teachers and the measures implemented for the improvement of teachers, as well as the 2.4 times increase of teachers' salaries in the last 10 years, had a positive effect on the quality of education in general education schools. In order to improve access to education in the country, an educational infrastructure based on modern technology has been created. In 2003-2021, more than 3,400 school buildings were built or renovated, which constitutes 76% of all schools. The scientific research potential has been modernized, application-oriented research has been expanded, opportunities for applying modern technologies have been created, and the role of intellectual property has been increased in this process. The number of publications on research in various fields of science has increased rapidly. As a result of the institutional reform in the field of intellectual property in the last 4 years, in the Global Competitiveness Index, our country moved from 71st to 30th place among 140 countries on the "Protection of Intellectual Property" indicator, and the share of the creative economy in GDP increased from 3.5% to 5.3%.

A clean ecological environment has been supported in the country, along with the sustainable and efficient use of existing natural resources, the possibilities of involving renewable energy sources in turnover have been expanded, and new installed capacities for renewable energy sources have been determined. Modern water resources infrastructure has been created, opportunities for effective waste management have been expanded.

1.1.4.2. GLOBAL TRENDS, CHALLENGES AND OPPORTUNITIES IN THE COMING DECADE

In the long-term perspective, it’s important that the country's economy should face new challenges arising from the global and domestic environment. The smallness of our national economy and its high integration into the global economy determines its sensitivity to challenges arising from the external environment and necessitates a change in the structure of the national economy. These challenges are multidirectional. In order for our country to enter the group of high-income countries, the economy must grow rapidly and continuously in the long term. The economies of 13 countries in the world showed average growth exceeding 7% every year during 25 years. These economies have grown rapidly, sustainably and inclusively, closing the gap with high-income countries.

Our national economy aims to be among high-income countries. For this purpose, there should be new economic growth that includes the qualities of sustainability and inclusiveness. Only such economic growth can create a foundation for a continuous increase in the income of every citizen of Azerbaijan. Rapid digitization trends in the economies of the world's countries and a significant increase in productivity, based on this, create opportunities for quality development. Continuous technological development around the world is rapidly expanding the global value chain and expanding its geography. This enables global commodities and services to be delivered to the final consumer on time, with high quality and at low cost. Consumers of the digital society have an opportunity to track the products they order along the entire value chain. Taking advantage of these trends will support the integration of the country's economy into the global value chain in the short term.

The trends of "greening and decarbonization" in the global economy create opportunities for the development of non-resource economies. Acceleration of the mentioned trends may affect the country's oil incomes in the long term. Falling demand for oil in the global energy market requires deep diversification of the non-oil-and-gas sector and compensation of declining oil incomes through non-oil-and-gas foreign exchange earnings. Combating climate change, effective use of natural resources and protection of biodiversity are among the main principles of a sustainable economy. Realization of the challenges on Sustainable Development Goals, the Paris Agreement on Climate Change and the country's development priorities requires the increase in use of renewable energy sources and the use of environmentally friendly, energy efficient technologies. In order for economic growth to be inclusive and sustainable, a balance of development between rural and urban areas is maintained. In rural areas, as well as in urban ones, educational institutions, medical institutions, cultural centers, important utility and development services, which are important elements of modern socio-economic infrastructure, are created on the basis of digital technologies. All these significantly reduce the difference in living standards between urban and rural areas. During rural planning and population settlement, the region's current and potential role in the economic value chain is taken into account. Acceleration of globalization processes and increase in the frequency of financial crises increase attention to ensuring macroeconomic and financial stability. Macroeconomic stability and sustainability are the main conditions for sustainable economic growth in the long term. Low and stable inflation, a sustainable exchange rate, as well as the stability of all segments of the financial sector determine domestic and foreign investment activity. Competition for attracting global direct investment is intensifying. These investments require the existence of a healthy and transparent business environment, macroeconomic stability and financial stability. In the absence of the mentioned conditions, the flow of foreign direct investments that bring high technology and knowledge to the country may be hindered. Experience shows that foreign direct investment, which is the main driver of rapid development, can create high-quality human capital, along with sustainable new jobs in the country. The COVID-19 pandemic has made the health, food security and sustainable employment challenges urgent for the economies of countries around the world. As a result of the application of digital technologies to the healthcare system, flexible and contactless medical services are expanded and more people have affordable access to healthcare services. Prevention of infectious diseases is not possible only through a strong health system and preventive measures. At the same time, it is important for people to have a healthy and adequate diet and to form the required immunity based on this. Countries create strategic food reserves for the long term both to solve the problems in food supply and to be insured against high price fluctuations in food prices.

Changes in the economy also affect the labor market, and mainly, the emergence of new specialties and the decrease in demand for a number of specialties require adequate measures to be taken in the field of population employment. The application of digital technologies and the prospects for the development of low-contact economic sectors increase the demand for human resources with high knowledge and skills. There are two strategic lines to meet these needs. The first strategic line is the formation of a new content of education that meets the needs of the modern economy. The second strategic line is the creation of lifelong learning opportunities for the requalification of existing human resources. Parallel implementation of both strategic lines is beneficial for economic diversification and rapid digitalization.

Promotion of intellectual activities results, innovation and creativity in leading economic sectors is expanding. Promotion of intellectual activities results, innovation and creativity play an important role in the continuous growth of intangible capital in the value chain based on intellectual property and in the form of technology, design and brands is a significant factor. For this reason, the development of a creative economy dominated by intellectual property should be supported, cooperation should be established between creative and modern digital technology experts, and the quality of professional training should be improved.

The main success in supporting prosperity in the economies of the world countries is to ensure a balance between the high-income population group and the poor population group. In the acquisition and distribution of income, preference should be given not to the principle of "earning income based on access to high productivity", but to the principle of "increasing productivity for all - creating equal access to work or entrepreneurial opportunities". This balance should always be realized through the socio-economic development and regulatory function of the state.

Sustainable employment serves to ensure the well-being of citizens and optimize the social burden of the state. The emergence of competitive value chains and increasing the level of education of the population support the establishment of sustainable jobs in the global economy. Domestic production and services will be integrated into the global value chain by attracting foreign investments and applying digital technologies. This will serve to emergence of competitive and sustainable employment opportunities, thus improving the well-being of citizens. The effective reintegration of the liberated territories into the socio-economic system is ensured in Azerbaijan. For the purpose of achieving this strategic goal, it is necessary to carry out reconstruction works in these territories in a phased manner, with prioritization, by considering efficiency conditions and based on modern experience, to create modern social and business infrastructure with the wide application of digital technologies, and to ensure sustainable settlement of the population based on this. The mentioned works are being implemented within the framework of international cooperation based on modern experience and approaches. Full utilization of the existing economic potential of the liberated territories, especially regional transport and communication projects to be implemented through the Zangazur corridor, creates broad opportunities for continuous and sustainable development.

1.1.5. CLIMATE PROFILE

Azerbaijan is located in the area of temperate and subtropical climate zones intersection. Climate-forming factors include solar radiation and atmospheric circulation. Along with these, geographical latitude, relief features, sea and ocean currents, and other factors also have a great influence on climate formation and determine the distribution of the elements of the climate zone such as temperature, humidity, wind, etc. Most of the territory of Azerbaijan is located in the subtropical climate zone, only the northeast of the Greater Caucasus mountains is in the temperate climate zone.

The Greater Caucasus mountains block cold air masses coming from the north, and the Lesser Caucasus mountains block warm dry tropical air flows coming from the south, weakening their effect. The Caspian Sea has a moderating effect on the climate. The average annual temperature in the Kura-Araz area is 14.5°C, and is below 0°C in the highlands.

The absolute maximum temperature in Nakhchivan (Julfa) is +46°C, and the absolute minimum temperature in Nakhchivan (Julfa) is −32°C. The annual temperature amplitude in Nakhchivan is more than 60°C (sharp continental climate type). In the Kura-Araz and Lankaran lowlands, in Absheron, the average annual temperature is +14.5°C, so it is possible to plant heat-loving plants here and harvest twice a year. However, artificial irrigation is needed since precipitation in these areas falls in the cold period of the year. Atmospheric precipitation in the Republic of Azerbaijan is mainly due to the intrusion of air masses into the territory. The amount, season and annual distribution of precipitation are determined by the terrain relief and the interaction of air masses with the Caspian Sea. The lowest average annual precipitation in Azerbaijan (less than 150–200 mm) falls on the southeastern Gobustan and the southern coast of the Absheron peninsula.

Annual precipitation in the central and eastern parts of the Kura-Araz lowland, the southeastern part of the Samur-Davachi lowland, the Araz region of the Nakhchivan Autonomous Republic, Gobustan and the main parts of the Absheron peninsula, is less than 300 mm. Their amount gradually increases from the Caspian Sea coast to the west, from the plains to the mountains.

In the mountains, precipitation increases up to a certain height (2600–2800 m in the Greater and Lesser Caucasus, 2600–3000 m in the Nakhchivan Autonomous Republic, up to 200–600 m in the Talysh), and then gradually decreases. Maximum annual precipitation in these areas is 1,400–1,600 mm on the southern slope of the Greater Caucasus, 800 mm on the northeastern slope, 800–900 mm in the Lesser Caucasus and Nakhchivan Autonomous Republic, and 1,700–1,800 mm in the Talysh mountains.

Unlike other mountainous areas of the Republic, the amount of precipitation in the Talysh mountains decreases with increasing altitude, and in the high mountainous part (above 2000 m) and in the intermountain valleys its amount is less than 250–300 mm. Despite the fact that the major part of precipitation falls on the warm period of the year (April-October), the summer months are dry, and even in the Lankaran-Astara zone, which is characterized by abundant precipitation, the amount of precipitation is 5–15% of the annual norm.

1.1.6. CLIMATE CHANGE AND GREEN DEVELOPMENT

Inclusion of the item "Clean environment and "green growth" country" into the list of national priorities demonstrates the country's desire to contribute to the implementation of Paris Agreement commitments and to mitigating the effects of climate change in general.

The “Socio-economic Development Strategy of the Republic of Azerbaijan for 2022-2026”, developed based on these priorities, envisages ensuring sustainable use of natural resources, promoting environmentally friendly industrialization, developing an effective waste management system for this purpose, protecting biodiversity, increasing water bioresources and developing aquaculture, as well as strengthening the protection of forested areas and greenery. As a result, the share of greenery in the total area of the country will be increased from 12% to 12.3% by 2026. The share of unusable land will decrease from 25% to 15%. The population's drinking water supply will increase from 70% to 85%, and irrigation water supply – from 80% to 90%. The coverage of the waste recycling process will be 20% (10% in the regions). The ratio of total area of the specially protected natural territories network to the total land fund of the country will be 10.5%. 65% of the forest fund will be inventoried. Agrochemical analyzes will be provided on 30% of the lands.

The regulatory environment in the energy sector will be improved and liberal market principles will be applied. The use of renewable energy sources will be increased, energy efficiency will be ensured. The use of environmentally friendly vehicles and other green technologies will be expanded to combat climate change. As a result, the financial burden of the state in the energy sector will be reduced and subsidies will be phased out. The share of renewable energy sources in the installed capacity of electricity generation will be increased to 24% by 2026 (in accordance with the target of 30% by 2030).

The afore-mentioned "Socio-economic Development Strategy of the Republic of Azerbaijan for 2022-2026" document specifically indicates a number of areas of activity consistent with the Paris Agreement, including the expansion of the use of green technologies to combat climate change. These areas of activity include the following:

- Inventory of greenhouse gases and development of a Monitoring-measurement, Reporting and Verification (MRV) system
- Creation of a National Database on Climate Change
- Development of “State Program on Low-Carbon Development”
- Development of National Adaptation Plan for sectors more vulnerable to the impacts of climate change
- Development of National Plan on Electromobility
- Stimulation of circulation of environmentally friendly and safe vehicles (cars, buses, etc.) and creation of necessary infrastructure
- Studying the potential in the field of hydrogen production and use, and formulation of proposals for pilot projects in this field
- Research on the application of energy storage systems and making proposals
- Research on the application of carbon capture, utilization and storage (CCUS) technologies in the energy sector and making proposals.

The action plan of this Strategy also includes energy efficiency, obtaining energy from waste, increasing green areas, and expanding the use of renewable energy sources.

The Republic of Azerbaijan, as a developing country, recognizes that climate change is a potential threat to all humanity, that neither developed nor developing countries are immune from climate change, and considering it important to take measures to prevent this global threat, has implemented a number of important measures in this direction. In this regard, it is of utmost importance to define how the two critical elements of the PA - Nationally Determined Contributions (NDCs) and Low-Carbon Long-Term Development Strategies (LCDSs) - are interconnected, and to effectively allocate resources to develop measures aimed at reducing (mitigation) impacts on the climate system.

The NDC targets a 35% reduction in GHG emissions by 2030 compared to 1990. The targets of the LCDSs under development are set for 2050.

For the purpose of ensuring the implementation of the Order of the President of the Republic of Azerbaijan dated May 3, 2021, the “Action Plan for the Creation of a “Green Energy” Zone in the Liberated Territories of the Republic of Azerbaijan in 2022-2026” was approved by the order of the Cabinet of Ministers, and the Ministry of Energy of the Republic of Azerbaijan was entrusted with the coordination function over this Action Plan. In addition, a “Carbon Neutrality Concept for the Liberated Territories” document was developed with the involvement of an international consulting company.

Green agenda of the country is being supported by the Heydar Aliyev Foundation, established in 2004, which has played a pivotal role in advancing Azerbaijan’s social, cultural, and environmental agenda. The Foundation is dedicated to promoting sustainable development and supporting initiatives that align with Azerbaijan’s national priorities, including environmental preservation and climate resilience.

As part of its mission, the Heydar Aliyev Foundation has championed several initiatives aimed at fostering environmental awareness and promoting sustainable development across Azerbaijan. These efforts are closely aligned with Azerbaijan’s commitments under the United Nations Framework Convention on Climate Change (UNFCCC), as well as the country’s Nationally Determined Contributions (NDCs).

1.2. HOW NATIONAL CONDITIONS IMPACT GHG EMISSIONS AND ABSORPTIONS (REMOVALS) OVER TIME.

1.2.1. FACTORS INFLUENCING THE DYNAMICS OF GHG EMISSIONS AND ABSORPTIONS

After ratifying the UN Framework Convention on Climate Change (UNFCCC) in 1995, one of Azerbaijan's initial steps was to prepare an inventory report on GHG emissions, monitor the dynamics of these emissions, and study the reasons for their changes.

The inventory process of GHG emissions in the Republic of Azerbaijan effectively began in 1998, with the preparation of the First National Communication for the period 1998-2000. To date, the country has developed four National Communication documents and two Biennial Updated Reports.

Analyses indicate that the dynamics of GHG emissions in Azerbaijan since 1990 have been directly linked to national conditions and changes in various elements of the economy and environment. Since 1990, Azerbaijan has undergone a range of extensive economic and environmental changes.

Although progress has been made in some fields related to GHG emissions (such as enhancing energy efficiency and improving land management practices), certain challenges still persist in sectors like the oil and gas industry, transportation, and waste management.

Despite the implementation of several strategic projects aimed at green development in the country, dependence on oil and gas continues to shape the country's overall emissions profile.

On the other hand, population growth, which is one of the leading elements of national conditions, has been one of the key factors determining the trends of GHG emissions in the country. In 1990, the population was 7.1 million, while by 2022, the last inventory year of the reporting period, this figure had risen to 10.1 million. Naturally, the increase of the population by approximately 50% during the last 30 years has correspondingly raised the demand for energy resources. Besides, the growing population's demand for new jobs, food products, industrial and household goods, as well as housing and transportation, has been one of the main reasons for the increase in GHG emissions in the country during this period.

Azerbaijan's Second National Communication to the Secretariat of the Climate Change Convention provides information on GHG emissions from 1990 to 2005 (Figure 54).

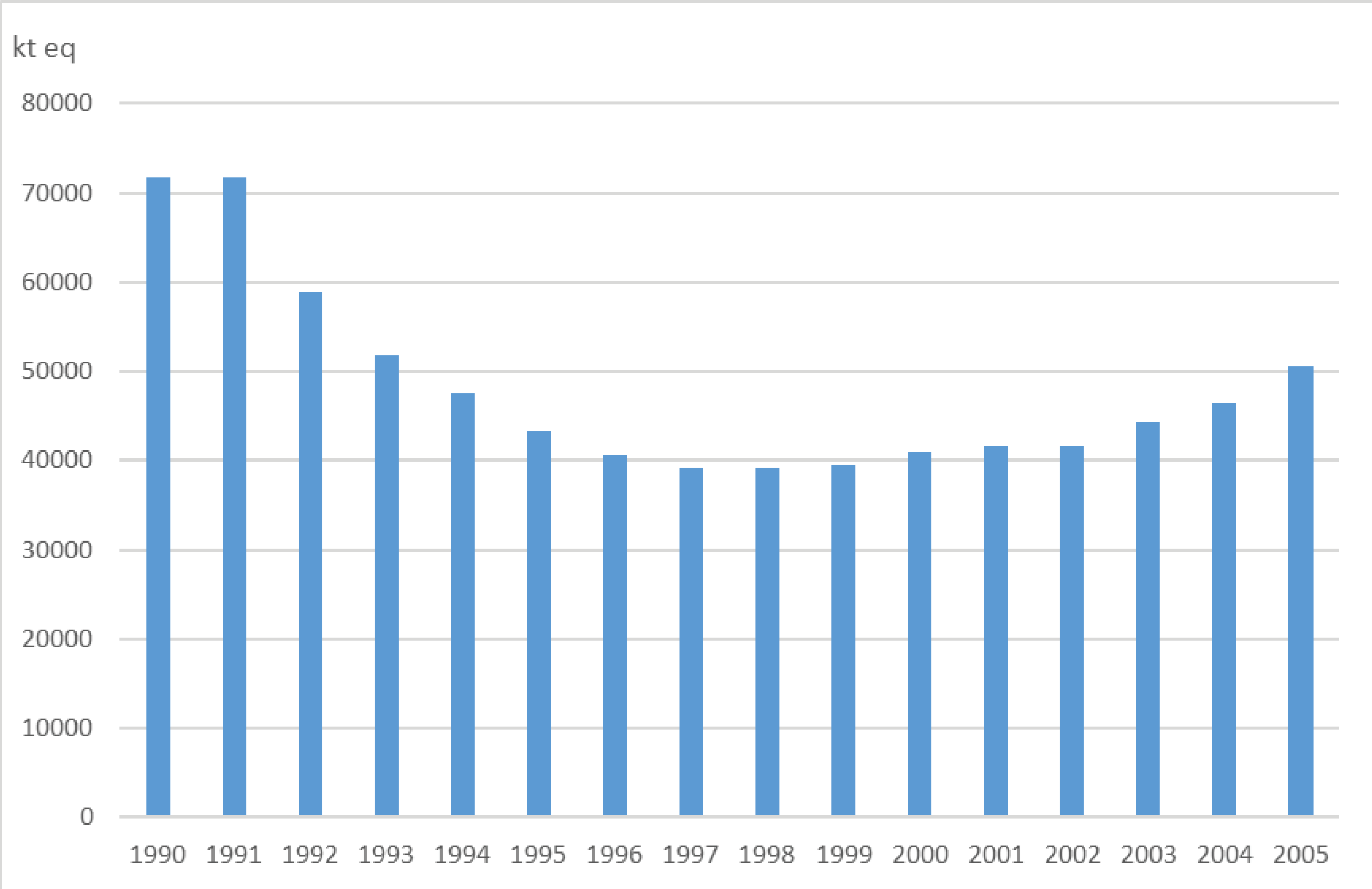


Figure 54. Total GHG emissions in Azerbaijan from 1990 to 2005.

As shown in the Figure, GHG emissions in Azerbaijan began to decline sharply starting in 1991. This decrease continued until 1998, when it reached its minimum level in that year, with a reduction of 45%. The decline was primarily attributed to the difficulties in the country's economic situation.

Thus, the sudden disruption of historically established economic ties among countries within the Soviet Union, stagnation in production, and the deepening of inflationary processes caused a sharp recession and led to a significant reduction in emissions.

The recession trend was particularly severe in the industry, resulting in the closure of many industrial sectors. 24 machine-building factories operating in the country, petrochemical enterprises in the city of Sumgayit, a large glass factory in Baku, and other facilities completely halted their operations.

In addition, the outbreak of war due to Armenia's aggression, the occupation of 20% of the territory, and the displacement of nearly one million people as refugees and internally displaced persons (IDPs) further exacerbated the situation. It is evident that the primary reasons for the sharp decline in GHG emissions in 1990-1998 were the disruption of economic ties resulting from the collapse of the Soviet Union and the aggression of Armenia. Despite the population growth in the country during said period, the amount of emissions decreased.

The Industry and construction category of the energy sector began to reduce its operations during the economic recession, i.e., in the 90s. Enterprises within this category eventually came to a complete halt. By the end of the 1990s, emissions in this category had decreased by 80%.

The "Contract of the Century," signed in 1994, breathed new life into the revival of the country. The recovery that began in the oil and gas industry spurred growth in other sectors as well. However, as Azerbaijan's economy rebounded in the 2000s due to increased oil and gas exports, emissions began to rise again, particularly in sectors like transportation and waste management.

In this report, the trends and dynamics of key categories from the base year 1990 to the most recent reporting year 2022 have been evaluated in line with time series.

After the situation improved in the country, the increased attention to the environmental situation facilitated the reduction of GHG emissions in this category. Several ecological projects were implemented during that time. Among them, the largest projects were the accumulation of associated gas from the "Gunashli" and "Oil Rocks" fields. With the implementation of these two projects, the annual gas accumulation reached 530 mln m^3.

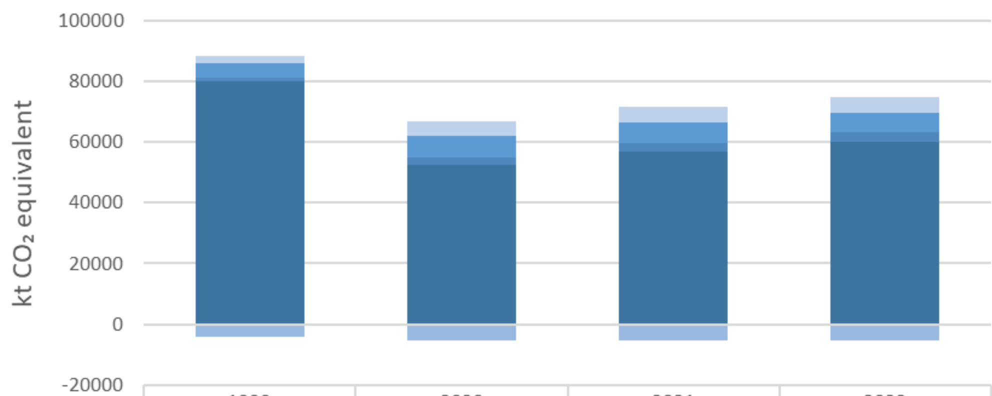
TPPs basically used liquid fuel oil such as mazut, while heating centers mainly relied on gas and, in exceptional cases, mazut. Starting in 2012, the country switched from mazut to gas, and as a result, there was a reduction of 8 million metric tons of CO_2 emissions annually. Already in 2022, the use of mazut dropped to 3%. However, the increase in population and industrial sectors has, in turn, raised the demand for electricity, which is one of the major factors contributing to the increase in emissions at present.

In the transportation category, emissions from aviation, road transport, and railways increased in 2022 compared to 1990. However, emissions from maritime (waterborne) transport decreased. This can be attributed to the fact that most ships in maritime transport have switched from using mazut fuel to diesel fuel.

Most of the GHG emissions in the other sectors, such as the commercial/institutional, population, and fishing industry categories, were lower than the base year. However, emissions in the population category have increased by about 57% compared to the base year. This is explained by the higher energy demand due to population growth and the improvement of their living conditions.

In the key category of industrial processes and product use sector, emissions substantially increased during the reporting period due to the rising utilization of mineral raw materials. Nevertheless, the transition of cement plants from the wet method to the dry method, namely, the implementation of new technologies, has helped to prevent further increases in emissions.

The increase in livestock during the post-Soviet period in Azerbaijan indicates a focus on agriculture, as categories such as enteric fermentation and manure management have significant emissions. One of the main reasons for the increase in agricultural emissions has been the growing demand for food products due to population growth. However, the results of the GHG inventory conducted within the framework of the current report indicate a gradual decrease in emissions from the agricultural sector since 2020.
The re-inventory process for the current report was conducted for the year 1990, while a new inventory was carried out for the years 2020-2022. The results of the inventory are presented in the Figure below.



	1990	2020	2021	2022
Waste	2759.53	4909.23	5178.94	4895.66
LULUCF	-3999.89	-5478.9	-5306.46	-5432.19
Agriculture	4523	7191.22	6899.52	6717.16
IPPU	1160	2443	2693	2865
Energy	80158	52462.44	56980.58	60226.75

Figure 55. GHG emissions by sectors

The amount of GHG emissions in 1990 was 84,600 kt CO_2 equivalent, while in 2022 it was 69,498.88 kt CO_2 equivalent, resulting in a 17.5% decrease in GHG emissions over this period. Despite the increased demand for natural resources due to population growth, the significant reduction in emissions in the country can primarily be attributed to an 24.86% decrease in the Energy sector.

The LULUCF sector in Azerbaijan has historically been recognized as a carbon sink sector, with forests playing a significant role in carbon sequestration. The increase in emissions due to the reduction of carbon dioxide absorption in grasslands and croplands is associated with the conversion of grasslands into croplands and residential areas, the development of livestock farms, and the rising number of cattle grazing in pasture lands.

Emissions have significantly increased due to rising activities in the IPPU, Agriculture and Waste sectors. While emissions in the Energy sector decreased in 2022 compared to 1990, it remains the largest contributor to the country's total annual emissions. Although the country has made progress in reducing emissions, particularly in the energy sector, it is crucial to maintain consistent attention to reducing emissions in the growing sectors.

1.2.2.1. IMPACTS ON EMISSIONS IN THE ENERGY SECTOR

In the energy sector, GHG emissions were 80.158 kt. CO_2 equivalent in 1990, whereas they decreased to 60,226.75 kt CO_2 equivalent in 2022, representing a 24.86% reduction. The reduction of emissions occurred despite population growth, primarily due to the widespread adoption of energy-efficient technologies and the transition from using mazut to natural gas in the country. The results of the analyses indicate that without these measures, GHG emissions from the sector would not have decreased by 24.86% but would have instead increased.

The reduction in emissions in the sector can also be linked to the collapse of the Soviet Union, as the country moved away from energy-intensive technologies and the use of coal and oil for electricity generation. The subsequent recovery of the economy, along with reforms in the energy sector, particularly led to improved energy efficiency in energy production. This also played a crucial role in the reduction of emissions, with investments in natural gas infrastructure.

1.2.2.1.1. IMPACTS ON EMISSIONS IN FUEL COMBUSTION ACTIVITIES (1.A)

As the economy distanced itself from the inefficient, high-energy-intensive infrastructure inherited from the Soviet era, emissions from the energy industry, particularly from public electricity and heat generation, have decreased by 27% in fuel combustion activities (1.A). The restructuring of industry and modernization of industrial infrastructure during the post-Soviet period also contributed to the reduction of emissions from fuel combustion. Besides, government-initiated energy efficiency programs have helped to reduce the carbon intensity of energy use in industry and commerce.

However, since the early 2000s, emissions have been rising steadily due to population growth, economic expansion, and high demand for energy products, particularly in the transportation and residential sectors.

In another category of the sector, Manufacturing Industries and Construction (1.A.2), a reduction of 81% was observed in 2022 compared to 1990. This is primarily reflective of the decline of heavy industries from the Soviet era, particularly energy-intensive industries such as steel production and similar sectors. Many of these industries have not been fully restored, and switching to a more service-oriented economy has limited energy demand in this sector, contributing to the reduction of GHG emissions.

1.2.2.1.2. IMPACTS OF FUGITIVE EMISSIONS FROM OIL AND GAS EXTRACTION (NATURAL GAS ACTIVITIES) (1.B)

Emissions from this category remain high, although certain reductions were achieved in recent years due to improved management practices and technological improvements. The oil and gas sector continues to dominate emissions within the country, primarily due to high fugitive emissions resulting from oil and gas extraction. However, improvements in leak detection and repair (LDAR) systems, especially due to foreign investments in Azerbaijan's energy infrastructure, have helped to conduct a more reliable monitoring of emissions. A reduction of up to 1% has been observed in the category compared to 1990.

1.2.2.2. IMPACTS ON EMISSIONS IN THE INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU) SECTOR

In Azerbaijan, the IPPU sector has exhibited various trends in emissions over time, closely linked to the country's industrial activities. With the development of infrastructure and urbanization, emissions from the mineral industry, particularly cement production, have consistently increased. Fluctuations in emissions have also been observed in the chemical industry and metal production sectors, including iron, steel, and aluminum. While emissions from some industrial sectors have remained relatively stable, the overall trend, particularly the rise in emissions from petrochemical production, draws attention. Economic changes such as the expansion of the manufacturing industry and construction sectors, along with the recovery of the industry after the post-Soviet era, have contributed to the increase in industrial emissions. Despite several modernization measures within the sector, the IPPU continues to make a significant contribution to the total emissions of Azerbaijan. This is evidenced by a 147% increase in emissions from the sector from 1990 to 2022.

Analyses show that Azerbaijan's industrial sector has expanded significantly over the past twenty years, primarily due to construction materials such as petrochemical and cement products. The development of Baku as a modern city and the improvement of the infrastructure along the Caspian Sea and other large-scale urbanization projects have significantly boosted the demand for such materials. The substantial increase in cement production associated with the construction boom has also significantly contributed to the rise in emissions generated by the sector. The 348% increase in the mineral resources industry from 1990 to 2022 is clear evidence of these effects.

In the Chemical Industry (2.B) category of the IPPU sector, a 269% increase in emissions has been observed from 1990 to 2022 throughout the reporting period. This growth in the petrochemical industry, both for export and domestic consumption, has been a driving force behind the increase in emissions.

One potential source for reducing emissions in this sector will be the phase-out of ozone-depleting substances (ODS). So, according to the decisions of the Montreal Protocol, ODS shall be completely phased out by 2030. The phasing-out of these substances in Azerbaijan will significantly impact the reduction of GHG emissions from this sector.

1.2.2.3. IMPACTS ON EMISSIONS IN THE AGRICULTURE SECTOR

In Azerbaijan's agriculture sector, in the time series of the reporting period, there has been observed a notable increase in emissions, primarily related to the growth in livestock, especially a rise in the number of cattle. The increase in emissions resulting from enteric fermentation and manure management is a direct consequence of the expansion of livestock production.

The expansion of livestock farming, in turn, reflects a greater focus on increasing agricultural output to ensure food security for the growing population and support rural economies. It is worth noting that a significant portion of livestock products is imported to meet the country's domestic demand. Additionally, waste from agricultural lands has increased mainly due to the intensification of farming practices and the use of fertilizers.

Overall, the emission trends in the sector highlight the impact of increasing agricultural activities following economic changes and modernization efforts in rural areas after the collapse of the Soviet Union. As a crucial component of Azerbaijan's economy, agriculture continues to contribute significantly to national emissions. An increase of 189% was recorded in the amount of emissions from the sector in 2022 compared to 1990. The main part (majority) of this increase falls in the livestock category (51%). Interestingly, during the period from 2020 to 2022, the increase in GHG emissions in the livestock category was replaced by a decrease.

1.2.2.4. IMPACTS ON EMISSIONS AND REMOVALS IN THE LAND USE, LAND USE CHANGE, AND FORESTRY (LULUCF) SECTOR

In the LULUCF sector, there has been a 35.8% increase in carbon sequestration. Currently, carbon sequestration in Azerbaijan's LULUCF sector is primarily influenced by forests and agricultural lands, which play an important role in carbon capture. Changes in the amount of carbon sequestered in forest areas are linked to afforestation, reforestation, and sanitary-cleaning activities conducted in different years.

The increase in carbon sequestration from croplands is associated with the expansion of cropland areas and the implementation of new technologies in land management. However, a decrease in carbon sequestration has been observed in some lands. Examples of this include fallow lands and perennial crops. This decrease is related to land use changes.

From 1990 to 2022, carbon emissions from grasslands exceeded carbon sequestration. Nonetheless, in 2022, emissions from these lands decreased by 71% compared to 1990. Overall, the emissions in pastures are primarily due to soil degradation caused by overgrazing and the conversion of pastures for agricultural and residential land use.

1.2.2.5. IMPACTS ON EMISSIONS IN THE WASTE SECTOR

In Azerbaijan's waste sector, a significant increase in emissions (77%) has been observed from 1990 to 2022, and this rise is primarily due to population growth and urbanization, which have intensified pressure on solid waste disposal and wastewater treatment fields.

Achievements in the field of waste management in Baku have positively impacted the reduction of emissions from the sector. However, problems related to waste management in the country’s regions, including other major cities, are contributing to the increase in emissions from this sector.

Both managed and unmanaged waste disposal sites are major contributors to emissions, with municipal wastewater being a source of CH_4 and N_2O. To mitigate the environmental impacts of waste, there is a need for improved management systems and sustainable treatment solutions.

1.3. INSTITUTIONAL ARRANGEMENTS

According to Article 4 of the Paris Agreement and in accordance with paragraph 61 of the MPG, each country's latest biennial transparency report shall reflect the existing institutional measures to monitor progress made in the implementation of its NDC, including monitoring of transmitted support for mitigation at the international level, including any changes in institutional measures.

After the adoption of the Paris Agreement in December 2015, countries began to implement their climate obligations, or “nationally defined contributions” (NDC). However, while many developing countries do not have the tools to measure, report, and verify progress on climate commitments and activities, there is no significant barrier in Azerbaijan to measuring or verifying this progress.

The data includes procedures and guidelines that allow monitoring of NDC progress, particularly through GHG emission accounting, quantification, and disclosure, that allow to determine impact mitigation measures in different sectors and how those sectors behave in relation to GHG emissions reduction targets. These indicators are also a valuable tool to help better understand the emission profile in the country and are the basis for structuring public policy at the national level.

After ratifying the UN Framework Convention on Climate Change in 1995 and the Kyoto Protocol in 2000, the Republic of Azerbaijan joined international efforts to mitigate the negative effects of global climate change. As a party that is not a part of Annex I of the Convention, it undertook obligations before the convention to prepare, regularly update the cadastre of anthropogenic emissions and absorbers of GHG emissions, prepare national information, educate the public, and submit this information to the Conference of the parties to the Convention, and these obligations are systematically fulfilled.

A number of institutional measures have been taken to coordinate the work carried out in this direction and conduct it in a more planned manner. Thus, by the decree of the President of the Republic of Azerbaijan dated April 30, 1997, the State Commission on Climate Change was established in Azerbaijan in order to ensure coordination of the implementation of obligations under the UN Framework Convention on Climate Change. By the decree of the President of the Republic of Azerbaijan dated April 1, 2005, the Ministry of Ecology and Natural Resources established in Azerbaijan the national competent authority on the Clean Development Mechanism of the Kyoto Protocol of the UN Framework Convention on Climate Change.

Although Azerbaijan, as a member country not included in the Annex I group of the Convention, has not taken quantitative obligations under the Kyoto Protocol to reduce gases that create a heat effect, a number of measures have been implemented in the country to mitigate the effects of climate change.

Examples of these are the expansion of the use of renewable energy sources, increasing energy efficiency through the use of more efficient technologies in the energy sector, afforestation of new areas, the use of gas instead of fuel oil in thermal power plants, improving the management of household waste, etc.

Azerbaijan, as a country with a developing economy, recognizes that climate change is a potential threat to all mankind.

Azerbaijan considers it expedient to base the fulfillment of obligations under the Paris Agreement on the principles of fairness and mutual respect and, at the same time, the correspondence of mitigation obligations to the main principles of the Convention, in particular, the principle of common but different responsibility and accountability, as well as the correspondence of countries to the existing potential and capabilities of countries, and that developed countries should play a leading role in this matter and support developing countries.

As an independent state, the Republic of Azerbaijan has already defined its national development priorities and strategies and has adopted the issue of environmental protection as one of the main priority issues.

Implementation of mitigation activities in order to keep the global temperature increase below 1.5 or 2°C is of special importance for Azerbaijan, and a number of projects have been implemented in this direction, are being implemented, and are being planned in various sectors of the economy.

The Nationally Determined Contributions developed by countries under the Paris Agreement are intended as the main implementation tool for the post-2020 period to achieve the long-term goals of the Paris Agreement. In this context, NDCs serve as a key roadmap to identify and strengthen countries' efforts and contributions to combat climate change, including adaptation linkages.

Azerbaijan signed the Paris Agreement on April 22, 2016 to join and contribute to global climate efforts and ratified it on January 9, 2017. The contract entered into force on February 8, 2017. In its NDC, Azerbaijan has aimed to reduce greenhouse gas emissions by 35% by 2030 compared to the 1990 reference year as a contribution to global climate change mitigation initiatives.

The Ministry of Ecology and Natural Resources is the state body that performs the coordinating function in the field of institutional regulation related to emissions management and climate change in Azerbaijan.
Ministry of Economy, Ministry of Emergency Situations, Ministry of Energy, Ministry of Agriculture, Ministry of Health, Ministry of Digital Development and Transport, Ministry of Finance, Ministry of Science and Education, State Urban Planning and Architecture Committee, State Statistics Committee, Azerbaijan State Water Resources Agency, Azerbaijan National Sciences Academy, SOCAR, "Azerenergy" OJSC, "Azerishig" OJSC, "Azeristiliktechizat" OJSC, "Tamiz Sheher" OJSC, local executive authorities, including municipalities, implement measures in this field. The afore-mentioned institutions operate within the authorities established by the legislation according to their statutes.

There is a coordination mechanism in the country where relevant stakeholders are represented in relation to climate change. Recently, based on international experience, noticeable structural changes have been made in all fields of activity of the country. Therefore, on March 11, 2020, the President of the Republic of Azerbaijan made changes and additions to the composition of the State Commission and approved the new structure of the Commission as follows:

Chairman of the State Commission-Deputy Prime Minister of the Republic of Azerbaijan
Deputy Chairman of the State Commission-Minister of Ecology and Natural Resources of the Republic of Azerbaijan
Members of the State Commission
Minister of Finance of the Republic of Azerbaijan
Minister of Economy of the Republic of Azerbaijan
Minister of Agriculture of the Republic of Azerbaijan
Minister of Health of the Republic of Azerbaijan
Minister of Science and Education of the Republic of Azerbaijan
Deputy Minister of Foreign Affairs of the Republic of Azerbaijan
Deputy Minister of Digital Development and Transport of the Republic of Azerbaijan
Deputy Minister of Energy of the Republic of Azerbaijan
Deputy Minister of Emergency Situations of the Republic of Azerbaijan
Chairman of Azerbaijan State Water Resources Agency
First Deputy Chairman of the State Urban Planning and Architecture Committee of the Republic of Azerbaijan
Deputy Chairman of the State Statistics Committee of the Republic of Azerbaijan
President of the State Oil Company of the Republic of Azerbaijan
President of "Azerenergy" Open Joint Stock Company

The Commission carries out interministerial coordination in accordance with its authorities and activity directions by managing works done and planned in the field of climate change.

The Ministry of Ecology and Natural Resources (MENR) of the Republic of Azerbaijan has been appointed as the coordinating state structure for MRV in the field of climate change. All issues related to climate change are dealt with in relation to MENR. Projects planned to be implemented in the field of climate are monitored, evaluated, and submitted to the State Commission on Climate Change by MENR. After consideration by the Commission, a relevant decision is made.

A number of activity directions that are in line with the Paris Agreement have been specified in the "Socio-economic Development Strategy of the Republic of Azerbaijan in 2022-2026." Among other things, one of the priority activities in the action plan of the strategy is "Inventory of gases that create heating effect and development of monitoring, measurement, reporting, and verification (MRV) systems." In the strategy, MENR is the main executive organization for this activity, and the Ministry of Economy, Ministry of Ecology, MA, MDDT, SOCAR, "Azerenergy," OJSC, and ANAS are specified as other auxiliary executive organizations. Implementation of the activity is planned for 2022-2026. In the action plan, the preparation of institutional proposals for the creation of the MRV system for 2023-2025 as an intermediate result of the activity and the creation of an institutional base based on the modern experience of the MRV system as a final result are planned for 2026.

In connection with the implementation of this activity direction, the State Commission on Climate Change analyzed the possible ways of improving the cooperation of MENR with other stakeholders. As a result of the analysis, it was decided that maintaining the inter-ministerial format (currently, the Commission) is the most suitable option, while at the same time it was recommended that the mandate to assume the supervisory role and provide leadership for all climate change activities, including MRV activities, be kept in the State Commission on Climate Change.

After extensive discussions with stakeholders, a preliminary draft of the proposed Institutional Framework was developed.

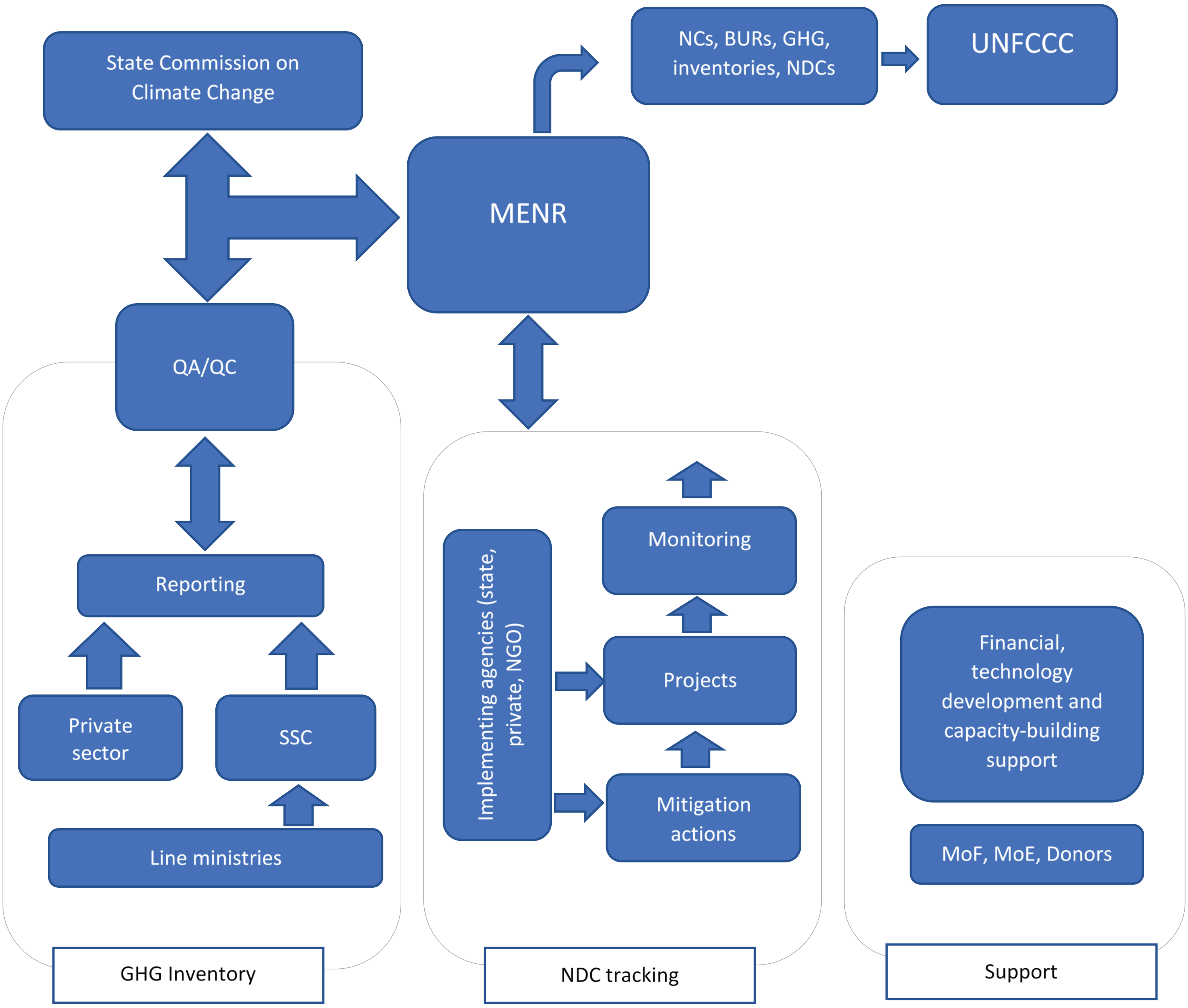


Figure 56. Proposed Institutional Framework on MRV in Azerbaijan

The MRV system for climate change mitigation involves not only the Azerbaijan government's current vision for the design and implementation of MRV but also the country's NDC targets to be tracked and implemented in a way that allows for the requirements of the Enhanced Transparency Framework.

MENR is proposed to be the coordinating body of the MRV system. The coordinating body is responsible for all coordination activities for the MRV system, in addition to compiling the inventory of all reports (e.g., BUR, NC, BTR) required under the UNFCCC. The main activities envisaged for the coordinating body include:

- Establishment of 3 additional units under the Commission in connection with the implementation of the perfect MRV system in the country in the initial project: GHG inventory, mitigation, and support.
- Appointment of an official responsible for quality control of data and reports received from various agencies to ensure quality control in each of these three units.
- The proposed role of the GHG inventory unit is to coordinate the development of GHG inventory and be responsible for collecting data from data providers to compile the inventory. The main task of this unit is the development of inventory reports.
- The role of the mitigation unit is to analyze the progress of activities and data collected by the various institutions implementing the estimated mitigation measures, as well as to develop mitigation reports.
- The proposed role of the support unit is to collect information on climate financing or other support. For instance, compiling information on technology transfer or capacity-building projects from the Ministry of Finance and other stakeholders and providing required reporting (including the support chapter under the BTR or new reporting requirements under the Paris Agreement) are envisaged as key activities.

It should be noted that most of the climate activities financed from the state budget (afforestation, various REDD+ activities, household waste management, use of renewable energy sources, various energy efficiency measures, etc.) are not envisaged as climate activities in the budget. In this regard, prioritizing mitigation and other climate activities in the budget under a single climate financing category is currently being discussed in the Commission. The Commission is also recommended to consider the creation of a separate unit on adaptation from a long-term perspective, since the development of an adaptation report in the Enhanced Transparency Framework may become a requirement in the future under the Paris Agreement.

The following main roles and responsibilities are proposed for the Commission:

- General management and control over climate activities;
- Formulation of strategies and activities that promote the implementation of mitigation and adaptation measures;
- Specifying roles and responsibilities of institutions.

At the same time, the reporting requirements for expanding the MRV system and future activities under the Paris Agreement were defined:

- Approval of sectoral action plans to be prepared by relevant ministries related to climate change;
- Elimination of obstacles encountered during the collection and management of information related to climate changes;
- Accepting climate financing as a separate priority in the budget for climate change adaptation and mitigation projects;
- Prioritizing and approving projects submitted for financing (e.g., GEF or GCF);
- Discussing and approving any updates to the NDC.

The State Commission on Climate Change organizes discussions on the MRV, GHG cadastre, BTR, NDC, and other draft reports to the UNFCCC with the relevant ministries and ensures decision-making.

The role of the coordinating body is important in the sustainable development of the MRV system. It is extremely important to determine and implement a number of measures necessary for the further development of MENR in the short and long term. The development of specific templates, methodologies, and standards is essential for a functional MRV system and requires specific technical expertise. In the long term, the role and responsibilities of the MENR should be expanded so that the MENR can develop its capacity to deal with the challenges and tasks related to the implementation of the Paris Agreement and its Enhanced Transparency Framework.

There are international financial opportunities to ensure the activities of the coordinating institution. For example, improvements can be made by using GEF funds and the Capacity Building Initiative for Transparency to develop the MRV.

If the funding mechanism under the UNFCCC changes in the future, it may be necessary to identify additional/alternative funding sources for the proposed structure. In this case, consideration may be given to allocating additional funds to MENR for the implementation of MRV activities and the creation of proposed new units.

Acting as the deputy chairman of the State Commission on Climate Change, MENR coordinates all work, including mitigation measures. So, in order to receive assistance from QEF, GCF, and other financial organizations for all mitigation projects, the projects are registered in MENR. MENR conducts monitoring and environmental expertise of proposed projects related to UN executive bodies. If the project is interesting in terms of reducing GHG emissions, MENR applies to the relevant financial institution for support.

Environmental Policy related to climate changes, International Cooperation (the department includes the climate sector), Analysis and evaluation of ecological security activities and other departments, National Hydrometeorology Service, State Environmental Security Service, Forestry Development Service, regional offices, and other institutions operate under the MENR.

Other institutions related to climate change include the State Environmental Expertise Agency, "Azerbaijan Greening and Landscape Construction" Open Joint Stock Company ("Azyashlandshaft" OJSC).

The Ministry of Economy participates in the preparation of state programs for socio-economic development and state programs for the development of regions, focusing on issues related to environmental protection, climate change, investments in these areas, and their coordination. The Ministry of Economy monitors socio-economic projects as well as environmental projects. The main purpose of this monitoring is to assess the achievements in all sectors and summarize them at the country level. Information about the projects is collected through a special template. There is no specific indicator for collecting data on mitigation activities in this template. In this regard, there is a great need to develop and improve the MRV system. Currently, relevant measures are being implemented within the action plan of the "Socio-economic Development Strategy of the Republic of Azerbaijan in 2022-2026" adopted for the implementation of "Azerbaijan 2030: National Priorities for Socio-economic Development.".

The Republican Hygiene and Epidemiology Center, a sanitary-epidemiological service body under the Ministry of Health, monitors the country's environment and all its elements, including air quality, in order to protect the health of the population, especially in large cities. This Center participates in the development of reports in the field of environmental protection together with the relevant departments under MENR.

The Ministry studies how climate change affects human health, coordinates efforts in this area, disseminates knowledge and raises awareness, and offers advice and guidance on best practices in climate change management.

The Ministry of Emergency Situations establishes guidelines for the development and approval of safety reports for industrial and mining sites that may pose a threat. The responsibilities of the Ministry regarding the climate change issues are as follows:

- to ensure the organization and implementation of measures to eliminate the consequences of climate-related natural disasters (for example, floods, inundation, landslides, etc.).
- to coordinate and control the activities related to the collection, transportation, recycling, storage, and landfill of radioactive waste, including the construction, use, maintenance, and decommissioning of facilities working with radioactive waste, regardless of the ownership form;
- to carry out radioecological monitoring of the environment to ensure the radiation safety of the population and the territory;

The Ministry of Ecology and Natural Resources and the Ministry of Health are partners in the activities of the relevant institutions of the Ministry of Emergency Situations in the direction of environmental protection and elimination of ecological disasters.

The Ministry of Agriculture exercises the following authorities in relation to the mentioned field:

- within its authorities, to carry out effective agrotechnical, reclamation, phytosanitary, erosion control, and desertification prevention procedures in the field of restoration and protection of soil fertility, as well as protection of field protection forests;
- to reduce the negative effects of waste generated during agricultural production, especially in the field of animal husbandry, on the environment, atmosphere, and human health, and to adopt strategies for efficient use of these wastes;
- to work together with local organizations to identify gases that create a heat effect in livestock enterprises, farms, and storage areas of agricultural products, eliminate their negative effects, and prevent waste from posing a threat to the environment and human health.

The Ministry's Agricultural Services Agency oversees several organizations that conduct research on agriculture, erosion, irrigation, and plant protection. The Ministry has a department dealing with environmental issues.

The Ministry of Energy, among other authorities, carries out the following tasks in the field of prevention of waste, including waste released into the atmosphere:

- to develop action plans for ensuring energy efficiency and environmental safety in cooperation with relevant executive authorities and coordinate efforts towards increasing the energy use efficiency;
- to ensure the development and implementation of measures for the efficient use of natural resources, including energy resources, as well as measures to reduce gases that create a heat effect, in accordance with its authorities and in coordination with the relevant executive authorities;
- to monitor the activities of relevant field enterprises in accordance with civil, energy, and environmental legislation, to apply field standards in these industries, and to monitor their implementation.

There are relevant structural divisions dealing with environmental protection within the Ministry.

In addition to its other main duties, the Ministry of Digital Development and Transport has the following authorities regarding the protection of the environment, especially the atmosphere:

- to create a database of relevant technological, technical, economic, financial, social, ecological, and other information related to the transport, road, and communication complex;
- to control the planning and implementation of measures such as prevention of the discharge of pollutants into the environment, especially into the atmosphere, from transport and communication systems.

There are structural units dealing with environmental issues under the Ministry.

SOCAR develops and implements comprehensive measures to prevent environmental and atmospheric pollution of oil and gas production and processing enterprises, capture and use of GHGs in mines, clean up polluted areas and make them ecologically clean, and accelerate gasification works in order to reduce anthropogenic impacts on forests.

The company ensures that necessary measures are taken to prevent emissions to the environment and atmosphere during the transportation and export of oil and gas products from its oil and gas processing facilities.
The company also includes the Department of Ecology and the "Ekol" engineering service CJSC, which perform tasks related to the protection of the environment and atmosphere.

"Azerenergy" OJSC manages the minimization of pollutants discharged into the environment, especially during the operation of thermal power plants, and ensures the reduction of waste by using modern technologies. Both "Azerenerji" and its subordinate institutions have relevant structural divisions that deal with environmental problems.

Radiation Problems, Soil Science and Agrochemistry, Botany, Microbiology, Geography, and other institutes operate within the Ministry of Science and Education and the Azerbaijan National Academy of Sciences. These academic institutions conduct research in the areas of environmental protection, forestry, desertification, climate change, and land degradation.

District (city) Executive Power bodies exercise local state power in accordance with the administrative territorial division. They are responsible for environmental protection and climate change within their jurisdiction.

Municipalities develop and implement environmental protection initiatives within their jurisdiction and participate in the management of lands, forested areas, and public open green spaces under their control and use.

In their activities, civil society and non-governmental organizations pay special attention to the issues of environmental protection, including atmosphere protection, climate change, and sustainable management of natural resources. Currently, there are about 3,000 officially registered NGOs in the country. More than 80 of them focus on the environment and the use of natural resources and play an active role in the implementation of projects in these areas. They contribute to the collection of information on climate change, help to disseminate the results of the initiatives implemented, and raise awareness among local communities and those most vulnerable to it.

The mass media of the country constantly focus on the issues of environmental protection, climate change, waste management, and sustainable management of natural resources. There are periodicals specialized in the fields of environment and nature.

Measurement of the impact of mitigation and adaptation measures implemented in Azerbaijan is carried out by each relevant executive agency. State institutions, municipalities, NGOs, private institutions, or any other organizations and institutions that carry out mitigation activities can act as executors.

Establishing an internal carbon trading system and determining quotas for major emitting enterprises is also one of the important conditions for the fulfillment of GHG reduction obligations.

The draft Law of the Republic of Azerbaijan "On the Management of Greenhouse Gases Released into the Atmosphere," which defines the legal, economic, and organizational bases of relations on the application of the internal carbon trading mechanism based on international experience in order to reduce greenhouse gases caused by anthropogenic activity and regulates the relations arising in this area, has been developed, and currently domestic procedures for approval are about to be finalized.

The law will enable the definition of more precise norms in the relevant field, the creation of effective monitoring and control mechanisms, and the ability for issuers to carry out their activities within the framework of the principle of transparency. In the project, the state cadastre of greenhouse gases, carbon register, climate projects, and circulation of carbon units are regulated. The state cadastre of greenhouse gases and the carbon register statutes and the documents defining the criteria of climate projects and other related legislative acts were developed together with the law.

Relevant guidelines are developed for each of the sectors where mitigation measures are implemented to simplify measurement by executive institutions while maintaining transparency and accountability. Measurement is intended to be carried out in a simplified manner according to approved templates, guidelines, and standards.

2. DESCRIPTION OF NATIONALLY DETERMINED CONTRIBUTIONS UNDER ARTICLE 4 OF THE PARIS AGREEMENT (INCLUDING UPDATES)

The Paris Agreement of the United Nations Framework Convention on Climate Change is a legally binding international treaty on climate change. It was adopted by 196 countries at the 21st Conference of the Parties held in Paris on December 12, 2015.

The main goal of the Paris Agreement is to limit global warming to below 2°C compared to pre-industrial levels (1750) and, if possible, to limit the increase to 1.5°C.

To achieve these long-term temperature goals, countries aim to contribute to reducing global GHG emissions within their capabilities and to reach a carbon-neutral economy as soon as possible.

Unlike the Kyoto Protocol (under which only developed countries have commitments), the PA is the first international treaty on climate change to engage all countries in multilateral and ambitious efforts to combat climate change and adapt to its impacts.

The implementation of the goals of the PA requires unprecedented economic and social changes based on existing science on a global scale. It is designed for countries to commit to increasingly ambitious PA climate action in five-year cycles. By 2020, countries submitted their climate action plans known as Nationally Determined Contributions (NDCs) and are now in the process of presenting enhanced NDCs for the next five years. Countries outline measures to reduce greenhouse gas (GHG) emissions in their NDCs to achieve the goals of the PA, as well as provide information on adaptation measures to cope with the impacts of rising temperatures. In addition to NDCs that cover five-year cycles, the PA encourages countries to develop and present low-carbon development strategies (LCDS) to better frame their efforts towards long-term goals.

LCDS provide a long-term direction for NDCs. Unlike NDCs, they are not mandatory. However, they help countries define visions and directions for future development within the context of long-term planning and development priorities.

The Enhanced Transparency Framework (ETF) has been established under the Paris Agreement (PA) to monitor all these processes related to NDCs and for tracking progress on a global scale. Under this framework, starting in 2024, countries shall provide transparency reports on measures taken and progress made in reducing GHG emissions, adaptation, financing and other support mechanisms. The data collected through the ETF will facilitate the assessment of collective progress toward long-term climate goals and enable global inventories. This framework will also provide clarity for recommending more ambitious plans to countries in further stages. and monitor progress over time to achieve ambitious and realistic NDCs. For countries to achieve ambitious and realistic NDCs, it is crucial to assess their potential, raise awareness on climate strategy development and possess the capability to monitor progress over time. During the assessment of potential in the UNFCCC processes, the key focus is on national priorities, sectoral programs, institutional frameworks, standards, databases and access to them (their accessibility), mitigation activities, specific needs related to intersecting issues, access to climate finance, governance and coordination, gender responsiveness and other relevant elements.

As part of its contributions to global climate change mitigation initiatives, the Republic of Azerbaijan has set a target of reducing GHG emissions by 35% by 2030 compared to the 1990 baseline year in its Nationally Determined Contributions.

The Republic of Azerbaijan reaffirmed its commitment to combating climate change and solidarity with the most vulnerable countries by submitting its NDC document to the UN Framework Convention on Climate Change in 2015.

2.1. DESCRIPTION OF PLANNED CLIMATE CHANGE MITIGATION MEASURES IN THE NDC

In accordance with national conditions, Azerbaijan has undertaken obligations on GHG emissions in its NDC and on other sectors, except for the IPPU sector. Thus, since there was no information about globally competitive green technologies in cement and iron/steel production processes, which were the key categories of IPPU at that time, no commitments for this sector were determined and included in the country's NDC. It is important to note that the commitments made in the first NDC do not include specific quantitative targets for each sector and the commitment to reduce emissions by 35% by 2030 compared to the base year of 1990 is taken as an overall target for the country as a whole.

Meanwhile, in the period before 2015, when time limitations, resource constraints and uncertainties were still high, no specific adaptation measures were reported, even though the country stated in its NDC document that it had placed special emphasis on adaptation activities. Although the NDC does not provide quantitative commitments by sector, it clearly gives significant attention to the energy sector, which plays a crucial role in the country's emissions. Below are details of the commitments made in the country's NDC regarding GHG emissions and absorptions by sector.

2.1.1. ENERGY SECTOR

Improvement of legislative acts on energy, implementation of energy efficiency awareness activities and replacement of existing electricity and heat generation technologies with modern technologies, reconstruction of distribution networks and transmission lines, insulation works to prevent energy losses and the application of modern lighting solutions.

2.1.1.1. OIL AND GAS SECTOR

Implementation of new, modern eco-friendly technologies in oil and gas processing, with the goal of producing fuel compliant with Euro-5 standards at oil refineries by 2019 and raising awareness among employees in the oil and gas processing sector.

Reduction of losses in the gas distribution system by 2020 through modernization of gas pipelines and other measures, and adaptation of the reduction level to international standards by 2050;

Accumulation of gases released into the atmosphere and prevention of gas leaks in oil and gas processing and distribution networks in accordance with the strategy adopted during oil and gas extraction.

2.1.1.2. RESIDENTIAL AND COMMERCIAL SECTOR

Organization of education programs related to mass use of control and measurement devices in electrical and thermal energies, as well as natural gas systems used by the population, introduction of energy-efficient lamps, the use of modern energy-saving technologies in heating systems and raising public awareness of energy use.

2.1.1.3. USE OF ALTERNATIVE AND RENEWABLE ENERGY SOURCES

The development and implementation of technical normative legal documents regarding the use of alternative and renewable energy sources, accelerating provision of the population's heat supply systems with renewable energy, expanding the use of innovative technologies and constructing small hydropower plants on small rivers, irrigation canals and water bodies of the Republic of Azerbaijan, as well as the use of biomass, solar, electricity and thermal energy, wind energy, heat pumps and geothermal energy in all sectors of the economy based on the assessments conducted.

2.1.1.4. TRANSPORT SECTOR

The introduction of environmentally friendly modes of transportation, the expansion of the use of electric modes of transport in passenger transportation, electrification of railway lines and switching to alternating current traction systems, improvement of the intelligent transport management systems and expansion of their scope, the development of metro systems and increasing the number of stations, as well as the construction of underground and above-ground pedestrian crossings to alleviate traffic jams.

2.1.2. AGRICULTURE SECTOR

Collection of methane gas generated from livestock and poultry farm manure and utilization of renewable energy and application of modern technologies.

2.1.3. LULUCF SECTOR

The establishment of new forest massifs, water and soil-protective forest belts, urban and roadside greenery, as well as further improvement of agricultural land and pasture management.

2.1.4. WASTE SECTOR

Development of modern methods of solid municipal waste management in big cities of the country.

2.2. UPDATES TO NATIONALLY DETERMINED CONTRIBUTIONS

In 2023, Azerbaijan updated its commitments under the NDCs and submitted its next NDC. The updated commitments indicate a target of a 40% reduction in GHG emissions by 2050 compared to the 1990 baseline year.

Currently, internal state procedures for the preparation of the 3rd NDC are currently underway in the country and the country is expected to submit a new NDC soon.

3. INFORMATION NECESSARY TO TRACK PROGRESS MADE IN IMPLEMENTING AND ACHIEVING NATIONALLY DETERMINED CONTRIBUTIONS UNDER ARTICLE 4 OF THE PARIS AGREEMENT

Azerbaijan has committed to achieving a 35% reduction in greenhouse gas (GHG) emissions by 2030 compared to the 1990 base-year level. This target aims to mitigate the growth of emissions by employing an economy-wide emissions reduction approach. Furthermore, at COP 26, Azerbaijan announced a new conditional target of reducing GHG emissions by 40% by 2050, demonstrating its ambition to align with global climate goals.

The mitigation target includes emissions and removals from all sectors and covers three key gases: CO_2, CH_4, and N_2O. These sectors include Energy (including Transport), Waste, Industrial Processes and Product Use (IPPU), Agriculture, and Land Use, Land Use Change, and Forestry (LULUCF).

The base year level for total economy-wide emissions, according to the latest National GHG Inventory submitted with this Biennial Transparency Report (BTR), is 84,600.35 kt CO_2 eq. The target level for 2030 is 54,990.229 kt CO_2 eq, indicating a significant reduction from the baseline. As of the most recent reporting year, the total emissions were 69,498.88 kt CO_2 eq, which represents a 17.85% decrease from the base year level.

Azerbaijan applies the 2006 IPCC Guidelines for National Greenhouse Gas Inventories to ensure accurate estimation and consistency. The accounting approach aligns with Article 4, paragraphs 13 and 14, of the Paris Agreement and follows the principles of Transparency, Accuracy, Consistency, Comparability, and Completeness (TACCC) to avoiding double counting. The same methodologies and accounting approaches are applied both to the national GHG inventory and the NDC to maintain consistency across reporting and implementation.

Additionally, QA/QC procedures have been applied to avoid double counting. Five sectoral focal points conduct quality control of activity data, while inventory experts validate the results in collaboration with international specialists. An IT-based MRV system is also being developed to further enhance transparency and data management.

Global Warming Potential (GWP) values from the IPCC Fifth Assessment Report (SAR) are used to convert GHGs to CO_2 equivalents. For LULUCF activities and harvested wood products, the IPCC Tier 1 approach and stock change method were utilized, respectively. Stratification of forestland based on age-class structure was partially applied due to data limitations; however, future reporting cycles will include more detailed stratification to improve estimates.

Any updates to reference points or methodologies are transparently reported to maintain the credibility of progress tracking. A recalculation of Azerbaijan's reference level resulted in an adjustment from 79 Mt CO_2 eq to 84,600.35 kt CO_2 eq to reflect more accurate data collection and technical corrections.

Azerbaijan ensures alignment between its NDC communication and national GHG inventory through the use of consistent data sources, methodologies, and assumptions. Any deviations or updates in the methodology are transparently documented in the National Inventory Document (NID) to maintain comparability over time.

At present, Azerbaijan has not included mitigation co-benefits from adaptation actions or economic diversification plans in its NDC.

4. MITIGATION POLICIES, MEASURES AND PLANS RELATED TO THE IMPLEMENTATION OF NATIONALLY DETERMINED CONTRIBUTIONS

As a Party to the UNFCCC, Azerbaijan, as a developing country, has not officially undertaken any quantitative commitments to reduce GHG emissions within the framework of the Convention until 2015, however, has implemented a number of mitigation measures in the country. Examples include the expansion of renewable energy sources, increasing energy efficiency, establishing new forest areas, using climate-smart technologies and switching from heavy fuel oil to gas, and so on.

As a non-Annex I country of the Convention, Azerbaijan had the right to participate in only one of the three flexible mechanisms established on the basis of market mechanisms of the Kyoto Protocol - the Clean Development Mechanism (CDM). The CDM, specified by Article 12 of the Kyoto Protocol, aims to assist Annex I Parties to fulfill their obligations in achieving sustainable development in the country and contributing to the ultimate goal of the Convention. Azerbaijan has participated in the CDM projects as a host country and committed to creating the necessary conditions for the implementation of the projects.

By the decree of the President of the Republic of Azerbaijan dated April 1, 2005, the MENR was designated as the National Designated Authority (NDA) to enhance the effectiveness of activities within the framework of the CDM projects.

Despite the fact that until 2015, as a party to the UNFCCC and its Kyoto Protocol, Azerbaijan implemented several mitigation measures (such as the use of renewable energy sources, afforestation, the adoption of climate-smart technologies, and the transition from fuel oil to natural gas), it had not officially made any quantitative commitments to reduce GHG emissions within the framework of the Convention. Memorandum of understanding regarding international cooperation on CDM projects were signed with the governments of Denmark and Germany. Discussions were also held with other developed countries (Italy, Japan, etc.) on signing memorandums of cooperation in the field of CDM.

After the entry into force of the Kyoto Protocol in 2005, interest in CDM projects increased in Azerbaijan. By 2012, a number of projects aimed at reducing GHG emissions in various sectors were developed in Azerbaijan, and 34 of them were registered by the UNFCCC. As shown in Table 54, if these projects, covering all sectors, had been implemented, the annual reduction in GHG emissions would have amounted to a total of 19,131 kt.

Sector	Number of Project proposals	GHG reduction rate in kt CO_2 eq per year
Energy	17	13,675.4
Renewable energy	9	1,775.0
Agriculture	2	3,331.0
Waste	3	287.1
Forest Expansion and afforestation	3	62.7
Total	**34**	**19,131.2**

Table 54. CDM Projects registered by the National Designated Authority

In Table 55, a summary of the CDM projects that have already been verified by or submitted to the CDM Executive Board of the UN Framework Convention on Climate Change is provided.

Seven CDM projects from Azerbaijan have been registered in the Secretariat of the Convention, and as shown in Table 55, if these projects are implemented, the projected reduction in GHG emissions will be approximately 2,700 kt CO2 equivalent per year.

Status and verification history	Registration code	Projects name	Expected annual CO_2 emissions reduction level (kt CO_2 eq.)	Methodology
23 May 2011	4822	Yeni Yashma Wind Farm	120.898	ACM0002 No. 12
20 August 2012	5574	AzDRES Energy Efficiency Improvement	1,023.293	AM0061 No. 2
10 October 2012	7658	Baku Waste to Energy Project	66.146	AM0025 No. 13
12 November 2012	8181	Balakhani Landfill Project	84.639	ACM0001 No. 12
23 December 2012	4884	Construction of „Janub“ Combined Cycle Power Plant in Azerbaijan	363.826	AM0029 No. 3
Withdrawn	9240	Capturing and processing of low pressure natural gas from SOCAR's Oil Rocks and Mud Pilpiles oil fields	218.558	AM0009 No. 5
Canceled		Construction of general cycle power station in Sumgait city	774.430	AM0029 No 3

Table 55. CDM projects verification status

On September 29, 2015, Azerbaijan submitted its "Intended Nationally Determined Contributions" (INDCs) document to the UNFCCC Secretariat, thereby officially declaring that it had undertaken voluntary quantitative commitments for the first time. According to this NDC, the country set a target to reduce GHG emissions by 35% by 2030 compared to the 1990 baseline year, as a contribution to global efforts. In 2023, the country submitted its updated 2nd NDC document under the Paris Agreement. In the updated and improved 2nd NDC, Azerbaijan has targeted a 40% reduction in the level of greenhouse gas emissions compared to the 1990 base year as a contribution to global efforts, contingent upon receiving international support for financial assistance, technology transfer and capacity building.

To achieve these goals, the situation in the country's priority sectors affecting the climate system and future trends in technological innovations in this field at the international level have been thoroughly analyzed, as well as the strategies developed by some countries and submitted to the Convention's Secretariat have been reviewed.

The priority directions of the document "Azerbaijan 2030: National Priorities for Socio-Economic Development" outline the following strategic goals:

- continuous improvement of national legislation, regulatory and economic instruments, as well as existing mechanisms for incentives, strategic planning and subsidies in line with low-carbon development;
- ensuring a gradual transition to more innovative (green) technologies in global markets without jeopardizing the creation of competitive products.
- providing financial support for low-carbon development and implementing international cooperation in this direction;
- integrated approach for sustainable development and use of financial mechanisms of the Convention for funding long-term mitigation measures and involvement of both the public and private sectors in financial processes.

4.1. NATIONAL PRIORITIES AND STRATEGIES ON CLIMATE CHANGE MITIGATION

Azerbaijan has chosen the path of developing a socially-oriented market economy to further enhance the well-being of its population. The document "Azerbaijan 2030: National Priorities for Socio-Economic Development" was approved by the order of the President of the country dated February 2, 2021. This document is a roadmap for strengthening Azerbaijan's economic sovereignty and transforming it into a powerful state with a high social welfare society based on modern living standards by 2030.

In the coming decade, the following five National Priorities shall be realized for the country's socio-economic development:

A sustainable, competitively growing economy.
2. A dynamic, inclusive society based on social justice.
3. A competitive human capital and an environment for modern innovations.
4. Great return to the liberated territories.
5. A country with a clean environment and "green growth."

The main goal of the "Socio-Economic Development Strategy of the Republic of Azerbaijan for 2022-2026", adopted for the realization of the 5 national priorities, is to achieve sustainable and high economic growth, resilience to internal and external shocks, the benefit of development for every citizen, high and fair social security, an inclusive society, balanced development of the capital and regions, education meeting the demands of the 21st century, creative and innovative society, healthy lifestyle for citizens, sustainable settlement and finally, reintegration into economic activity. The mentioned goals are fully aligned with the Sustainable Development Goals directly developing out of the 2030 Agenda and are particularly significant in the implementation of the obligations arising from the "Transforming our World: The 2030 Agenda for Sustainable Development."

This socio-economic development model is planned to be implemented in two stages. In the first stage (2022-2026), the conditions for the successful implementation of the socio-economic development model by 2030 will be put in place. In the second stage, which will cover the years 2027-2030, a qualitatively new image of the national economy will be formed by ensuring the leading role of these basic conditions.

The strategic framework under the fifth priority of the document, "Clean environment" and "green growth country," provides an important basis for implementing measures to reduce the impacts (mitigation measures) on the climate system in the country. In line with this priority, sustainable and continuous use of natural resources will be ensured. The share of greenery in the total area of the country will be increased from 12% to 12.3%. The share of unusable land will decrease from 25% to 15%. The recycling rate of waste will reach 20% (with 10% in the regions). The ratio of the total network area of Specially Protected Nature Areas to the total land fund of the country will be 10.5%.

In the energy sector, the regulatory environment will be improved and liberal market principles will be applied. The use of renewable energy sources will be enhanced and energy efficiency will be provided. The utilization of environmentally friendly (eco-friendly) vehicles and other green technologies will be expanded to combat climate change. As a result, the financial burden on the state in the energy sector will be reduced and subsidies will be phased out.

The share of renewable energy sources in the installed capacity of electricity production is expected to reach 24% by 2026 (in line with the target of 30% by 2030). The compliance of socio-economic development goals with sustainable development objectives is closely linked to the 17 sub-goals of the United Nations Sustainable Development Goals through the "Socio-Economic Development Strategy for 2022-2026." Achieving a "Powerful state and high welfare society" will also contribute to the realization of the Sustainable Development Goals.

To achieve these goals, along with the "Socio-economic Development Strategy of the Republic of Azerbaijan for 2022-2026", a number of sectoral roadmaps and national programs have been adopted:

- "State Program on the Great Return to the territories liberated from occupation of the Republic of Azerbaijan"
- About measures related to the creation of a "green energy" zone in the liberated territories of the Republic of Azerbaijan;
- Strategic Roadmap for the development of communal services (supplying the population with electricity and thermal energy, water and natural gas) in the Republic of Azerbaijan;
- Strategic Roadmap for the production and processing of agricultural products in the Republic of Azerbaijan
- "State Program for the socio-economic development of the Nakhchivan Autonomous Republic for 2023-2027";
- "State Program on the development of citrus fruit growing in the Republic of Azerbaijan for 2018-2025";
- "State Program on the development of tea growing in the Republic of Azerbaijan for 2018-2027";
- "State Program on intensive development of livestock and efficient use of pastures in the Republic of Azerbaijan in 2019-2023";
- "State Program on the development of cocooning and sericulture in the Republic of Azerbaijan for 2018-2025";
- "Strategic Roadmap for the development of heavy industry and machine building in the Republic of Azerbaijan";
- "State Program for the socio-economic development of the regions of the Republic of Azerbaijan in 2019-2023";
- "State Program on the Development of Official Statistics in the Republic of Azerbaijan in 2018-2025", etc.

These programs directly or indirectly promote the reduction of GHG emissions, contributing to climate change mitigation measures as well as implementation of the NDCs.

Most of the mitigation measures are included both in the textual part as well as in the CTF Table 5.

4.1.1. MITIGATION POLICIES IN THE ENERGY SECTOR

The energy efficiency policy of our country began to be implemented in 1996 with the adoption of the Law of the Republic of Azerbaijan "On the use of energy resources". This law determines the fundamental principles of state policy and the main directions of state regulation in the field of energy resources use and outlines the activities of the relevant executive authority on the use of energy resources. To achieve the goal specified in the development concept "Azerbaijan 2020: Vision for the future" approved by Decree No. 2918 of the President of the Republic of Azerbaijan dated May 29, 2013, highlights the effective state regulation that ensures healthy competition in a market economy, as well as the principles of a comprehensive approach to the transition into a high-value-added export-focused economy, which uses energy efficiently, and development of socio-economic sectors. The country's energy efficiency policy is further defined in the "Strategic Roadmap for the Development of Communal Services" (electricity, thermal energy, water and gas) approved by the Decree of the President of the Azerbaijan Republic dated December 6, 2016. The document encompasses the strategic vision until 2020, a long-term perspective for the period until 2025 and target goals for the period after 2025.

Municipalities that have signed the agreement based on the Covenant of Mayors, coordinated by the Ministry of Energy on the initiative of the EU, are at different stages of developing their Sustainable Energy and Climate Action Plans (SECAP).

On December 17, 2022, the "Agreement on strategic partnership in the field of green energy development and transmission between the governments of the Republic of Azerbaijan, Georgia, Romania and Hungary" was signed in Bucharest. The implementation of this agreement will be our overall contribution to Europe's energy security.

The agreement emphasizes investments in production potential for green, especially renewable energy, collaboration in the development of Long-Term Low Emission Development Strategies, the implementation of measures in the fields of production, transportation and trade of renewable, clean energy and green hydrogen, energy efficiency and decarbonization on the basis of mutual benefit within the framework of its legislation and in accordance with the principles of international law and issues of expanding cooperation in these directions, aiming to achieve rapid, substantial and sustainable reductions in greenhouse gas emissions by 2030, in line with the targets set under the Paris Agreement.

According to the agreement, eco-clean electricity (clean energy) will be exported to Europe not only from Azerbaijan, but also from Georgia.

At present, the total power generation capacity of Azerbaijan is 7,937 MW, whereas the capacity of renewable energy power plants, including large hydropower plants, comprises 1,278 MW, which accounts for 17% of the total capacity. Additionally, the wind energy potential in the Azerbaijani sector of the Caspian Sea is estimated at 157 GW, the 35 GW of which corresponds to shallow coastal areas and 122 GW to water basins (pools) with a depth greater than 50 meters.

Realizing such great potential is quite an ambitious but achievable goal, as the cost of offshore wind energy production in the world is rapidly decreasing. In the European Union, this cost is currently lower than that of energy derived from gas. Therefore, Azerbaijan's plan to build wind farms in the Caspian Sea and export the generated energy has attracted substantial interest from potential investors with a realistic view.

Many foreign companies have already begun showing interest in energy production from renewable energy sources in the liberated territories. For instance, South Korean company "Securo" is seeking a way to participate in the construction of a 100 MW Wind Power Plant in Kalbajar and Lachin regions.

A Memorandum of Understanding has been signed between the Ministry of Energy and Fortescue Future Industries of Australia. This Framework Agreement on joint cooperation for studying and developing renewable energy projects and the potential of “green hydrogen” in Azerbaijan envisages to explore and implement projects with a total capacity of up to 12 GW on the production of renewable energy and “green hydrogen” in Azerbaijan.

Azerbaijan has already taken several steps to increase energy production from alternative sources to provide the necessary volumes for export. The construction of wind and solar power plants near Baku, with capacities of 240 MW and 230 MW, respectively, started and a solar power plant was commissioned in October 2023. The construction of a solar power plant with the same capacity is underway in the recently liberated region of Jabrayil.

The Zangezur corridor will play a crucial role in the export of energy types alongside other infrastructure projects. It is also planned to export energy to Türkiye and Europe through this corridor in the future. Thus, the establishment of the “Jabrayil” energy hub, along with the construction of power transmission lines running through the Zangezur corridor to the Nakhchivan Autonomous Republic, will facilitate the export of electricity to Türkiye and from there to the European market, contributing to the development of the region.

Additionally, renewable energy sources from the liberated territories will be utilized. Substations and hydropower plants have been constructed in these areas. Azerbaijan is collaborating with Georgia, Romania and Hungary to establish the Caspian-Black Sea-Europe energy corridor, which will allow the export of 4 GW of electricity. An additional 1 GW of "green" energy is planned to be transported via the Nakhchivan-Türkiye-Europe route.

It is also worth noting that Kazakhstan and Uzbekistan are currently interested in having access to these corridors, which will strengthen the pa
rtnership on energy security and “green projects” within the framework of the Middle Corridor.
The liberated territories are rich in renewable energy resources and their favorable geographical location allows for significant utilization of this potential. Preliminary estimates suggest that there is over 7,200 MW of solar energy and up to 2,000 MW of wind energy potential in the liberated territories. Fuzuli, Jabrayil, and Zangilan regions possess high solar energy potential, while mountainous areas such as Lachin and Kalbajar are rich in wind energy. A relevant Implementation Agreement for a solar energy project with a capacity of 240 MW has already been signed in Jabrayil district. And in the territory of Lachin and Kalbajar districts, it is planned to implement the construction project of WPPs (wind power plants) with a capacity of up to 400 MW.

As mentioned, it is planned to establish a "Green Energy" zone in the liberated areas. In this regard, the "Green Energy Zone" concept has been developed and an Action Plan for the creation of a "green energy" zone in the liberated territories of the Republic of Azerbaijan for 2022-2026 has been approved.

4.1.1.1. THE STRATEGY OF TRANSITION TO "GREEN ENERGY" IN AZERBAIJAN: CHALLENGES AND PERSPECTIVES

The transition to “green energy” is one of the fundamental aspects of Azerbaijan's energy policy. Increasing the share of energy derived from "green energy" sources in the country's energy balance is a primary goal of reforms taking place in the energy sector. Azerbaijan actively collaborates with international organizations, various countries and investors in the field of “green energy”:

Azerbaijan Renewable Energy Agency was established under the Ministry of Energy by a decree of the President of Azerbaijan dated September 22, 2020 to ensure the organization and regulation of activities related to the efficient use of renewable energy sources in our country.

- Necessary normative-legal acts are adopted for the development of the renewable or “green energy” sector and the formation of institutional mechanisms hereof, among which the Law of the Republic of Azerbaijan “On the use of renewable energy sources in the production of electricity” (2021) plays a crucial role.
- Following the Decree of the President of the Republic of Azerbaijan “On accelerating reforms in the energy sector of the Republic of Azerbaijan” dated May 29, 2019, special attention is paid to attracting foreign investors to develop the renewable energy industry. To this end, a “Roadmap for the development of offshore wind energy in Azerbaijan” was prepared in cooperation with the International Finance Corporation and a Memorandum of Understanding was signed accordingly.
- According to the Decree of the President of the Republic of Azerbaijan dated May 3, 2021 “On measures related to the creation of a “green energy” zone in the territories liberated from occupation of the Republic of Azerbaijan”, the “Action Plan for the establishment of “green energy” zone in the liberated territories of the Republic of Azerbaijan in 2022-2026” was approved by the Cabinet of Ministers.
- The “Socio-economic development strategy of the Republic of Azerbaijan in 2022-2026”, outlines the directions of action related to increasing the use of renewable energy sources, as well as expanding the utilization of bioenergy and geothermal energy.
- The document “Azerbaijan 2030: National Priorities for socio-economic development” emphasizes the significance of creating a “green energy” space. It also envisages expanding the application of “green technologies” and increasing the share of alternative and renewable energy sources in consumption in all sectors of the economy based on scientific and technical potential.
- In 2022, an Agreement was signed on strategic partnership in the field of “green energy” development and transmission between the governments of the Republic of Azerbaijan, Georgia, Romania and Hungary in Romania. As per this agreement, it is planned to export “green energy” produced in the Caspian Sea to Europe.
- Declaring 2024 as the “Year of Solidarity for the Green World” in the Republic of Azerbaijan by the Decree of the President of the Republic of Azerbaijan dated December 25, 2023, demonstrates a strong focus on and commitment to environmental protection.
- Azerbaijan has joined the global initiative to triple renewable energy capacity and double energy efficiency measures by 2030.

4.1.1.2. EXISTING POTENTIAL AND PRACTICAL MEASURES

Azerbaijan's favorable geographical position and climatic conditions create vast opportunities for “green energy” production. Significant progress has been made in renewable energy generation through wind, solar, mountain rivers, biomass and geothermal water sources. Purposeful state policy is being implemented in the direction of efficient use of these resources.

Transforming these areas into a “green energy" zone is considered one of the main directions in the course of economic development determined by the territories liberated from occupation.

With the involvement of a specialized international consulting company, a relevant Concept document was developed regarding the establishment of a “green energy” zone in the liberated territories of the Republic of Azerbaijan. The purpose of the concept is to provide the area with ecologically friendly green energy by using the high renewable energy potential available in the liberated territories and to formulate proposals by exploring the prospects of applying eco-friendly and energy-efficient green technologies. As part of the project, various scenarios for energy demand and supply have been reviewed, focusing on the development and settlement options for these territories. At the same time, continuous research was conducted in these regions to study the hydro, solar, wind, biomass, geothermal and other renewable energy potentials to build wind and solar power plants using existing resources, and also to construct hydropower plants in reservoirs and small rivers.

These regions have the potential of 7,200 megawatts of solar energy and 2,000 megawatts of wind energy. About 25% of the internal water resources of our country are formed in these territories. Solar energy potential is observed in Fuzuli, Jabrayil, Zangilan and Gubadli, while wind energy potential is mainly found in mountainous areas of Lachin and Kalbajar. The main rivers of the region such as Tartarchay, Bazarchay, Hakarichay and other small rivers have great hydropower potential. Furthermore, according to the preliminary analysis, it is assumed that there are 3093 cubic meters of thermal water reserves per day in Kalbajar and 412 cubic meters per day in Shusha.

Within the framework of establishing the Green Energy Zone, there are planned various measures such as electricity generation from renewable energy sources in the liberated territories, energy efficiency initiatives, the use of electric vehicles, the installation of renewable energy systems/grids (especially solar panels) on building rooftops, and the application of solar-powered LED lamps for street and road lighting, the use of renewable energy technologies in heating, cooling and hot water supply, as well as the introduction of smart energy management technologies and waste-to-energy management.

According to the Decree of the Cabinet of Ministers of the Republic of Azerbaijan dated June 21, 2022 "On the creation of the "green energy" zone in the liberated territories of the Republic of Azerbaijan within the framework of the Action Plan, state and private organizations dealing with the implementation of green technologies and energy efficiency requirements are expected to take appropriate measures in the liberated territories of the Republic of Azerbaijan in 2022-2026.

Transporting "green energy" to world markets is one of the main directions in Azerbaijan's energy policy. The technical potential of Azerbaijan's renewable energy sources is estimated at 135 GW on land and 157 GW at sea. The economic potential of renewable energy sources stands at 27 GW, including 3,000 MW from wind energy, 23,000 MW from solar energy, 380 MW from bioenergy and 520 MW from mountain rivers. Azerbaijan plans to have a renewable energy production potential of 5,000 MW by 2030:

- In 2023, the largest solar power plant of the Caucasus and the Central Asian region, with a capacity of 230 megawatts, was put into operation in Azerbaijan and the construction of such new plants continues.
- Significant progress is being made in the construction of the "green energy" electric cable that will extend from the Caspian Sea to the Black Sea and Europe.
- To develop the renewable energy sector, projects are being implemented with the support of international financial organizations such as the World Bank, the European Bank for Reconstruction and Development and the Asian Development Bank.
- There have been signed Agreements on renewable energy production in Azerbaijan with foreign companies, including "Masdar" of United Arab Emirates, "ACWA Power" of Saudi Arabia, "bp" of Great Britain, "Fortescue Future Industries" of Australia, "TEPSCO" of Japan, "Maire Tecnimont" of Italy, "China Gezhouba Group Overseas Investment" of China, "Total Energies" of France and other foreign companies and relevant measures are being implemented.
- Solar power plants with a total capacity of 39 MW are operating in the Nakhchivan Autonomous Republic. "The "State Program for the socio-economic development of the Nakhchivan Autonomous Republic for 2023-2027" includes comprehensive measures for the creation of the "Green Energy Zone" in Nakhchivan. Agreements have been signed with companies such as "Nobel Energy Management", "TotalEnergies" and "A-Z Czech Engineering" to promote the development of "green energy" production in Nakhchivan.

4.1.1.3. MEASURES IMPLEMENTED TO CREATE A "GREEN ENERGY" ZONE IN THE LIBERATED TERRITORIES OF THE REPUBLIC OF AZERBAIJAN IN 2022-2026

4.1.1.3.1. ESTABLISHMENT OF THE TRANSMISSION NETWORK FOR ELECTRICITY SUPPLY

On May 27, 2023, two substations were commissioned: the “Lachin City” substation with a capacity of 2x40 MVA and the “Gorchu” digital hub substation with a capacity of 2x25 MVA (110/35/10 kV). At the same time, 110 kV power transmission lines were built between these stations, forming a circular power supply system. To connect the existing 110 kV “Gubadli SS-Jabrayil SS” OPTL to the 330/110 kV “Jabrayil” substation, the construction of a 24 km double-circuit line has been completed.

4.1.1.3.2. CREATION OF THE AZERBAIJAN-TÜRKIYE-EUROPE ENERGY CORRIDOR (JABRAYIL ENERGY HUB PROJECT)

On May 4, 2023, the 330/110/10 kV “Jabrayil” substation, with a capacity of 2x250 MVA, was built and put into operation as part of the construction of the “Jabrayil” energy hub, which was the first stage of the Azerbaijan-Türkiye-Europe Energy Corridor project. Furthermore, within the framework of the same project, , the construction of 330 kV high-voltage transmission overhead lines between the “330 kV “Aghjabadi” SS - 330 kV “Jabrayil” SS” and “330 kV “Imishli” SS - 330 kV “Jabrayil” SS”, covering a total length of 262 km, has been completed to integrate the 330/110/10 kV “Jabrayil” substation into the power system. Meanwhile, 330 kV “Aghjabadi” SS and 330 kV “Imishli” SS have been completely reconstructed using modern technologies.

4.1.1.3.3. ESTABLISHMENT OF A DISTRIBUTION NETWORK FOR ELECTRICITY SUPPLY

35/0.4 kV "Zangilan" substation and Digital Management Center have been constructed in Zangilan city. In Shusha city and in the districts of Fuzuli, Jabrayil, Khojavand, Zangilan, Gubadli and Aghdam, repair and restoration works have been carried out on 40.5 km of 35 kV, 72.3 km of 10 kV, and 34.2 km of 0.4 kV power supply lines, including 11 units of 35 kV and 82 units of 10 kV substations. There have been laid 100 km long lines using 35 kV self-supporting insulated wires for the electricity supply of special facilities in the directions of Zod, Alagollar, Istisu, Zar, Marjimak, Yellija and Aghgaya villages in Kalbajar district and Bozlu and Minkand settlements in Lachin district, as well as 35/0.4 kV-11 complete transformer substations have been installed. The construction of Digital Control Centers in Aghdam, Kalbajar and Gubadli districts, as well as 110/35/10 kV "Istisu" and two 35/0.4 kV substations in Aghdam district is ongoing. Also, there have been established Digital Substation and Control Center in Fuzuli, a Junction Substation and Digital Control Center in Hadrut, an Innovative Technology Center for Electric Networks in Shusha and Digital Control Center in Jabrayil.

4.1.1.3.4. IMPLEMENTATION OF MEASURES FOR THE INTEGRATION OF ELECTRICITY PRODUCED FROM RENEWABLE ENERGY SOURCES INTO THE GRID

With the support of the World Bank, the "Studying and strengthening of the grid" project is being implemented in Azerbaijan. The aim of this project is to facilitate the transmission of electricity generated from renewable energy sources into the grid, conduct assessments and relevant analyses and prepare related reports.

At the same time, TETRA TECH and EPRA, which are technical consultants of "Masdar" and "Azerenergy" OJSC, are conducting researches to determine the potential integration capacities of solar and wind power plants into the energy system of Azerbaijan.

There are continued observations on potential measurement at Solar Monitoring Stations installed in Jabrayil and Zangilan districts. Preparations are underway for wind measurement observation activities in Lachin and Kalbajar districts.

4.1.1.3.5. CONSTRUCTION OF A SOLAR POWER PLANT IN JABRAYIL DISTRICT

Works are continued under the "Implementation Agreement" signed on June 3, 2021 with bp company for the evaluation and construction of a 240 MW solar power plant in Jabrayil district. Currently, the project is in the evaluation phase. bp has involved the "Lightsource bp" company in the evaluation and construction works. Under the project, the land plot coordinates have been determined, topographic surveys have been conducted and relevant works are being carried out in the direction of studying connectivity options to the grid, as well as performing hydrometeorological analyzes and environmental impact assessments. The Azerbaijan National Agency for Mine Action has completely cleared the area designated for the implementation of the "Shafaq" solar power plant project of bp company. At present, industrial-scale issues are being addressed and geotechnical studies are being conducted by bp company within the project.

4.1.1.3.6. CONSTRUCTION OF KHUDAFARIN AND GIZ GALASI HPPS

At the meeting of the Joint Technical Commission on the construction of the "Khudafarin" and "Giz Galasi" hydro-junctions and hydroelectric power plants on 11-12 July 2023 and the meeting of the relevant working group on 16-18 October 2023, the issues of completing the remaining works at the "Khudafarin" and "Giz Galasi" hydro-junctions were discussed and it was agreed to take appropriate measures in this direction.

4.1.1.3.7. CONSTRUCTION OF WIND POWER PLANT IN LACHIN AND KALBAJAR DISTRICTS

Representatives from foreign companies have visited the selected area for the purpose of the implementation of a 186 MW wind power plant project in Lachin district. Besides, a technical assignment has been prepared for the construction of a measurement monitoring station. After the tendering process, the winning company will undertake to conduct wind measurements.

4.1.1.3.8. ASSESSMENT OF THE HYDROPOWER POTENTIAL, INCLUDING THE CAPACITY OF THE PLANNED HPPS

The hydropower potential of the liberated territories is estimated to be approximately 550 MW. The "I State Program for the Great Return to the Liberated Territories of the Republic of Azerbaijan" outlines the restoration of 23 small hydropower stations and the construction of 37 new ones by 2026.

"Azerbaijan Investment Company" OJSC has announced an investment competition for the construction of 10 small hydropower stations (SHPS) with a total installed capacity of 39.5 MW in Kalbajar and Lachin districts. On December 27, 2023, "Azerbaijan Investment Company" OJSC signed a Joint Participation Agreement with Turkish companies "Demirören Yatırım Holding A.Ş." Group of Companies and "Arges Enerji Team" LLC for the purpose of restoration and operation of 5 small hydropower stations with a capacity of 13.8 MW in Kalbajar and Lachin districts.

4.1.1.3.9. RESTORATION OF SHPS (SMALL HYDROPOWER STATIONS)

- Currently, 14 hydropower stations with a total capacity of 90.1 MW are operating in the liberated territories. The Aghbulag station, with an installed capacity of 14.25 MW, is in test operation.
- Construction and installation works are ongoing at 12 stations with a total capacity of 104.8 MW. Of these, 3 stations with a total capacity of 31.5 MW are being reconstructed. Restoration and construction works continue at 5 stations with a total capacity of 29.3 MW, including the decommissioned Zabukh station. Construction and installation works have begun at 4 stations with a total capacity of 44 MW.
- On May 27, 2023, small hydropower stations "Meydan", with a capacity of 3.4 MW, and "Gamishli", with a capacity of 6.3 MW, were put into operation after reconstruction in the territory of Kalbajar district. On August 25, 2023, the 5.3 MW Soyugbulag, 8.3 MW Chirag-1 and 3.6 MW Chirag-2 small hydropower stations were commissioned in Kalbajar district after reconstruction.

In the administrative territory of Kalbajar district, the reconstruction of "Zar" SHPS with a capacity of 4.3 MW and the construction of 3 hydroelectric power stations with a total capacity of 39.9 MW ("Yukhari Vang" with a capacity of 8.6 MW, "Ashaghi Vang" with a capacity of 22.5 MW and "Nadirkhanlı" with a capacity of 8.8 MW) have been started. The reconstruction works of 6 MW "Alkhasli" and 8.25 MW "Mishni" power stations in Lachin district have been completed and put into operation on August 25, 2023. In Lachin district, there are being carried out reconstruction works of small hydropower stations "Mirik" with a capacity of 3.5 MW, "Zabukh" with a capacity of 2.8 MW, "Garagishlag" with a capacity of 4.0 MW and "Aghbulag 1" with a capacity of 14.7 MW. The construction works of 4 small hydropower stations with a total capacity of 42 MW ("Shayifli", "Sarigishlag", "Zangilan" and "Jahangirbayli" with a capacity of 10.5 MW each) have been completed in Zangilan district. On September 28, 2023, "Jahangirbayli" SHPS was put into operation. The construction of the 4.1 MW "Toghanali" SHPS has also begun in the administrative territory of Goygol district.

4.1.1.3.10. IMPLEMENTATION OF APPROPRIATE MEASURES I N THE BIOENERGY AND GEOTHERMAL ENERGY UTILIZATION OPPORTUNITIES

- To expand the utilization potential of geothermal energy, Azerbaijan has been admitted to the Global Geothermal Alliance, managed by the International Renewable Energy Agency (IRENA), to foster collaboration with international organizations and learn from advanced global practices in this field.
- On the basis of the technical assignment documents on "Expansion of geothermal energy utilization opportunities" and "Expansion of bioenergy utilization opportunities", as well as for the identification of pilot projects in this field there have been involved consulting companies.

4.1.1.1.3.11. IMPLEMENTATION OF PILOT PROJECTS ON THE APPLICATION OF GREEN TECHNOLOGIES

Regarding the determination of the locations where the pilot projects will be implemented, houses in Aghali village of Zangilan district have been allotted. Analyses have been conducted on the introduction of various technologies to be used in the mentioned areas.

Additionally, a project has been presented to the Karabakh Revival Fund for financial support in its implementation.

Supporting projects in the "green energy" sector is considered one of the priorities under the concessional loan program of the Entrepreneurship Development Fund. If an application is submitted for financing investment projects of business entities to support "green energy" projects in the liberated territories, the funding for those projects will be reviewed.

Furthermore, to efficiently utilize the hydropower potential of the liberated territories through public-private partnerships, collaborative efforts have been established between “Azerbaijan Investment Company” and “Arges Energy Team” (Türkiye) for the restoration and reconstruction of small hydropower stations and appropriate measures have been taken.

Efforts are ongoing to support the establishment of production and service sectors for green technologies in the liberated territories of the Republic of Azerbaijan.

4.1.1.1.4. MITIGATION MEASURES TAKEN TO REDUCE GHG EMISSIONS IN THE TRANSPORT-ROAD COMPLEX (TRC)

4.1.1.1.4.1. AUTOMOTIVE TRANSPORTATION INDUSTRY

From April 1, 2014, Euro-4 environmental standards are applied to motor vehicles circulating in the territory of the Republic of Azerbaijan.

According to applicable legislation, lower excise duty rates are imposed on passenger vehicles with smaller engine volumes imported into the Republic of Azerbaijan.

A policy is in place to apply lower insurance premiums for the compulsory insurance of the civil liability of passenger vehicles with small engine volumes.

Starting from January 1, 2019, electric vehicles and since January 1, 2020, buses operating on compressed gas have been exempted from value-added tax (VAT) upon import for a period of 5 years.

Lower import customs duties are applied to vehicles that have not been in operation for less than 1 year since their manufacturing date.

Wherever possible, bus stop "bays" and special traffic lanes for buses are being created.

In the administrative territory of Baku city, it is required that buses performing passenger transport be equipped with compressed natural gas (CNG) or electric engines. Currently, approximately 38% of the buses in operation use CNG fuel.

In 2020, 100 new "LEVC" brand (electric-powered) taxi vehicles were imported into the country and put into service. Works on the electrification of the taxi fleet are ongoing.

In 2022, the "Rules for developing an Urban Mobility Plan" were approved.

As of January 1, 2022, the import and sale of hybrid vehicles with a manufacturing date less than 3 years and with engine capacities not exceeding 2500 cubic centimeters, were exempted from value-added tax (VAT). Similarly, the import and sale of second- and third-level electric vehicle chargers for electric vehicles have been exempted from VAT since January 1, 2022.

The import duty rate is set at 0% (previously 15%) for electric-powered passenger cars up to 3 years from the date of manufacture, while the import duty rate is set at 0% (previously 5%) for second and third level chargers for electric vehicles.

For electric-powered buses, the import duty rate has been set at 0% (previously 15%).

To renovate/modernize the transport fleet, an increased excise duty rate is applied to the import of gasoline and diesel passenger vehicles older than 7 years. Besides, the import of passenger vehicles older than 10 years (excluding rare vintage vehicles and those temporarily brought into the customs territory) to the territory of the Republic of Azerbaijan has been restricted.

The internet information resource "edm.ayna.gov.az" has been created, which displays information about electric vehicle charging stations (EVCS) on an interactive map.

4.1.1.1.4.2. RAILWAY TRANSPORTATION SECTOR

Rail passenger transportation to the Absheron peninsula and regions (on the Baku-Ganja, Baku-Aghstafa and Baku-Gabala routes) is provided using "Stadler" high-speed electric trains.

To produce renewable energy, 147 solar panels with a capacity of 66 kW and 160 solar panels for heating have been installed at the Bilajari locomotive depot, while 210 solar panels of the same capacity and 140 solar panels for heating have been installed at the Ganja locomotive depot.

4.1.1.1.4.3. WATER TRANSPORT

A new International Sea Trade Port complex has been constructed in the Alat settlement of Baku city. Baku Port has been awarded the "EcoPorts" certificate by the European Sea Ports Organization.

The collection of data on fuel consumption on ships with a total capacity of 5000 and more sailing under the flag of the Republic of Azerbaijan has been organized. The "Ship's Energy Efficiency Management Plan" of ships sailing under the state flag of the Republic of Azerbaijan are checked and approved by the State Maritime and Port Agency.

4.1.1.1.4.4. AIR TRANSPORT

Azerbaijan participates in the Carbon Offset and Reduction System for International Aviation (CORSIA) under the International Civil Aviation Organization (ICAO).

Azerbaijan has also joined ICAO's Action Plan for Emission Reduction (APER).

Plans are in place to renovate the fleet with modern and efficient aircraft, as well as to increase the use of biofuels.

4.1.1.1.4.5. ROAD INFRASTRUCTURE

The reduction of heat-producing gases has been achieved due to the reconstruction and major repair of roads, the construction of road junctions at different levels, underground and surface pedestrian crossings, the elimination of traffic jams and the increase of the average speed of vehicles. Also, green belts (zones) have been built along roadways.

When designing and constructing roads, the degree of its impact on the environment is determined, the compatibility of the road with the landscape is taken into account and project solutions with the least impact on the environment are preferred.

Green belts are established along roadways, contributing to waste reduction.

4.1.1.1.4.6. BAKU METRO

Measures are taken to expand the use of metro transport to mitigate climate impacts—new stations are constructed and modern railroad cars (carriages) are purchased and so on. The Conceptual Development Plan of Baku Metro envisages the phased expansion of the existing network of Baku Metro. The target is to increase the number of lines to 5, the number of stations to 76, and the total length of tracks to 119 kilometers. Furthermore, the distance between each station is designed to be 900 meters, with platforms accommodating seven-car trains.

4.1.1.1.4.7. SUSTAINABLE URBAN MOBILITY IN AZERBAIJAN

The project "Sustainable urban mobility in Azerbaijan" has been launched with the involvement of the international consulting company (ICC). The goal of the project is to transform Baku into a "20-minute" city by 2030. All organizations included in the transport-road complex, as well as relevant state institutions, are involved in the implementation of the project. The project is organized on the basis of the following three principles:

Getting results rapidly. First of all, increasing the attractiveness of public transport.
Decision-making through Digital Twin Technology. Digital twin is a simulation model that allows to forecast passenger and transport flows, assess travel time reductions and make optimal decisions on the development of transport infrastructure. A "digital twin" modeling tool has been created and is already being used in the evaluation of certain infrastructure projects.
Involvement of state bodies and other stakeholders. Creation and implementation of an effective management mechanism for project implementation. The newly created "Transport Coordination Council" plays a crucial role in this approach.

4.1.1.1.4.8. TRANSPORT COORDINATION COUNCIL

As part of its activities, the Transport Coordination Council has initiated pedestrianization of historically significant streets in downtown Baku, as well as is seeking ways to restrict traffic in certain streets of the city center on weekends.

Relevant reconstruction works are being carried out for effective use of transport in the Transport Exchange Centers, mainly located in front of the metro stations, where access to other transport, except for public transport and taxis, is restricted.

To establish micromobility infrastructure in Baku city, the project of building 17 km of bicycle paths/lanes, primarily in the central part of the city, has been started by the decision of the Council.

As part of the implementation of the Decree of the President of the Republic of Azerbaijan dated 7 March 2024 on "Sustainable Urban Mobility in Azerbaijan" and the promotion of the use of electric motor vehicles, charging stations will be installed for the power supply of 160 buses to be brought to Baku in 2024 for operation in the city of Baku at the bus depot located in the city of Zigh for overnight charging of electric buses, as well as for the availability of daytime charging at 4 Transport Interchange Centres, which are the last stops of the route lines.

To increase the use of electric vehicles, efforts are underway to install 77 electric vehicle charging stations (EVCSs) in Baku city and surrounding areas, 70 EVCSs in the districts and 20 in the Karabakh region.

The use of electric buses in public transport is projected to rise significantly, with plans for 500 electric buses in 2025 and 1,100 in 2026.

At the same time, drafts of relevant legal acts have been prepared, which envisage free use of paid parking spaces for electric vehicles, obtaining the right to move in special bus lanes and tax exemptions for individuals selling electricity through charging stations for electric vehicles (including any services provided to customers as a result of the execution of this activity).

Within the framework of the implementation of the Decrees of the Cabinet of Ministers of Azerbaijan Republic dated January 20, 2024 "On measures related to the modernization of the bus fleet at the expense of local production", a Framework Agreement was signed with the Chinese company "BYD Company Limited" (BYD) for the supply of the bus fleet at the expense of local production in our country. The annual production capacity of the new facility is expected to be 500 buses.

"Preparation of the National Plan for Electromobility" provided for in the "Socio-Economic Development Strategy of the Republic of Azerbaijan in 2022-2026" is being carried out and to increase the participation of banks in the financing of environmentally friendly vehicles, the "Roadmap for 2024 on the stimulation of circulation of environmentally clean and safe vehicles and the improvement of infrastructure" approved by the Commission for Business Environment and International Ratings, envisages the allocation of loans on preferential terms by the Central Bank or the formation of other support mechanisms, the application of the leasing mechanism in the financing of environmentally friendly vehicles.

4.1.2. MITIGATION POLICIES AND MEASURES IMPLEMENTED IN THE AFOLU SECTOR

The AFOLU sector has a key role in achieving national goals for climate change mitigation and adaptation, as well as in reducing negative impacts on developing economies. In addition, it contributes to many of the Sustainable Development Goals adopted in 2015 and plays a fundamental role in business development.

In Azerbaijan, the AFOLU sector has an exceptional role in combating climate change, as its mitigation potential includes both enhancing carbon absorption and reducing emissions through effective land and livestock management.

However, challenges such as unsustainable forest management, deforestation, land degradation, and wildfires in the AFOLU sector cause emissions. Forests are among Azerbaijan's most valuable natural resources, covering an area of 1,040.2 thousand hectares, which accounts for 12% of the country’s territory.

In 2015-2022, various measures were implemented to mitigate the effects of climate change in the AFOLU sector, which had been identified as a priority in Azerbaijan's Nationally Determined Contributions.

Institutional mechanisms, political documents and legislation to support measures in combating climate changes within the AFOLU sector do not yet meet modern requirements. It is also worth noting that the main state bodies responsible for the AFOLU sectors have not established departments to address climate change. The Strategic Roadmap for the production and processing of agricultural products in the Republic of Azerbaijan outlines targets for reducing GHG emissions in the agricultural sector through the collection of methane gas from manures formed in livestock and poultry farms and the spread of perennial crops, aligning with the goals of the sector in question of the NDC. Moreover, the document adjusted to NDC recommends the use of alternative energy sources in the heat supply of greenhouses, the establishment of protective forest strips, the use of plant species with economic importance (olives, almonds, pistachios, pomegranates, mulberries, figs, etc.) in the establishment of greenery and the improvement of pasture management-all contributing directly to the carbon sequestration potential of forests and grasslands.

The "State Program for socio-economic development of the regions of the Republic of Azerbaijan in 2019-2023", which was adopted later, continues to support the implementation of the AFOLU by facilitating the application of modern agricultural technologies and technical equipment, promoting the production of eco-friendly agricultural products and encouraging more efficient use of natural resources while protecting the environment. Besides, measures such as the creation and expansion of agroparks for various plants and livestock, the establishment of new agroforestry massifs and forest plantations in cities and roadsides, including honey forests, provided for in the Action Plan, support the reduction of the sector’s GHG emissions in line with the NDC of the AFOLU sector.

The AFOLU sector is focused on increasing absorption in 6 land types, divided into forest areas, croplands, grasslands (pastures), wetlands, residential areas and other lands based on GHG classification, as well as reducing emissions resulting from deforestation and forest degradation.

In parallel, the preparation of the draft of the National Forest Program and its Action Plan on the protection and sustainable development of forests in Azerbaijan has been completed and the document is currently undergoing internal approval procedures. The program promotes and supports the sustainable development, expansion and management of forests as key priorities for Azerbaijan and also ensures the development of strong normative-legal and institutional capacities for sustainable forest management. It identifies key climate change mitigation actions for the next decade, aligning with the NDC framework. In this regard, the National Forest Program and its Action Plan determine the main measures to combat climate change for the next decade in accordance with the NDC. The National Forestry Program and its Action Plan aim to support additional GHG sequestration and to increase the share of AFOLU sectors in carbon sequestration in GHG inventory through the planting of fast-growing and multi-purpose trees on open forest lands, as well as on the newly allocated forest fund lands.

In Azerbaijan, millions of seedlings (including forest and fruit trees) are cultivated annually to support afforestation, reforestation and forest restoration efforts. In addition, it should be noted that there has been a significant increase in the planting of fruit orchards on lands suitable for agriculture recently. Between 2010 and 2017 alone, more than 60,000 ha of new orchards were planted with productive tree species in Azerbaijan. For example, hazelnut orchards were expanded from 34,000 ha to 80,000 ha. Moreover, starting in 2001, there has been a growing trend of cultivating young trees on forest fund lands, which then were included in the category of valuable forests. Both in the orchards and in the agroforestry zones, productive fruit tree species such as olives, walnuts, almonds, hazelnuts, mulberries, unabi (jujube), pomegranates, chestnuts and pistachios are planted. At the same time, the development of sericulture is one of the priority directions in Azerbaijan, which is directly related to the expansion of mulberry orchards. In this regard, between 2016 and 2018 alone, 5,553,890 mulberry seedlings were planted in forest and non-forest areas.

State programs will support the development of afforestation and reforestation projects (planting of fast-growing trees, restoration and expansion of primary forests, and introduction of agroforestry practices). To plant new forest areas and orchards in this area, breeding of high-quality forest and fruit seedlings will be continued.

Overall, in the last 15 years, measures have been taken in the direction of afforestation, afforestation, and forest restoration in the area of 165.2 thousand hectares. To speed up the ongoing efforts, Azerbaijan joined the Bonn Challenge, pledging to restore 270 thousand hectares of forest area by 2030. Of this, 170,000 hectares are to be implemented by the country itself, while 100,000 are expected to be realized through international assistance.

4.1.3. MITIGATION POLICIES AND MEASURES IMPLEMENTED IN THE WASTE SECTOR

Tamiz Shahar" OJSC, established by Decree No. 2983 of the President of the Republic of Azerbaijan dated August 6, 2008, "On the improvement of municipal waste management in Baku city", deals with the disposal and neutralization of solid municipal waste.

One of the significant fields of the company is the Balakhani landfill for urban waste management.

The landfill was rehabilitated and transformed into a sanitary landfill as part of the "Integrated Solid Waste Management" project, operating on the basis of a loan agreement between the Ministry of Economy and the World Bank. The total area of the landfill is 120 ha.

As a result of the performed work, soil cover has been applied to nearly 60 hectares, with a total area of 2.9 million m^2 covered by specific (geogrids, geotextiles, geomembranes, etc.) isolation layers. In total, 26 special cells have been built for the disposal of waste at the landfill, allowing for the treatment of approximately 10 million tons of waste. At the same time, a reverse osmosis system has been installed for the treatment of leachate (waste water) collected at the landfill. Here, the treated leachate is converted into technical water for irrigation through special filters. There is obtained electric energy from biogas produced by the decomposition of organic waste through a special generator with a capacity of 2 MW/h. The area has also undergone greening efforts to prevent erosion and improve the landscape, with over 14,000 trees planted. To minimize the impact on the environment, samples are regularly taken from the surface soil, water and air at the landfill and analyzed in the appropriate laboratory. As per the results of the analysis, the impact parameters in the area have improved significantly in terms of quantity.

On November 30, 2023, as part of the Balakhani landfill project, a purchase agreement was signed with B.B Energy (ASIA) PTE LTD of “Tamiz Shahar OJSC” for emission reductions.

Within the framework of the "Comprehensive Action Plan for the Improvement of the Environmental Situation in the Republic of Azerbaijan for 2006-2010" approved by the Decree of the President of the Republic of Azerbaijan dated September 28, 2006, a contract was signed on December 15, 2008, between the Ministry of Economy and the French company "Constructions Industrielles de la Méditerranée S.A." (CNIM S.A.) for the construction of a solid municipal waste incineration plant in Baku. The annual incineration capacity of the plant is 500,000 tons of solid municipal waste and 10,000 tons of medical waste, generating up to 200 million KWh of electricity annually, which is transmitted to the general network of Baku through high-voltage lines. The plant started operating in December 2012.

Recognizing the significance of waste sorting in waste management, special attention was paid to taking appropriate measures in this direction. In order to sort municipal waste and develop recycling business in the country, a semi-automatic solid municipal waste sorting plant with an annual capacity of 200,000 tons was built in Balakhani using German technology. As a result of sorting at the factory, there are separated recyclable materials such as paper, glass, plastic, metal and other raw materials, which reduce the overall volume of waste, form a market for cheap raw materials and establish a foundation for developing recycling sectors in the country, save energy and most importantly, minimize the negative impact of waste on the environment.

Meanwhile, the Balakhani industrial park was established with the aim of developing recycling in the country.

Of particular importance are measures to improve waste management, expand the scope of waste collection services and reduce the harmful effects of waste on the environment. As part of the Integrated Solid Waste Management Project, the current situation has been evaluated to implement a unified waste management system across the country and proposals for creating a network of regional sanitary landfills and transmission stations for the establishment of a system of transport, collection and neutralization for the sustainable management of municipal solid waste in urban and rural areas, as well as recommendations for phased legal, administrative, financial, institutional and technological reforms have been prepared. Based on these recommendations, the "National Strategy for the Improvement of Solid Waste Management in Azerbaijan for 2018-2022" was developed and adopted.

According to the Decree of the President of the Republic of Azerbaijan No. 2701 dated June 22, 2021, "On the regulation of some issues in the field of municipal waste management" and "On making amendment to Decree No. 2983 of the President of the Azerbaijan Republic" "On improving the municipal waste management in the city of Baku" dated August 6, 2008, the scope of activity of "Tamiz Shahar" OJSC was expanded and the collection, transportation, placement and neutralization of all solid municipal waste in the territory of Shusha city, which was liberated from occupation, was entrusted to "Tamiz Shahar" OJSC.

According to Decree No. 1735 of the President of the Republic of Azerbaijan dated July 2, 2022, in order to take further measures in the field of waste management and improve the municipal solid waste management, "Tamiz Shehar" OJSC has been assigned the responsibility of collecting, transporting, disposing and managing municipal solid waste in liberated areas until a new solid waste management mechanism is established in the Republic of Azerbaijan.

5. SUMMARY OF GREENHOUSE GAS EMISSIONS AND REMOVALS

Please refer to Chapter 1, which is dedicated to the national inventory.

6.SUMMARY OF FLEXIBILITIES IN NDC TRACKING

Description of the application of flexibility	Clarification of capacity constraint	Timeframe for improvement
Azerbaijan applies flexibility under Paragraph 85 due to limited capacity for estimating GHG emission reductions in a detailed tabular format. The country provides qualitative descriptions of policies and measures but lacks the technical resources for precise quantitative estimates at this time.	Capacity constraints include insufficient data, technical expertise, and modeling tools needed to produce accurate estimates of expected and achieved emission reductions.	Azerbaijan aims to improve its ability to provide detailed emission reduction estimates for BTR 3. This will involve developing technical expertise, enhancing data collection systems, and implementing necessary modeling tools for more accurate reporting.
Azerbaijan applies flexibility under Paragraph 92 by not including the projections, due to current limitations in its capacity to fully comply with detailed projection reporting requirements.	Capacity constraints include insufficient technical expertise and limited data availability needed to provide comprehensive and accurate projections as outlined in the MPGs.	Azerbaijan plans to improve its capacity to provide detailed projections for BTR 3, through enhancing technical capacities to use modeling tools, improving data systems, and technical training to align with the full reporting guidelines.

CHAPTER III

Climate Change Impacts and Adaptation under Article 7 of the Paris Agreement

1. NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS AND LEGAL FRAMEWORKS

1.1. NATIONAL CIRCUMSTANCES

Azerbaijan's geography is marked by a diverse range of biogeophysical features, including mountainous regions, lowland plains, and a long coastline along the Caspian Sea. The country's total land area is approximately 86,600 km², including Pirallahi, Chilov, Boyuk Zira, Garasu, Sangi Mughan and other islands in the Caspian Sea. There are diverse climatic zones ranging from semi-arid and desert-like regions in the central plains to subtropical areas in the south and alpine climates in the mountainous regions.

The Caspian Sea is the largest inland body of water in the world It is subject to water-level fluctuations (10-20%) and on average covers an area of 370 thousand km2. The Caspian Sea plays a significant role in moderating the coastal climate, while the Greater and Lesser Caucasus Mountains influence precipitation patterns and create microclimates in specific regions.

Azerbaijan is in a semiarid area, which is recognized as vulnerable to climate changes. Azerbaijan ranked 73rd out of 181 countries in the 2024 ND-GAIN Index. Due to its location in the southern hemisphere, the territory of Azerbaijan receives high sunlight and heat rates. Summers are hot and dry.

The relief of the Republic of Azerbaijan is very diverse. Two main forms of relief dominate in this area - plains and mountains.

About 60 percent of Azerbaijan's territory is foothills and mountainous. The main geomorphological units of the Republic, the Greater Caucasus, the Lesser Caucasus (along with the Karabakh plateau), and the Talysh mountains, which surround the Kura-Araz lowland from the north, west, and southeast. The Nakhchivan Autonomous Republic is located around the middle reaches of the Araz River and surrounded by Zangazur and Daralayaz mountains. The lowest point is Caspian coastal areas which is below sea level (currently -26.5 mBs), the highest point Bazarduzu - 4,466 meters.

The Kura-Araz lowland covers the area between the Greater Caucasus, Lesser Caucasus, and Talysh mountains. Being the largest intermontane lowland in the Caucasus, it occupies the central part of the republic.

The capital of Azerbaijan is Baku, the largest port on the Caspian Sea. This city is a major economic, scientific and cultural center of the Caucasus. The Greater Baku area covers most part of Absheron peninsula. Baku is especially vulnerable to the declining levels of the Caspian Sea which impacts coastal infrastructure, industries, and ecosystems, transportation routes, and the local fishing industry. Furthermore, as the country's largest city, Baku faces other climate-related risks such as urban heat island effects and increased demand for water and energy.

The climate of Azerbaijan is strongly influenced by the country's geographical position, topography, and the Caspian Sea. 8 of the 11 climate types on Earth (according to V.V. Keppen) were identified in this area.

- The semi-desert and dry desert climate mainly covers the Central lowland regions (areas up to 400 meters height in the Kur depression), the Caspian coastal zone from the mouth of the Samur River to the Kyzylagac Bay, the plains along Araz river in the Nakhchivan MR, and the closed mountain depressions of Talish (from 1000 meters). The winter is mostly warm (cold in the plains along Araz river and in the closed mountain valleys of Talish). Summer is hot, some days the temperature is over 40°C.
- The mild-warm climate with dry winter is spread in the low mountainous zone of the southern slope of the Greater Caucasus (at an altitude of up to 1000 meters), in the Ganikh-Ayrichay depression (200-500 m), in the northern and eastern slopes of the Lesser Caucasus (at an altitude of 400-1500 m). The winter is mild, with little precipitation, and the summer is mild-hot.

- Mild-hot climate with dry summer. It is mainly in Lankaran-Astara zone. Annual precipitation accounts for 100-150% of possible evaporation and more. Winter is mild, summer is mild-hot and dry, autumn is very rainy. From May to mid-August, there is little rain and frequent droughts, artificial irrigation is used.
- The cold climate with dry winter is on the north-eastern slope of the Greater Caucasus (1000-2700 m) and in the middle and high mountains (1400-2700 m) of the Lesser Caucasus Summers are cool and winters are relatively mild.
- Cold climate with dry summer. It covers the middle and high mountain zone (1000-3000 m) of Nakhchivan MR. Winter is cold and snowy, summer is cool.
- The temperate-warm climate with evenly distributed precipitation is typical for the zone of mountain forests on the southern (600-1500 m) and northeastern (200-500 m) slopes of the Greater Caucasus. Winter is mild, summer is mild-hot.
- A cold climate with abundant precipitation in all seasons is typical only for the southern slope of the Greater Caucasus (1500-2700 m). Upper forest covers subalpine and alpine zones. Winter is cold and summer is cool.
- Mountainous tundra climate is in the Greater Caucasus and Lesser Caucasus above 2700 m, and in Nakhchivan MR above 3200 m. Winter and summer are cold. In some places, snow remains from year to year.

Demographics

As of January 1, 2024, Azerbaijan's total population stands at 10,180,800[30]. Currently, 54.5% of the population lives in urban areas, while 45.5% resides in rural areas. The capital, Baku, houses 23% of the population, with 2,344,900 people, making it the most populous urban center in the country. Urban areas, while key to the economy, are becoming more exposed to climate risks such as higher temperatures and growing infrastructure demands.

In rural areas, where 45.5% of the population resides and agriculture is the primary livelihood, climate change poses significant challenges. Climate change impacts, such as reduced rainfall, water scarcity, increased droughts, and the rising intensity of hazardous hydrometeorological events like floods, present significant challenges. With much of the rural population relying on irrigation for crop production, water resource constraints are becoming more severe.

Currently, 54.5% of the population lives in urban areas, primarily in major cities such as Baku, Ganja, Sumqayit, and Mingachevir and is likely to increase going forward. In rural areas, where 45.5% of the population resides and agriculture is the primary livelihood, climate change poses significant challenges.

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Economy

Major sectors of economy of Azerbaijan are fuel energy, machinery construction and metal processing, chemical and petrochemical, light and food industries, as well as agriculture. The GDP of Azerbaijan increased by 4.6% from 2021 to $78.7 billion in 2022.[31] While the nation's oil GDP fell by 2.7 percent over this time, its non-oil GDP grew by 9.1%. 51.1% of GDP came from industry, 8.2% from trade and car repair, 6% from transportation and logistics, 4.8% from construction, 4.8% from agriculture, forestry, and fisheries, 1.6% from hotel services, 1.4% from information and communications, and 7.4% from taxation. Azerbaijan recorded $52.7 billion in foreign trade in 2022, a 55.4% increase. The nation also reported a rise in total net exports at the same period, with imports rising 23.9% to $14.5 billion and exports rising 71.6% to $38.1 billion annually. Iron and steel, machinery, automobiles, and food items are the top imports.

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[30] https://www.stat.gov.az/source/demoqraphy/ap/?lang=en

[31] State Statistical Committee

Iron and steel, machinery, automobiles, and food items (mostly meat and dairy) are the top imports. In 2022, the U.S.-Azerbaijan trade turnover was $570.16 million, a 19% decline from the previous year. In 2022, Italy, Turkey, Israel, and India were the biggest export destinations for Azerbaijan.

The production of gas and oil, which in 2022 generated more than 92.5% of export earnings and almost 47.8% of the nation's GDP, is the backbone of the Azerbaijani economy. In 2022, 11.4 billion cubic meters of gas were transported to Turkey via the Southern Gas Corridor (SGC) pipeline, and then to markets in Europe. The Azerbaijani government is aiming to develop its renewable energy sector, as the country has substantial wind and solar potential. To facilitate the future export of green power and green hydrogen to European markets, Azerbaijan intends to develop 1500 MW of renewable energy capacity by 2030.

To diversify its economy and move away from hydrocarbons, Azerbaijan is aiming to expand its green energy, agriculture, logistics, tourism, and information and communication technology (ICT) industries. Targeting cotton, rice, citrus fruits, tea, tobacco, hazelnuts, and other agricultural products, the government subsidizes machinery and other inputs. Azerbaijan is still expanding its east-west and north-south transportation and trade routes. The Port of Alat (Baku International Sea Port) and the nearby Free Trade Zone (FTZ) are becoming regional hubs for logistics and transportation as a result of the significant increase in trade on the Middle Corridor.

Infrastructure and information on adaptive capacity

At the national level, Azerbaijan adopted the "Strategic Roadmap on Social-Economic Development[32]" in 2021, which will allow the country to create a new development model based on short (2025), medium (2030) and long-term measures (post 2030). The Strategic Development Road Maps (SDRM), up to 2025 and beyond, cover eight priority sectors of the economy, including the development of the manufacture and processing of agricultural products, the manufacture of small and medium entrepreneurship-level consumer goods, the oil and gas industry, development of heavy industry and machinery, tourism, logistics and trade, vocational education and training, financial services, communication and information technologies and utilities. However, this and other policy documents do not adequately account for climate change in planning for future development.

This adaptation readiness proposal is in line with existing policies, programmes, and investments in Azerbaijan related to development and climate risk management. The activities build on the adaptation priorities identified by the MENR for agriculture, water and coastal areas, the road map for NDC implementation, also with Azerbaijan's 2022-2026 Economic Development Strategy. The prioritization of the water and agriculture sectors reflects the Strategic Development Road Map for agriculture, which mentions the need for better monitoring and evaluating of CCA, as well as the UNFCCC Technology Needs Assessment (TNA), which highlights the needs in the agriculture and water sectors. Coastal areas on the other hand are relevant for SDRMs with economic importance around the Caspian Sea, including tourism, logistics and trade, the oil and gas industry, and utilities. Given the expected increased frequency of extreme events on the Caspian Sea coastal areas, such as extremely high waves, strong winds and flooding, there is a need to develop adaptation programs for those areas. The Adaptation Planning project will support the development of mechanisms to reduce the negative impacts of climate change, develop policy and implementation measures in accordance with the Road-maps.

[32]Azerbaijan 2030: https://president.az/en/articles/view/50474

1.2. INSTITUTIONAL ARRANGEMENTS

State Commission on Climate Changes

Azerbaijan has established a comprehensive institutional framework to assess climate change impacts and facilitate cross-sectoral decision-making. The **State Commission on Climate Change** was created in 1997 to coordinate the country's commitments under the United Nations Framework Convention on Climate Change (UNFCCC). Currently, the commission is coordinated by the Cabinet of Ministries and following organizations are represented in the state commission

- Ministry of Ecology and Natural Resources
- Ministry of Finance of the Republic of Azerbaijan
- Ministry of Economy of the Republic of Azerbaijan
- Ministry of Agriculture of the Republic of Azerbaijan
- Ministry of Health of the Republic of Azerbaijan
- Ministry of Foreign Affairs of the Republic of Azerbaijan
- Ministry of Transport, Communications and High Technologies
- President of the Azerbaijan National Academy of Sciences
- State Oil Company of Azerbaijan (SOCAR)
- Azerenergy Open Joint Stock Company
- Amelioration and Water Farm Open Joint-Stock Company

In 2020, the composition of the State Commission on Climate Change was renewed and it set new tasks.

- Increase capacity of organizations to reduce the negative effects of climate change
- Strengthen coordination between organizations to optimize water use
- Increase preparedness and strengthen coordination between organizations to reduce the risk of natural disasters
- Identifying and attracting financial resources for more effective organization of the fight against climate change
- Development and implementation of national and regional programs to mitigate adverse effects of climate changes

Ministry of Ecology and Natural Resources (MENR)

The Ministry of Ecology and Natural Resources (MENR) is the principal governmental body responsible for formulating and enforcing environmental policies that align with Azerbaijan's commitment to climate resilience. MENR plays a vital role in climate adaptation by formulating policies, environmental monitoring, public awareness, international collaboration and capacity building.

The MENR develops comprehensive national environmental policies that incorporate climate adaptation strategies, ensuring that all sectors are aligned with climate goals and conduct monitoring programs to assess the impact of climate change on ecosystems, biodiversity, and natural resources.

The MENR also facilities public awareness campaigns and educational programs that promote understanding of climate change impacts and resilience strategies, empowering communities to engage in sustainable practices. International Collaboration is one of the main activity directions of the MENR. It engages in international environmental agreements and collaborations, enhancing Azerbaijan's capacity to address transboundary climate issues. MENR also collaborates with local governments and non-governmental organizations to build capacity for effective climate governance. This includes providing training and resources to local officials to strengthen their ability to implement adaptation strategies.

National Hydrometeorological Service

The National Hydrometeorological Service plays a crucial role in providing the necessary data and information for climate adaptation efforts by weather Forecasting, climate scenario development and management of the early warning systems in Azerbaijan. The service has a climate change center, which was in charge of developing national climate change communications.

State Water Resources Agency (SWRA)

The State Water Resources Agency (SWRA) is integral to managing Azerbaijan's water resources, especially in the context of climate adaptation. Sustainable Water Management that ensuring sustainable water resource management practices is one of the main activity directions of the SWRA. SWRA is the key state organization responsible for provision of water supply to the agricultural bodies and amelioration of lands. Water reservoirs, all the existing irrigation schemes, distribution channels, collector-drainage networks in the country are in the balance of this organization. The SWRA also deals with irrigation schemes that are under construction now. In most regions, the departments responsible for irrigation channels and collector-drainage networks operate separately. The organizational structure of SWRA is quite complicated and sometime parallelism is observed in the operation of its departments. The Irrigation Systems and Mechanical Irrigation Offices (ISMIO) deal with the provision of farmers with water supply. The ISMIOs ensure delivery of water received from main channels and other water resources to the Water User Associations. Subartesian Wells Operation Offices (SWOO) raise the ground water to earth surface with mechanical method for farming areas, and deals with the operation, repair and restoration of subartesian wells and electricity and mechanical equipment. The water supply of winter pastures is dealt with by the Winter Pastures Water Supply Systems Operation Offices. The work f the collector-drainage systems is controlled by Melioration Offices. The structure of AWE is not based on area principle. Only mechanical irrigation offices operate in most regions.

Ministry of Agriculture (MoA)

The Ministry of Agriculture of the Republic of Azerbaijan is a body of executive power that forms and implements state policy in the field of agriculture. The Ministry also provides practical assistance to local executive structures in conducting agrarian reforms. This institution has exclusive authorities in organizing of breeder, quarantine and sanitary measures.

The MoA cooperates with international organizations in different spheres. Its partners include UN's FAO, UN's IFAD, USAID, and multiple organizations. These organizations work closely with farmers through the Ministry and provide different types of assistance in correct growing measures.

The Ministry of Agriculture has notable activity in application of modern irrigation technologies in a dry country such as Azerbaijan, whereas proper irrigation is the key factor that enhances productivity and maintains productive lands. The Ministry, together with state bodies like State Agrarian Service Agency runs broad range of programs related to sustainable land use and application of water saving technologies.

The ministry works closely with rural communities to address the specific challenges they face due to climate change, promoting localized solutions and building capacity for sustainable farming practices.

Ministry of Emergency Situations (MES)

The Ministry of Emergency Situations is entitled to reduce the risks of water-related natural disasters, flood and flash floods, landslides, avalanche, drought, forest fires, to manage them during emergency situations and apply emergency zone when necessary.

Currently, MES controls the security work of large water bodies and takes measures to prevent possible natural disasters. Mingachevir water reservoir, Shamkir water reservoir and other large water economy facilities have been attached to the balance of MES.

The regional center of MES operates in all regions of Azerbaijan. These centers carry out activities such as mitigation of the impact of any type of disasters hitting regions of the country, saving people and reduction of incurred losses. The centers also have mitigation activities to reduce the risks of natural disasters by carrying out awareness raising measures among population and strengthening the infrastructure.

Water User Associations

Water User Associations (WUAs) have been established in accordance with the law of the Republic of Azerbaijan on Amelioration and Irrigation. The main goals of these associations include the following: ensure efficient use of irrigation schemes; collect water charges; solve disputes erupting among the users during the use of water.

The key problem of WUAs in the region is that they do not have sufficient material and technical capacity. Therefore, the WUAs cannot sufficiently meet the interests of water users.

Local Municipalities

State-owned water economy facilities of local importance that are located in the municipal lands, are under the ownership of the municipalities. The use and management of these facilities is governed by the law of the Republic of Azerbaijan on water economy of municipalities. According to this law, the municipalities can create water economy enterprises to operate water economy facilities that are in their balance. The treatment of irrigation systems that are in the balance of municipalities, the maintenance of the collector-drainage networks is also in the responsibility of the municipalities. Besides, the municipalities can organize the management of the water bodies that are under their ownership and develop different action plans to ensure protection of water bodies. For example, the municipalities can determine water intake points in the water bodies, establish special ban zones and create water protecting wood strips.

The Law of the Republic of Azerbaijan on the Water Economy of Municipalities allows the municipalities to create small irrigation offices in their territories. These small irrigation offices might make it possible to solve water economy problems of farmers located at the lands with municipal ownership, or those that are in the territory of municipality from administrative viewpoint. Although the current WUAs are in close touch with AWE, it would be better if they closely cooperate with municipal structures. The adjustment of the operation of WUAs with municipalities might have a positive impact on the settlement of gender problems and election of WUA representatives.

1.3. LEGAL AND POLICY FRAMEWORKS AND REGULATIONS[33]

There are numerous legislative documents and programs that can lead to a explore for preparedness against the negative effects of climate change. However, there is sufficient information in the legislation on climate change adaptations. Examples of these laws and policies include water, construction and forest codes, land reclamation and environmental agriculture laws, as well as regulatory rules for a few activities. These laws contain sufficient provisions and regulations to reduce the risk of adverse effects of climate change.

Adaptation in legislation and policy documents include rules, regulations and measures that reduce climate change vulnerability risks and increase capacities. The following activities are envisaged in the state programs and strategic road maps:

- Water pricing, water saving Irrigation and irrigation scheduling
- Wastewater recycling and use
- Dryland Agriculture and agricultural insurance
- Construction of processing enterprises for agricultural products
- Moving agricultural activities to less hazard-prone zones and crop management
- Strengthening dams around rivers and flood risk zonings, designing retention areas
- İncreasing water holding capacity of reservoirs
- Reforestation in basins and improvement of roads
- Construction of infrastructure to reduce water losses in irrigation
- Making paved canals in irrigation network
- Prevention of water wastage, protection of water sources
- Optimization of water use, reduction of flood and flood risks
- Coastal zoning

Land code

The Land Code aims to regulate land relations in Azerbaijan and identify different types of land ownership. The Land Code contains the main provisions on land use, protection, restoration and rational use. According to the Code, land plots under the 20-50-meter coastal strip of the Azerbaijani section of the Caspian Sea cannot be alienated while remaining in state ownership and can be used and leased only for state purposes by the decision of the relevant executive authority. However, the Land Code does not contain any provisions on climate change adaptations and the fluctuations of the Caspian Sea levels.

[33] https://e-qanun.az/

Water code

The current water code was adopted in 1997. This code determines the internal water resources (rivers, lakes, ground water etc.) of the Republic of Azerbaijan as a national asset. Water Code constitutes the basis of the water legislation and regulates the relations regarding the use of water bodies, their water resources, and their protection. All the water bodies constitute the water endowment of the country. According to the law, the water bodies can be under public, municipal, and private ownership. The public governance in the use and protection of the water bodies which are under the public ownership is exercised by the relevant bodies of executive power within the boundaries of their authorities. Despite its flexibility and modernity, there is no article on climate change adaptation in this code. At the same time, the code does not address the participation of communities and small farmers in water management. Although the Code defines the main executive bodies related to water management, it does not provide for the principles of cooperation between them. No issues related to gender-based water management are considered as well.

Law on Agrarian Insurance

This law regulates the relations related to the insurance of risks in the agricultural sector through a joint insurance mechanism, determines the legal, economic and organizational basis of agricultural insurance.

Agricultural producers are insured against one or more of the following risks on agrarian insurance subjects in accordance with the insurance rules:

- natural disasters.
- fires.
- plant diseases and pests.
- infectious diseases and poisonings.
- attack by wild animals and the spread and attack of especially dangerous pests.

The Law on Agrarian Insurance does not contain a specific reference to climate change, adaptation and possible climate-related risks. However, the law allows for insurance against climate-related natural disasters.

Law on amelioration and irrigation

The Law of the Republic of Azerbaijan on Amelioration and Irrigation is the key document that determines the amelioration/land reclamation and irrigation activity in the territory of Azerbaijan. According to the law, the amelioration and irrigation systems can be under public, municipal, and private ownership. In this law, the activities of the water user associations, municipalities and executive bodies are regulated in an interrelated manner. All water rights are determined by the state. According to this law, the state has an exclusive right on the management, distribution and the use of the water resources that are under its ownership. It should be noted that almost all irrigation systems in the Republic of Azerbaijan are owned by the state. According to the law, the implementation of irrigation measures shall not deteriorate the environmental situation.

However, this law also does not provide anything about integrated water management, its importance and climate change adaptation. The law does not consider the community participation in the water governance as well. No issues related to gender-based water management are considered as well. Although the law emphasizes the importance of sustainable use of water resources, the law does not disclose the mechanism for such use and there is no provisions about climate change and adaptations.

Law on water supply and wastewater

This law was adopted in 2000. The main goal of the law is to determine the provision of the population, enterprises and institutions with water and management of wastewater. According to the law, the Cabinet of Ministers and the local bodies of executive power are key executive bodies.

This law establishes the main water rights and wastewater management rights. Article 5 of the Law envisions the key principles of water supply and wastewater management. Article 6 indicates the main duties of the water supply and wastewater institutions. According to Article 10, the permission to use water is granted by the local bodies of executive power.

This law also does not mention for climate change adaptation and integrated use of water resources.

Law on water economy of municipalities

This law was adopted in 2001. According to this law, the water economy facilities of the municipalities include the systems and settings established regarding the use, restoration and protection of water resources that are not under the public and private ownership or under the ownership of the water user associations. The municipalities can establish and manage water economy facilities in the areas that are under their ownership. Besides, the operation of small water sources which are under the ownership of the municipalities, is implemented by the municipalities. According to the law, the municipalities establish water economy in their territories.

This law generally works very poorly in the country. The law does not provide for the participation of small entrepreneurs, farmers, and communities in water management. The law does not contain anything related to climate change adaptation.

A comprehensive list of water legislation that drives and influences the agricultural water use in Azerbaijan as well as the overview of possible climate change contents of existing laws is provided below.

Law on State of Emergency

Law on State of emergency of Azerbaijani Republic were adopted in 2004. In accordance with the Constitution of the Azerbaijan Republic, a temporary state of emergency may be imposed in Azerbaijan or in parts of it for the protection of the country and the security of its citizens. The state of emergency determines additional responsibilities and special regime of operations for state authorities and administration bodies, enterprises, departments and organizations, community and civil society organizations and citizens. The purpose of the state of emergency is to normalize the situation as soon as possible, to restore the rights and freedoms of citizens, to eliminate the consequences of natural disasters, environmental and other disasters. According to Article 2 of this law, a state of emergency is declared during natural disasters (e.g. floods, landslides), epidemics, epizootics, major environmental and other accidents.

Town Planning and Building Code

Town planning and Building Code of Azerbaijani Republic were adopted in 2012. It is the main legal document on the safety and regulations of construction throughout Azerbaijan. This document is the legal ground that stipulates principles of all town planning and building activities in Azerbaijani Republic. This is the only document that provides legal ground for structural safety of buildings, including school buildings, coastal areas. The document also provides a legal ground for the roles of government, municipalities, and companies with respect to land use and building activities.

Article 4 and 5 shows main directions of the government policy and authority in the field of urban planning and building. Article 6 talks about authority of municipalities. Article 9 stipulates principles of fire and environmental safety of constructions and buildings. According to article 60, all the material used in buildings must be fire-resistant and reliable to prevent fires spreading out. Walls, doors, ceilings (article 61) and floors should be constructed from fire resistant materials and provide easy fire compartmentalization. In addition, the article suggests that fire compartments should be built and is easily accessible during the fires. According to article 62, stairs should be easily accessible and usable during emergency evacuations. Article 54 requires that materials used in constructions must be certified according to relevant requirements. Law does not contain a specific reference to climate change, adaptation and possible climate-related risks.

Law on Fire Safety

Law on Fire Safety provides legal ground for non-structural and structural fire safety of all types of buildings, including historical buildings, private houses, schools etc. The current law on fire safety was adopted in 1997. The law determines legal ground and principles of state fire protection and control. The law is enforced for the provision of fire protection on the territory of the Azerbaijan Republic of human life and health, national treasures, all types of property.

Article 9 of the law on Fire Safety specifies that State Fire Service is a main governmental body that guarantees fire safety of all types of buildings. Article 5 stipulates functions of relevant authorities with respect to fire safety. According to this article, related executive bodies have following functions:

- Provide the implementation of fire safety measures at buildings, schools, enterprises and managed areas
- Establish and support fire service teams in workplaces and schools
- Organize implementation of fire safety propaganda and educate population in fire safety
- Provide the strict compliance with norms, standards and rules of fire safety by the management of government authorities, enterprises and organizations as well as citizens

The Law does not contain a specific reference to climate change, adaptation and possible climate-related risks.

The Law on Civil Défense

The law on civil defense was adopted in 1997. The Law of Azerbaijan Republic on Civil Defense stipulates the legal grounds and principles of civil defense in Azerbaijan Republic and regulates public relations in the field of civil defense. According to Article 5, the aim of civil defense is making of preventive measures to prevent emergencies, minimizing the possible damage and losses due to emergencies and mitigation of emergencies and their consequences.

The article 6 defines the responsibilities of the state, companies, communities and individuals in the field of civil defense. According to this this article, all interested parties in the field of civil defense in emergencies are responsible for minimizing the effects of the state of emergency.

Article 11 stipulates that the Ministry of Emergency Situations of Azerbaijan Republic carries out awareness rising in the field of protection of population. The Law does not contain a specific reference to climate change, adaptation and possible climate-related risks.

The Law on the Protection of the Environment

The Law on the Protection of the Environment (1999) establishes the legal, economic, and social grounds of the environmental protection. One of the key goals of the law is to ensure an efficient use of natural resources. The law establishes the main principles of the use of environment. These principles envision efficient use and restoration of natural resources. Article 10 envisages the determination of the threshold limits of the use of natural resources and the deployment of the harmful items, household and production wastes discharged into the environment, which is entrusted to the relevant body of executive power. The law stablishes the rights and responsibilities of the state, local self-governing bodies, citizens, and public unions in the field of environmental protection. There are no mentions about the children separately, while the laws recognize right of all people to clean environment. The Law does not contain a specific reference to climate change, adaptation and possible climate-related risks, however, several activities defined by law can be considered as adaptation activities.

The Law on Environmental Safety

The Law on Ecological Safety (1999) also offers a wide-ranging supervision related to protection of the public from natural and manmade hazards. This law specifies the rights and duties of the state, local authorities, individuals, and public organizations; generation and dissemination of information; and requirements for maintenance of ecological safety. The law aims to establish legal framework for protection of lives and health of citizens and protection of all environmental values. According to the law, reduction of environmental risks and elimination consequences of environmental disasters is in the responsibility of the state and local governing bodies. The Law does not contain a specific reference to climate change, adaptation and possible climate-related risks, however, several activities defined by law can be considered as adaptation activities.

Forest code

Forest code was adopted in 1997. Azerbaijani Forest Code makes legal grounds for tending, protecting, restoring, and using the Azerbaijani forests, shrublands and soils of forest fund. This code identifies the forest resources of the Republic of Azerbaijan as a shared national wealth. The Forest Code constitutes the basis of the forest legislation and regulates the balance between the use and protection of forest resources. All the forests constitute the forest fund of the country. There is no opportunity for representatives of the private sector or local communities to participate in management of forests. The Law does not contain a specific reference to climate change, adaptation and possible climate-related risks, however, several activities defined by law can be considered as adaptation activities.

Laws of Azerbaijani Republic on Municipalities

Laws of Azerbaijani Republic on Municipalities (e.g. law on Water Economy of Azerbaijan) suggest that municipalities are the main institutions in municipality lands that may carry various types of DRR activities. According to law, hazard risks can be reduced by joint efforts of municipalities, communities and governments. Law on Management of municipality lands stipulate that municipality lands should be managed effectively this management should not cause high hazard risks. Although these laws do not contain specific provisions on climate change and adaptation, disaster protection activities can be considered as adaptation activities.

Orders and decrees of the President of Azerbaijan[34]

In addition to laws and regulations, there are Presidential decrees and decisions of the Cabinet of Ministries that may include CCA, which are listed below. Although many of these rules and regulations contain provisions to adapt and reduce the risk of natural disasters, there are no specific "reminders" of climate change and adaptation.

- Decree of the President of the Republic of Azerbaijan on approval of the "Regulations on the Electronic water economy information system", 13.02.2021, N1289
- Order of the President of the Republic of Azerbaijan "On additional measures to ensure the efficient use of water resources", 27.08.2020, N2178
- Order of the President of the Republic of Azerbaijan "On improvement of water supply management in the Republic of Azerbaijan", 11.06.2004, N 252
- Decree of the President of the Republic of Azerbaijan "On measures to improve management in the field of amelioration and water economy", 23.02.2006, N 372
- Order of the Republic of Azerbaijan "On privatization of small hydropower plants", 21.12.2001, N 844
- Order of the President of the Republic of Azerbaijan "On measures to improve the supply of irrigation water to arable lands and to meet the needs of the population for drinking water" 15.05.2013, N2894
- Order of the President of the Republic of Azerbaijan "On measures to improve the supply of irrigation water to arable lands and to meet the needs of the population for drinking water", 05.06.2017, N2962
- Order of the President of the Republic of Azerbaijan "On measures to combat the harmful effects of mudflows and floods and eliminate the emergency situation", 03.08.2018, N384
- Decision of the Cabinet of Ministers of the Republic of Azerbaijan on the "Rules of state accounting of waters," 17.01.2000, N7
- "Rules for determination of water protection zones, their coastal protection strips, sizes, borders and use" Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 24.03.2000, N56
- "Regulations on the rules of paid water use in the Republic of Azerbaijan" Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 18.03.2006, N84
- "Rules for exercising state control over the use and protection of water bodies", Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 25.09.1998, N195
- "Rules of standardization in the field of use and protection of water objects", Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 15.10.1998, N206
- "Preparation and implementation of water use limits" Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 15.10.1998, N206
- "Development, coordination, state examination, approval and implementation of schemes of combined use and protection of water resources", Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 15.10.1998, N206
- "Rules for approval of internal water use plans and general system plans for water use", Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 15.10.1998, N206
- "On the rules of maintaining the state water cadastre", Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 05.12.1995, N261

[34] President.az

- “Rules of water use”, Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 17.08.2014, N262
- “Rules for approval of the annual water economy balance for the Republic”, Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 03.05.2019, N208
- “Rules for construction, operation and maintenance of telecommunication facilities and facilities in the border areas of the Republic of Azerbaijan, including border rivers, in the Azerbaijani part of the Caspian Sea (lake)”, Decision of the Cabinet of Ministers of the Republic of Azerbaijan, 06.01.2006, N3
- “Rules for Determining and Using Flood Zones, Their Size, and Boundaries” (July 27, 2004 № 99)
- State Protection Rules for Historical and Cultural Monuments (August 2, 2001, №132).
- Regulations on state regulation of land use and use (October 23, 2003, 75975).
- Regulations on Monitoring of the Environment and State Natural Resources (July 1, 2004, №90).
- Regulations of the State Committee for Urban Planning and Architecture of the Republic of Azerbaijan (November 9, 2007, №647).
- Rules for the gradual implementation of state control in the field of construction by the Ministry of Emergency Situations of the Republic of Azerbaijan (December 6, 2008, №273).
- Rules of state control over the use and protection of lands (November 28, 2000, №421).
- Rules for maintaining the State Land Cadastre (June 7, 1999 №94).
- Rules for the use of lands intended for railway transport and lands belonging to the special protection zone of the railway (February 23, 2005, №33).
- Rules for issuing permits for engineering and agricultural works on lands exposed to exogenous geological processes (May 1, 2000, №79).
- General bases and principles of land zoning (May 1, 2000, №79)
- Decision of the Cabinet of Ministers of the Republic of Azerbaijan on approval of “Types of protection measures and their application in areas with high probability of occurrence of potentially dangerous natural and man-made events” (February 6, 2017 № 31)
- Decision of the Cabinet of Ministers of the Republic of Azerbaijan on additional measures to identify landslide-prone areas and restrict construction work in these areas (March 5, 2015 № 56)

2. IMPACTS, RISKS AND VULNERABILITIES[35]

2.1. CURRENT AND PROJECTED CLIMATE TRENDS AND HAZARDS

Temperature and precipitation changes

In recent decades, a gradual increase in temperature has been observed in the entire territory of the country. Depending on the area and seasons, the temperature increase values are different. For example, the number of frosty days in winter has decreased, and this process is most often observed in mountainous areas. In the last 23 years, temperature anomalies were 1.10C on average across the country. In 2023, the average temperature for the entire country was 14.6 degrees, which is 1.90C above the average temperature for 1971-2000 (12.70C).

[35] Third and Fourth National Communications to UNFCCC

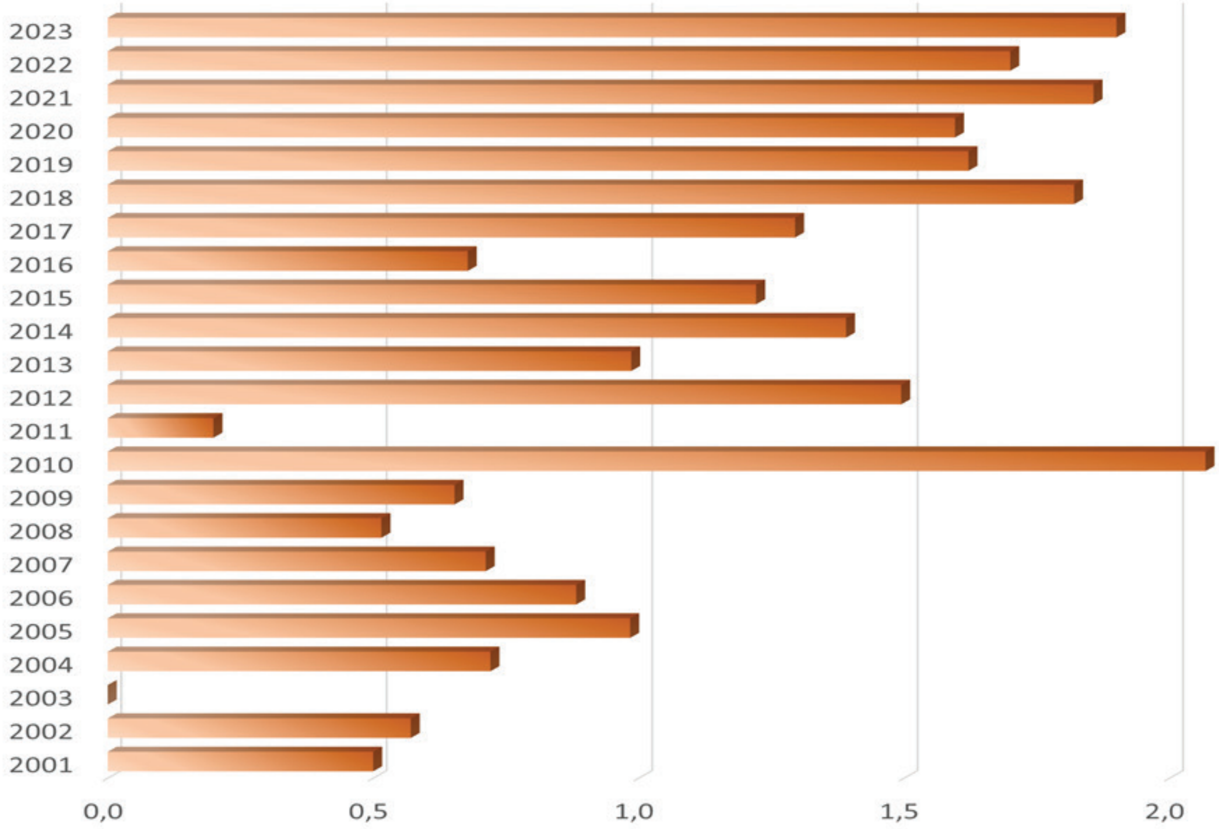
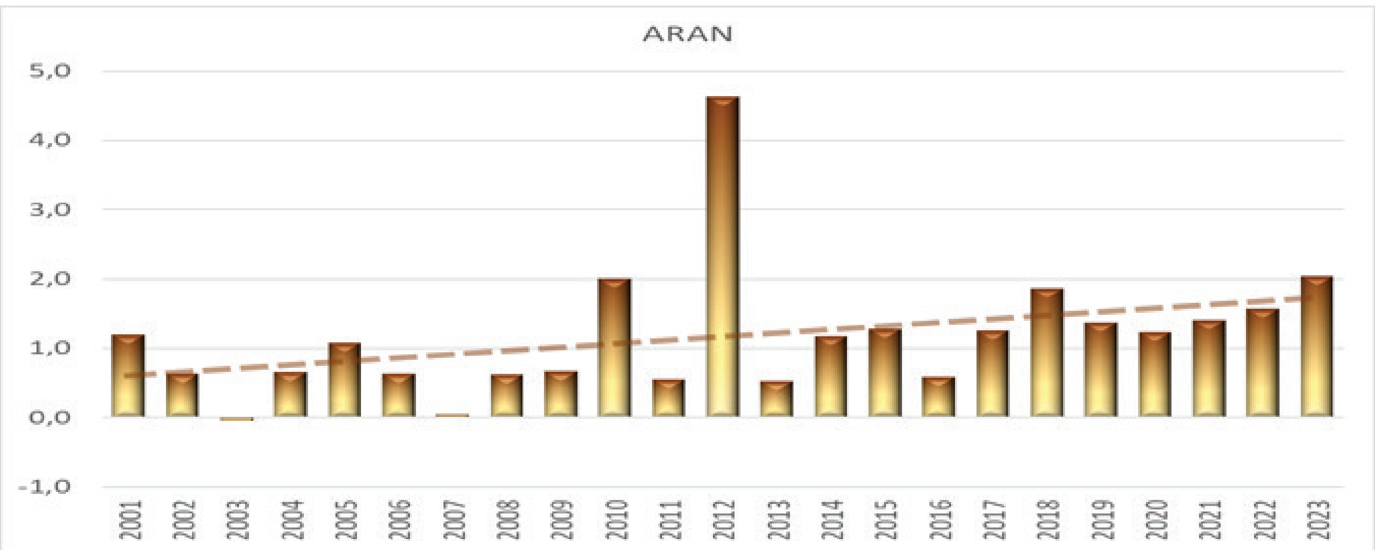
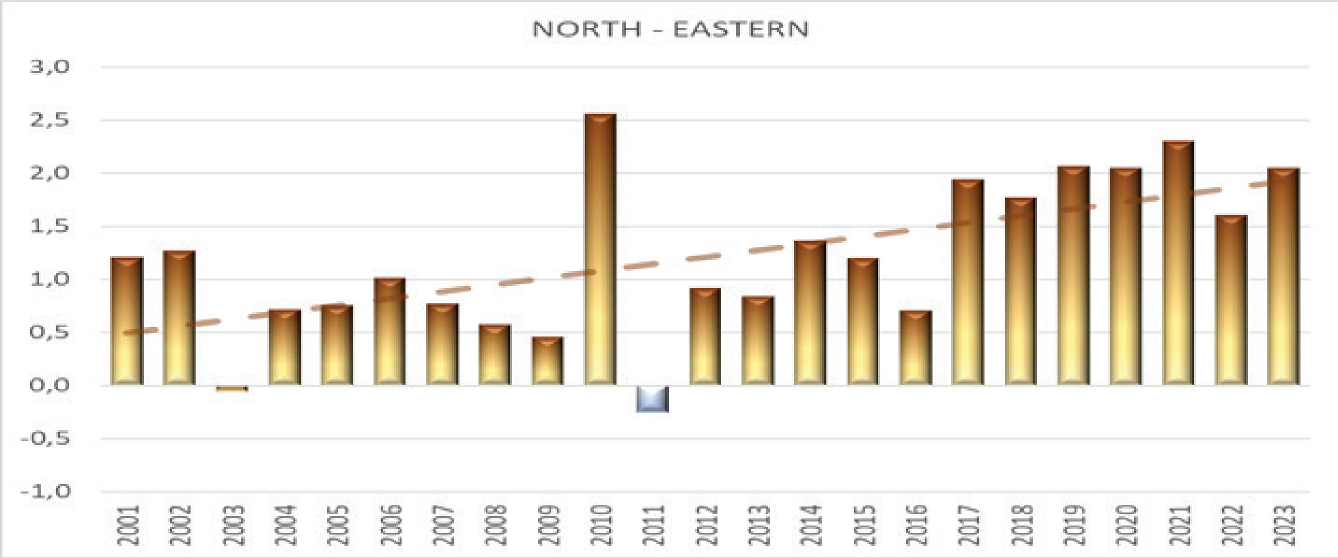


Figure 57. Average annual temperature changes over the years

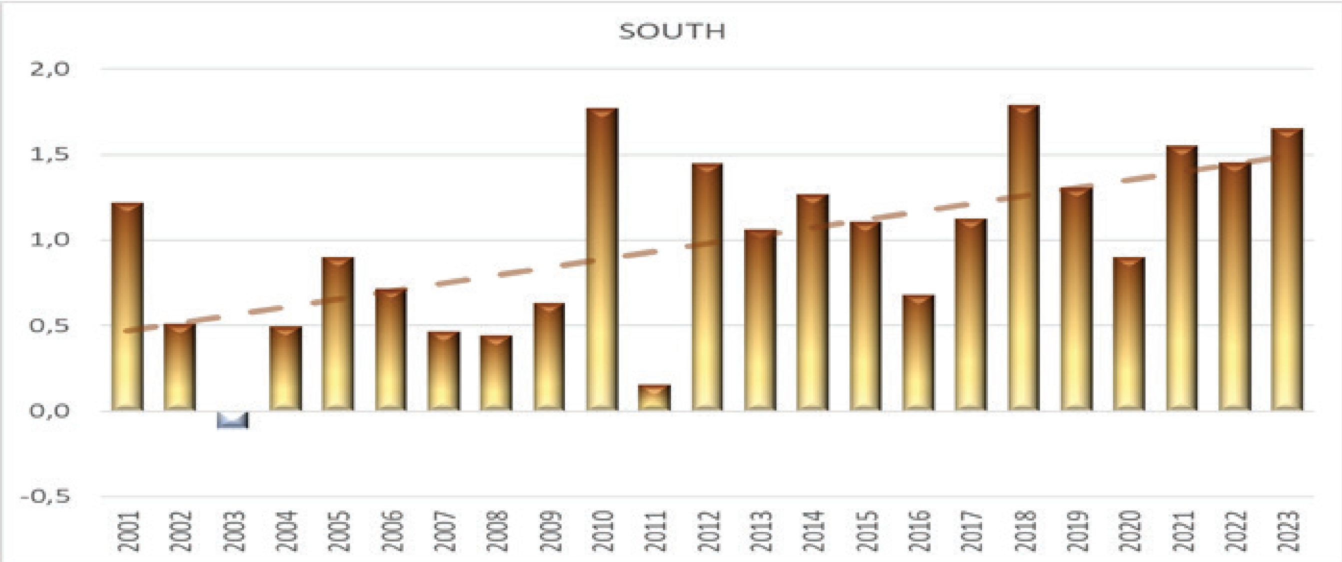
Average annual temperature and precipitation anomalies were calculated for 8 regions characterized by different climatic conditions (Aran, North-East, North-West, Mountainous-Shirvan, West, South, Absheron and Nakhchivan AR) based on data from 35 hidrometeorological stations.



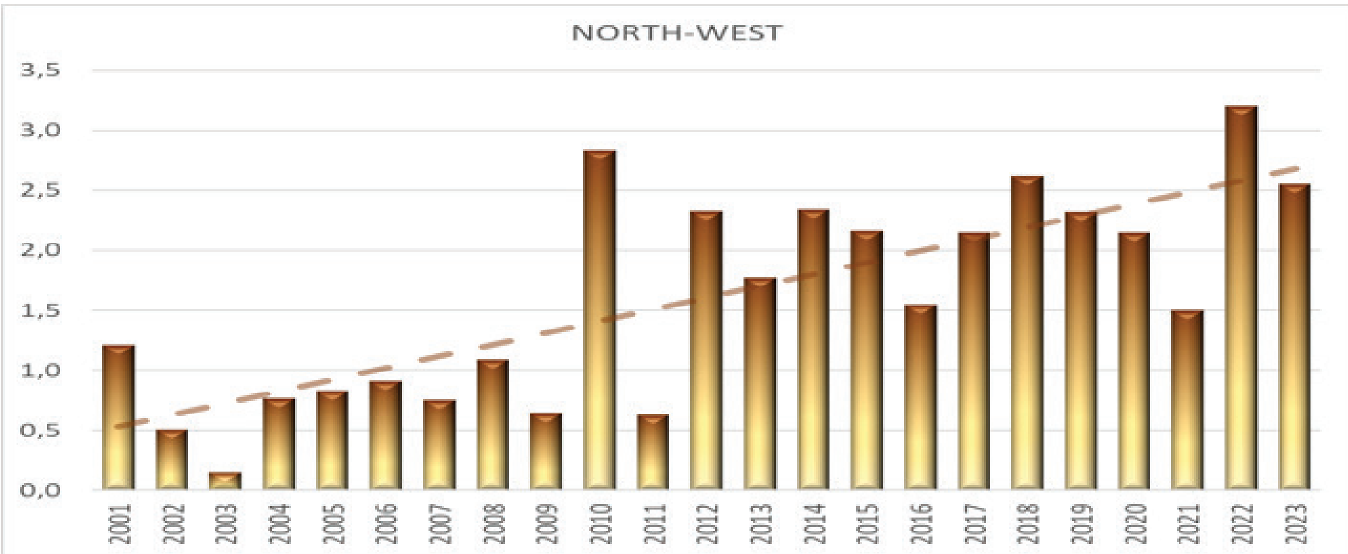
For period of 2001-2023 the average temperature anomaly in Aran region was +1.0°C, (compared to the 1971-2000). The highest average temperature anomaly in region was 4.6°C in 2012. The highest anomaly was observe in 2012 +6.7°C Zardab, +5.8°C Mingachevir.



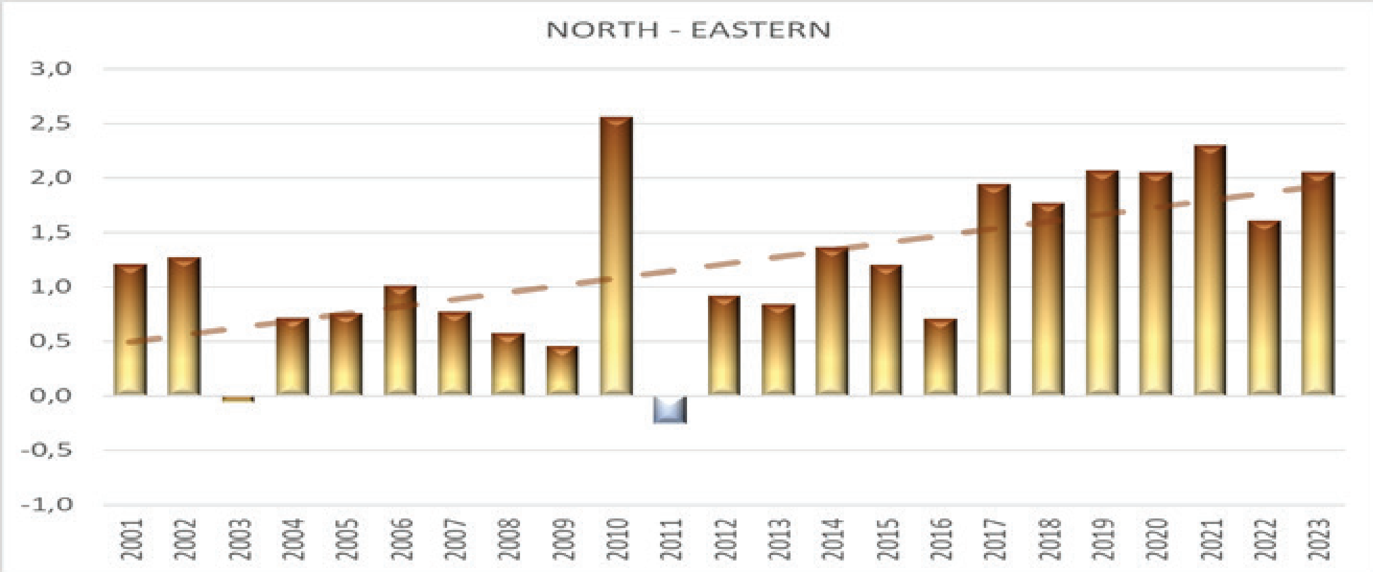
For period of 2001-2023 the average temperature anomaly in north-eastern region was +1.2°C, (compared to the 1971-2000). The highest average temperature anomaly in region was 2.6°C in 2010. Highest anomaly was observe in 2010 +2.3°C Guba, 2023 +3.3°C Gyryz.



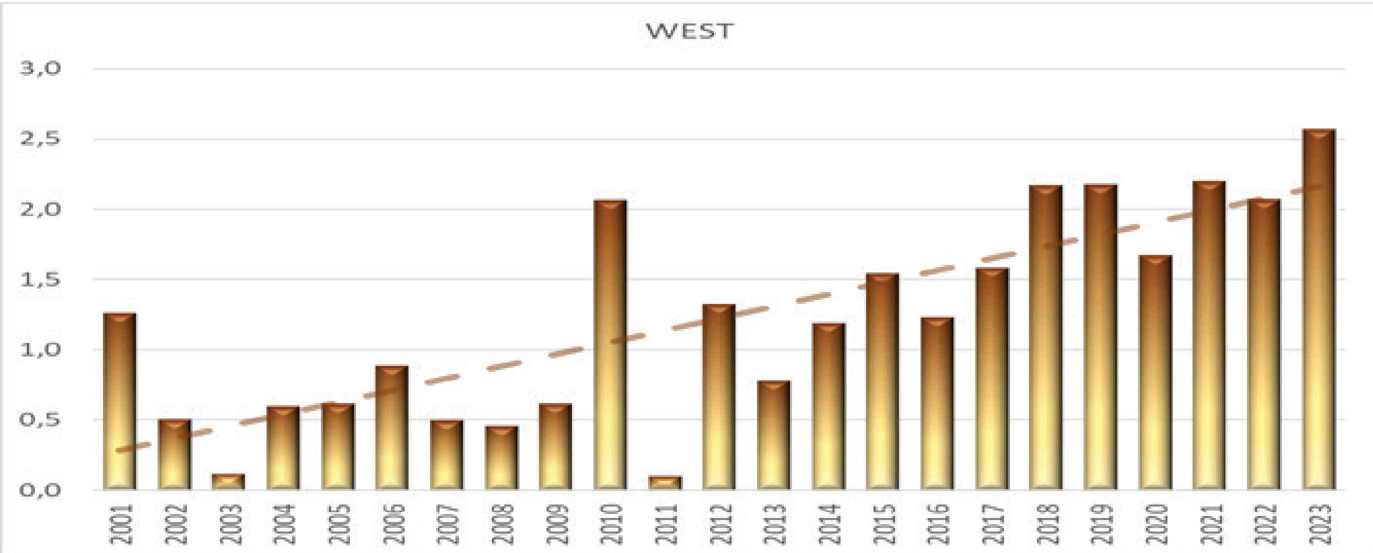
For period of 2001-2023 the average temperature anomaly in southern region was +0.8°C °C, (compared to the 1971-2000). The highest average temperature anomaly in region was 1.8°C in 2010 and 2018. Highest anomaly was observe in 2010 +1.9°C Lankaran, 2018 +1.9°C Bilasuvar.



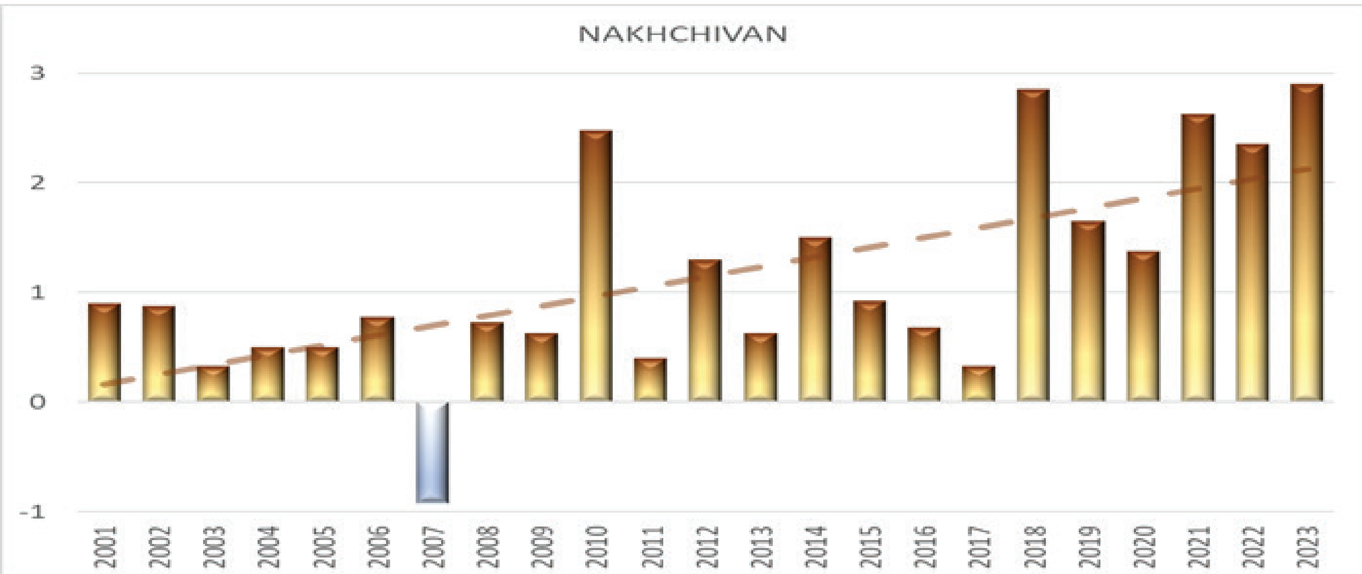
For period of 2001-2023 the average temperature anomaly in north-west region was +1.6°C, (compared to the 1971-2000). The highest average temperature anomaly in region was 3.2°C in 2022. Highest anomaly was observe in 2022 +3.8°C Sheki.



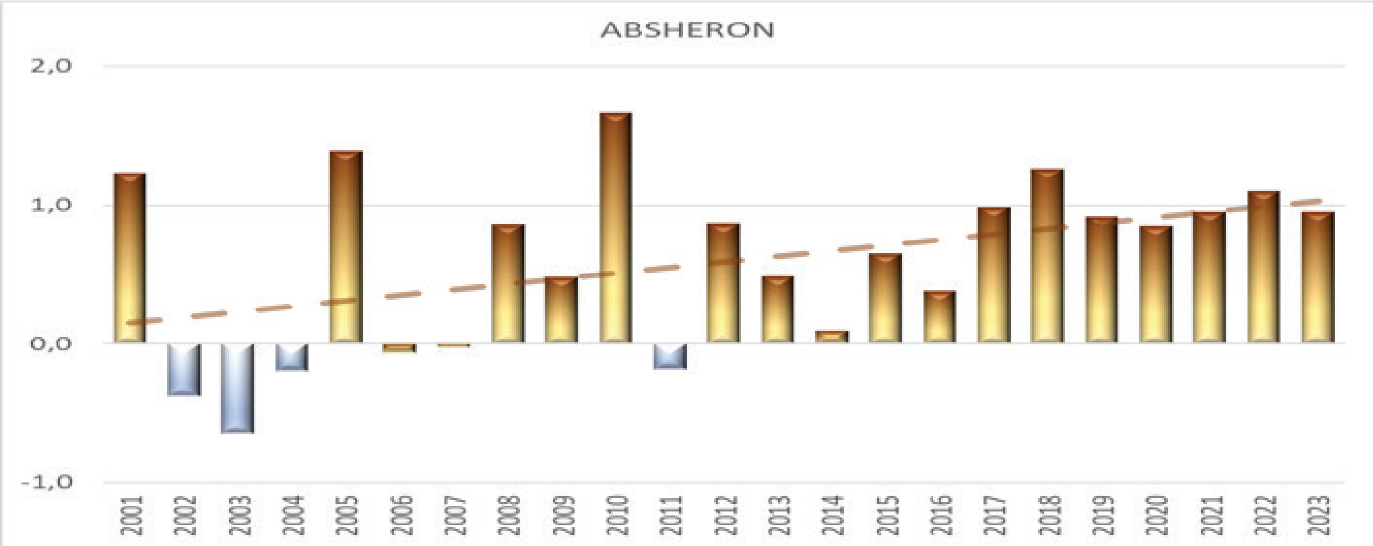
For period of 2001-2023 the average temperature anomaly in Daghlig Shirvan region was +1°C, (compared to the 1971-2000). The highest average temperature anomaly in region was 2.2°C in 2023. Highest anomaly was observe in 2023 +2.2°C Maraza.



For period of 2001-2023 the average temperature anomaly in western region was +1.1°C, (compared to the 1971-2000). The highest average temperature anomaly in region was 2.6°C in 2023. Highest anomaly was observe in 2019 +2.6°C Gadabay, 2018 +2.1°C Ganja, 2021 +2.8°C Akhstafa.



For period of 2001-2023 the average temperature anomaly in Nakhchivan AR was +1.1°C, (compared to the 1971-2000). The highest average temperature anomaly in region was 2.9°C in 2023. Highest anomaly was observe in 2018 +2.9°C Nakhchivan, 2010 +3.5°C Shahbuz, 2021 +3.8°C Sharur, and 2023 +4°C Julfa.



For period of 2001-2023 the average temperature anomaly in Absheron was +0.6°C, (compared to the 1971-2000). The highest average temperature anomaly in region was 1.7°C in 2010. Highest anomaly was observe in 2018 +1.8°C Baku, 2005 +4°C Alat.

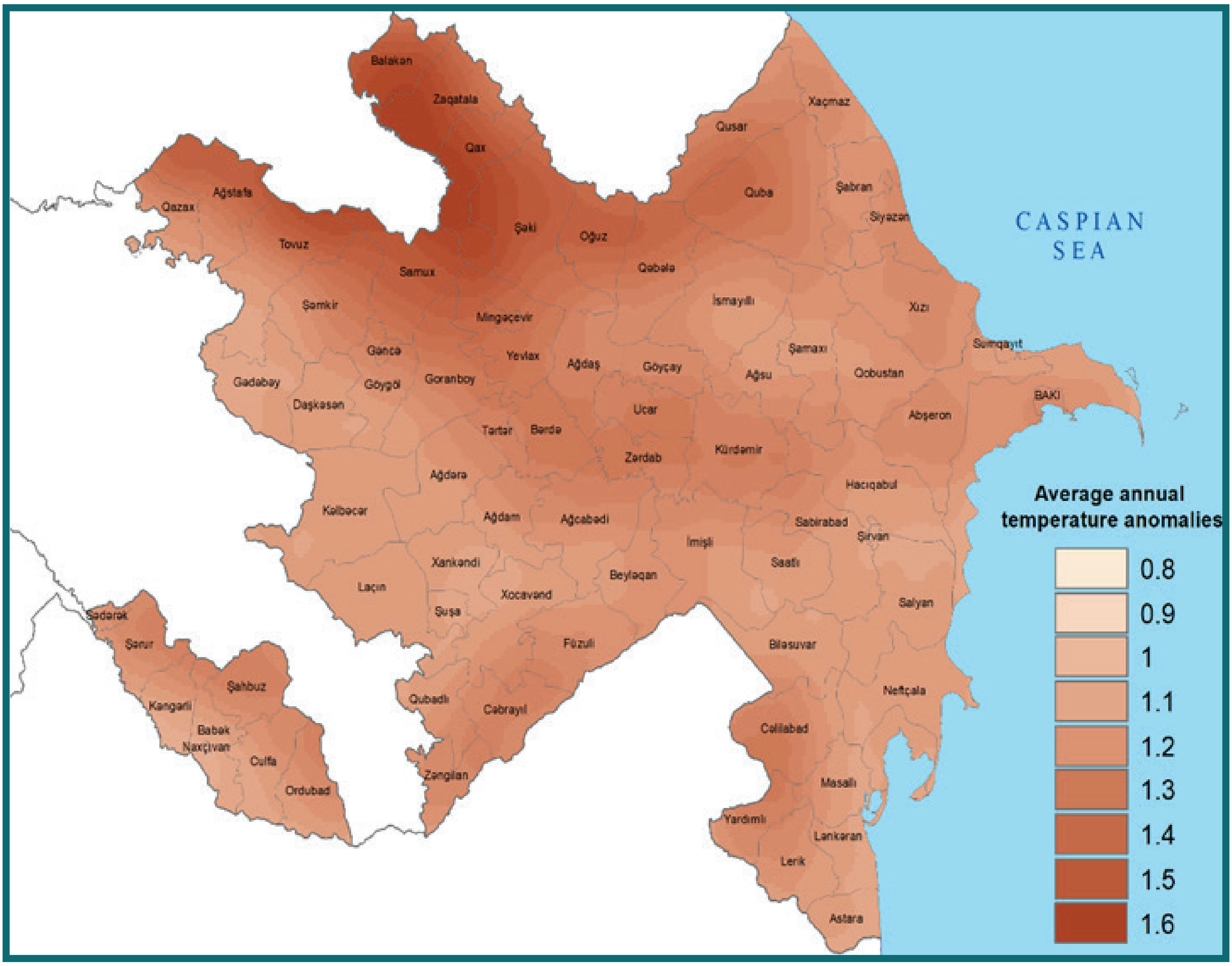


Figure 58. Average annual temperature anomalies for 2001-2023

The air temperature anomaly in most parts of the country varies between positive 0.9-1.20C. The highest positive anomaly is observed in the northwestern region of 1.3-1.60C. The least positive anomaly is observed in coastal areas of 0.6-0.90C.

Precipitation

Recent decades are characterized by an increase in precipitation extremes. It is also distinguished by its contrasting distribution in time and space: when there is a drought in one part of the country heavy rains cause floods in another part.

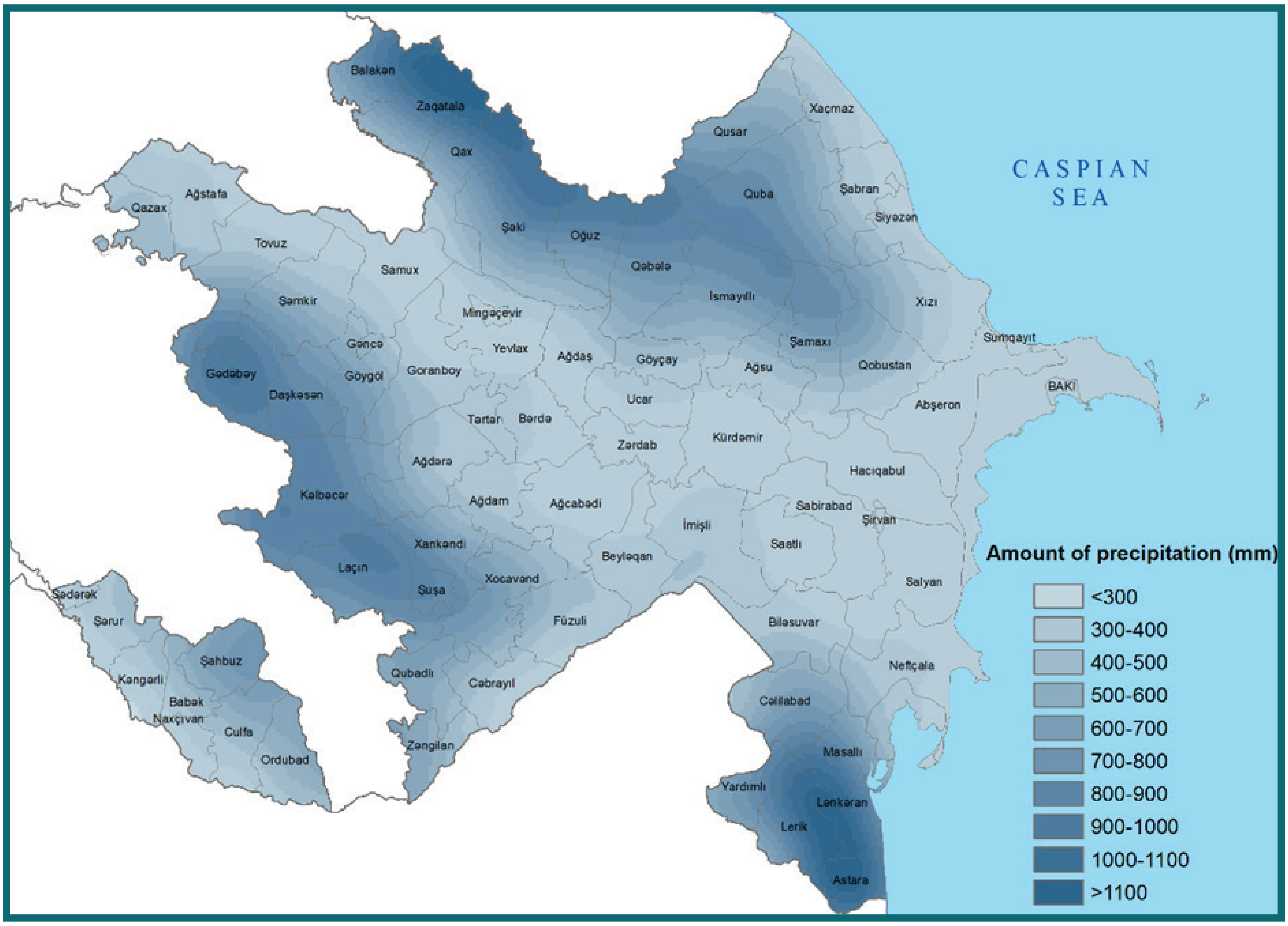


Figure 59. Average amount of precipitation in 2001-2023

In the last two decades, the multi-year average amount of precipitation was 464 mm. In the territory of Azerbaijan, the least average annual precipitation falls in southeastern Gobustan. The amount of annual precipitation is less than 300 mm in the Kura-Araz plain, the plains along Araz river in Nakhchivan MR, and the Absheron peninsula. The amount of precipitation gradually increases from the plains to the mountains.

Precipitation in the mountains increases from sea level to a certain height (2600–2800 m in the Greater and Lesser Caucasus, 2600–3000 m in Nakhchivan) and then gradually decreases. The maximum amount of annual precipitation in these areas is 1400–1600 mm on the southern slope of the Greater Caucasus, 800 mm on the north-eastern slope, 800-900 mm in the Lesser Caucasus and Nakhchivan MR.

Unlike other mountainous areas of the republic, the amount of precipitation increases to 1700-1800 mm in Talysh mountains within elevention zones 200-600 m height, and then decreases to 700-900 mm by increase of height.

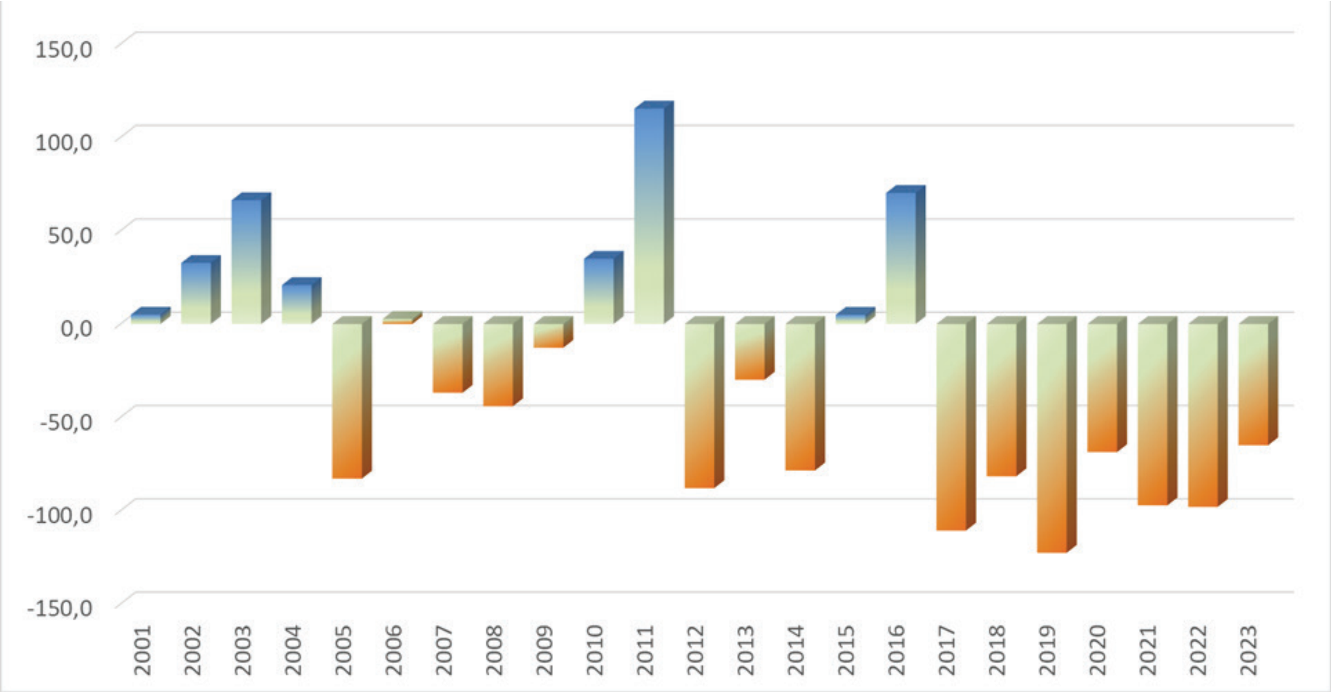
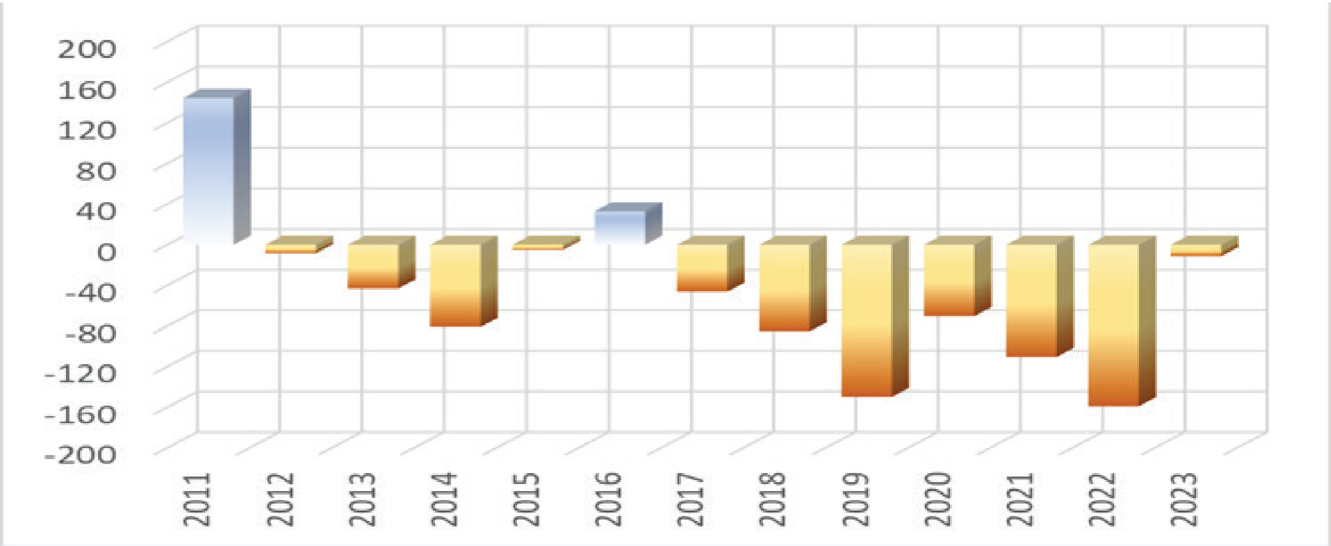
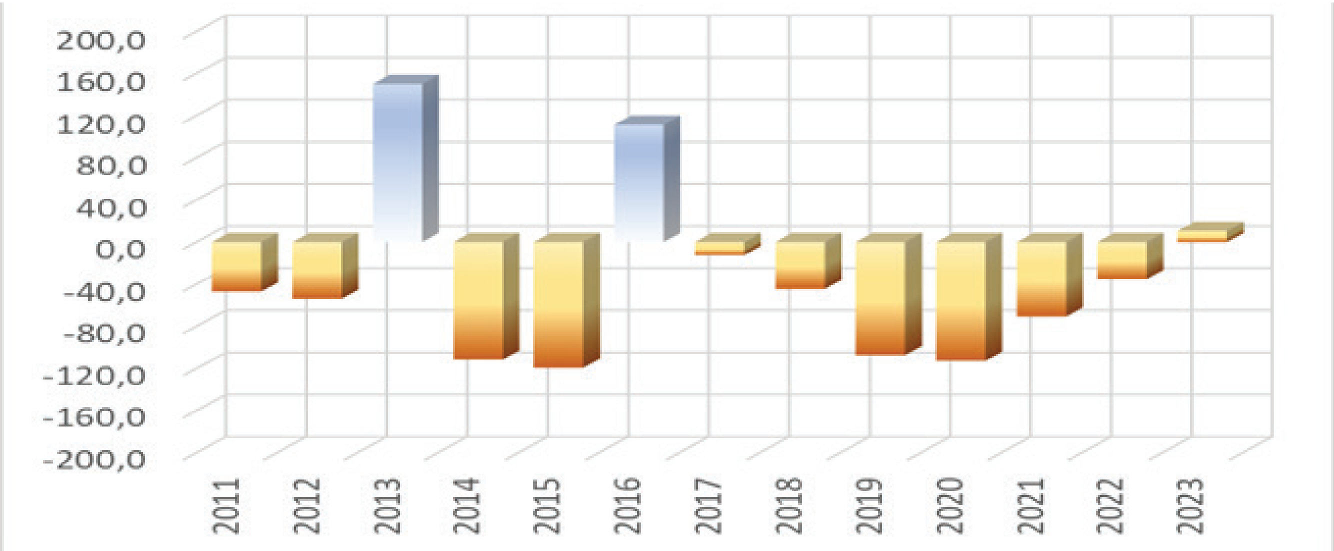


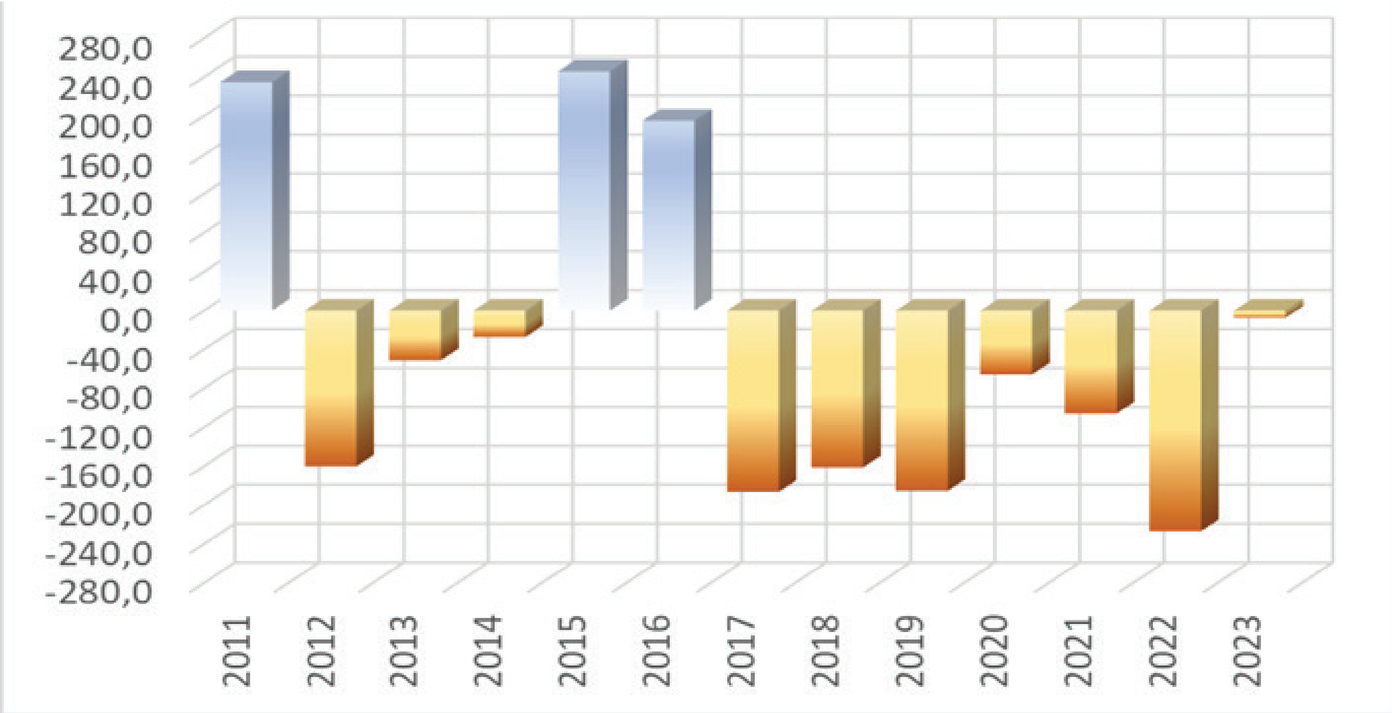
Figure 60. Average precipitation anomalies



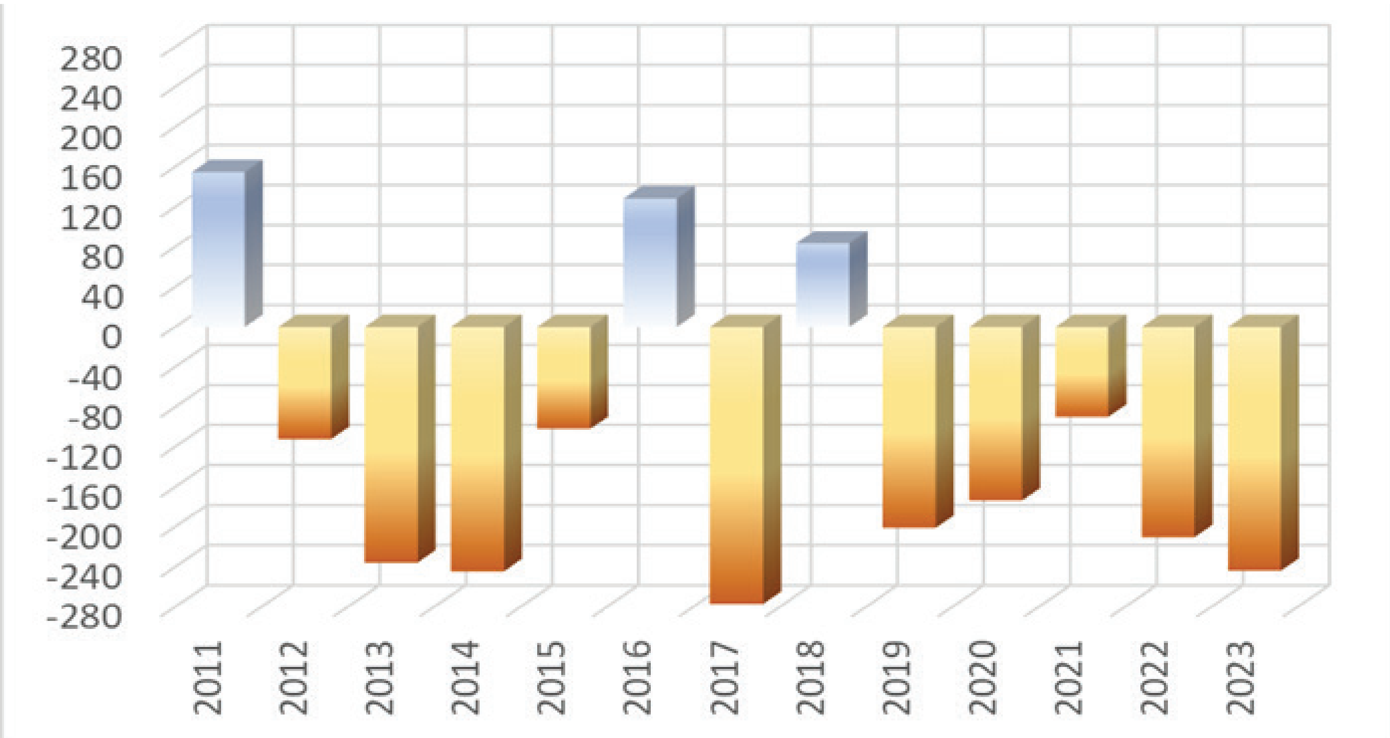
Over the past 13 years, the average amount of precipitation in the Aran region has decreased by 45.5 mm, which is 13.5% of the 1971-2000 norm (333.2 mm). The highest anomaly in region was -159 mm in 2022, which is 47.7% of the 1971-2000 norm (333.2 mm).



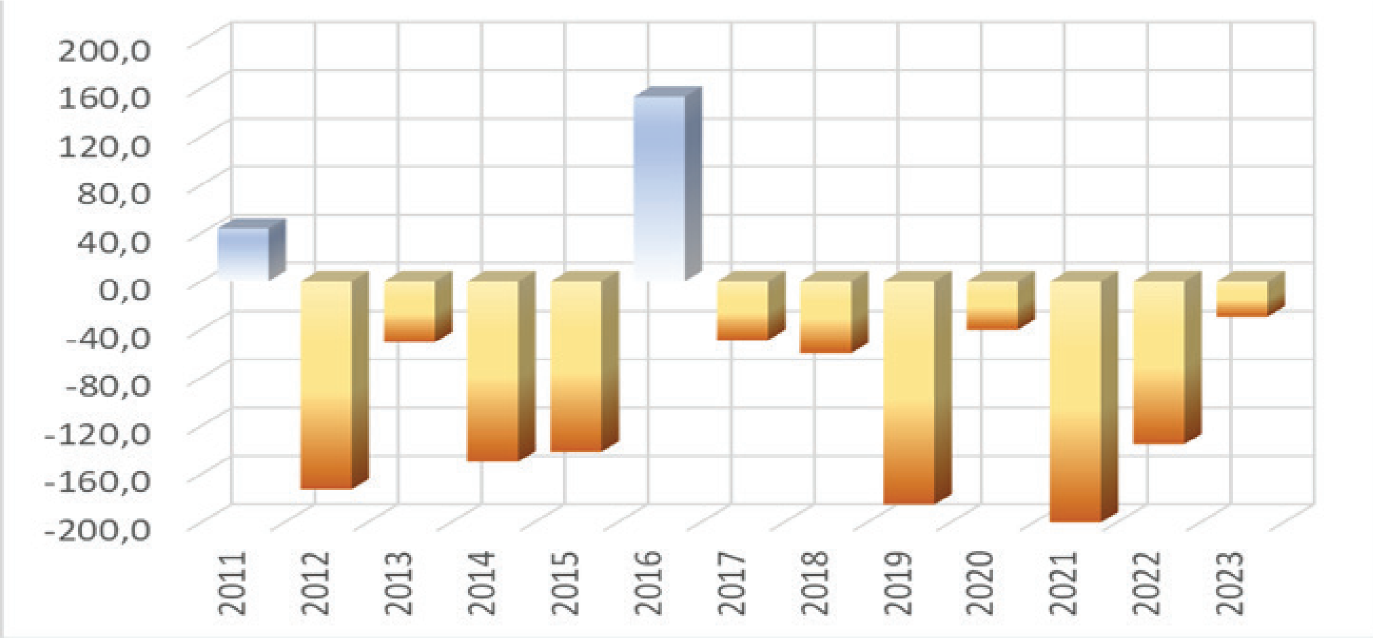
Over the past 13 years, the average amount of precipitation in the north-east region has decreased by 34 mm, which is 6.5% of the 1971-2000 norm (528.7 mm). The highest anomaly in region was -119.4 mm in 2015, which is 22.6% of the 1971-2000 norm (528.7 mm).



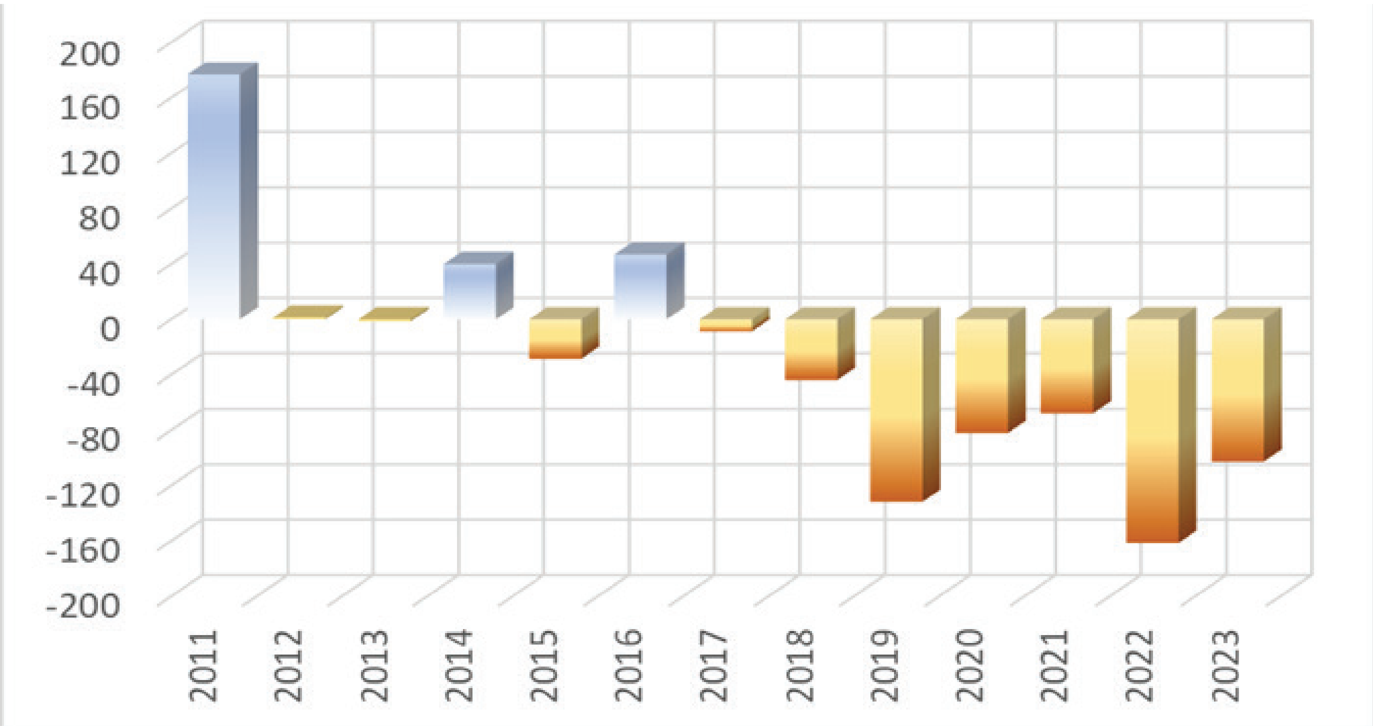
Over the past 13 years, the average amount of precipitation in the Southern region has decreased by 38.5 mm, which is 5.2% of the 1971-2000 norm (735 mm). The highest anomaly in region was -226.7 mm in 2022, which is 30.8% of the 1971-2000 norm (735 mm).



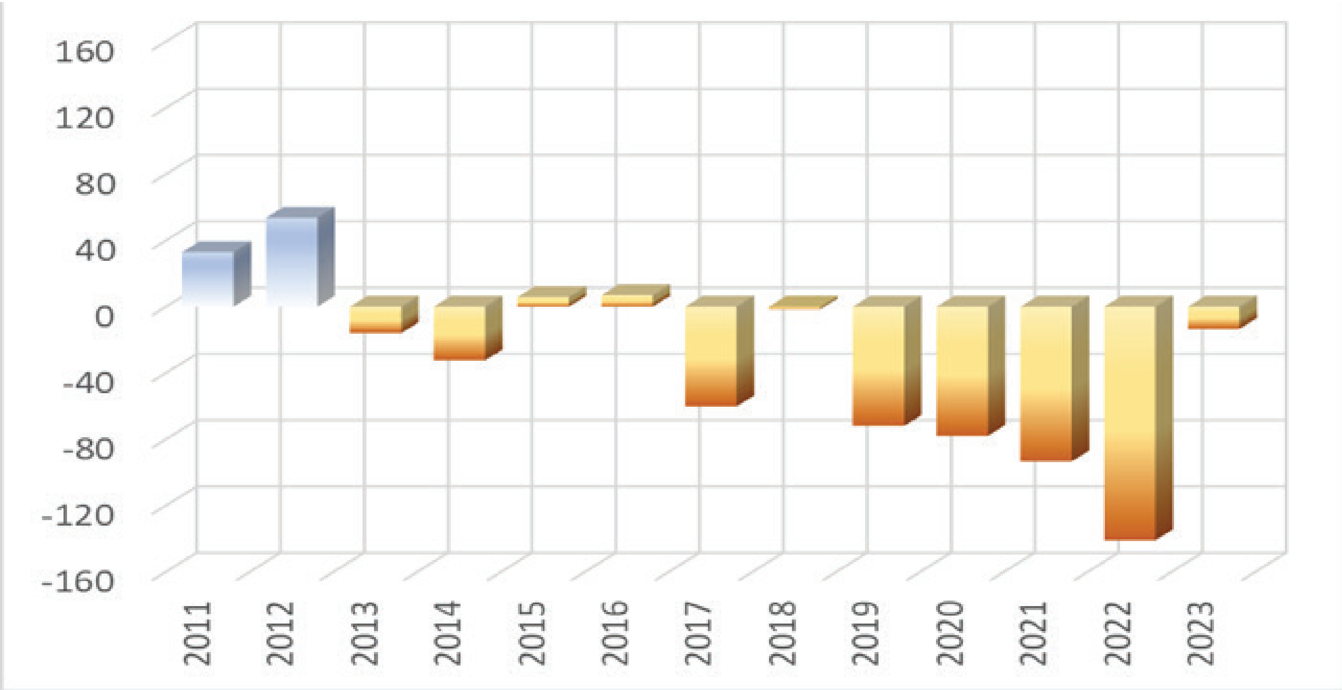
Over the past 13 years, the average amount of precipitation in the north-west region has decreased by 117 mm, which is 12.9% of the 1971-2000 norm (908 mm). The highest anomaly in region was -277.1 mm in 2017, which is 30.5% of the 1971-2000 norm (908 mm).



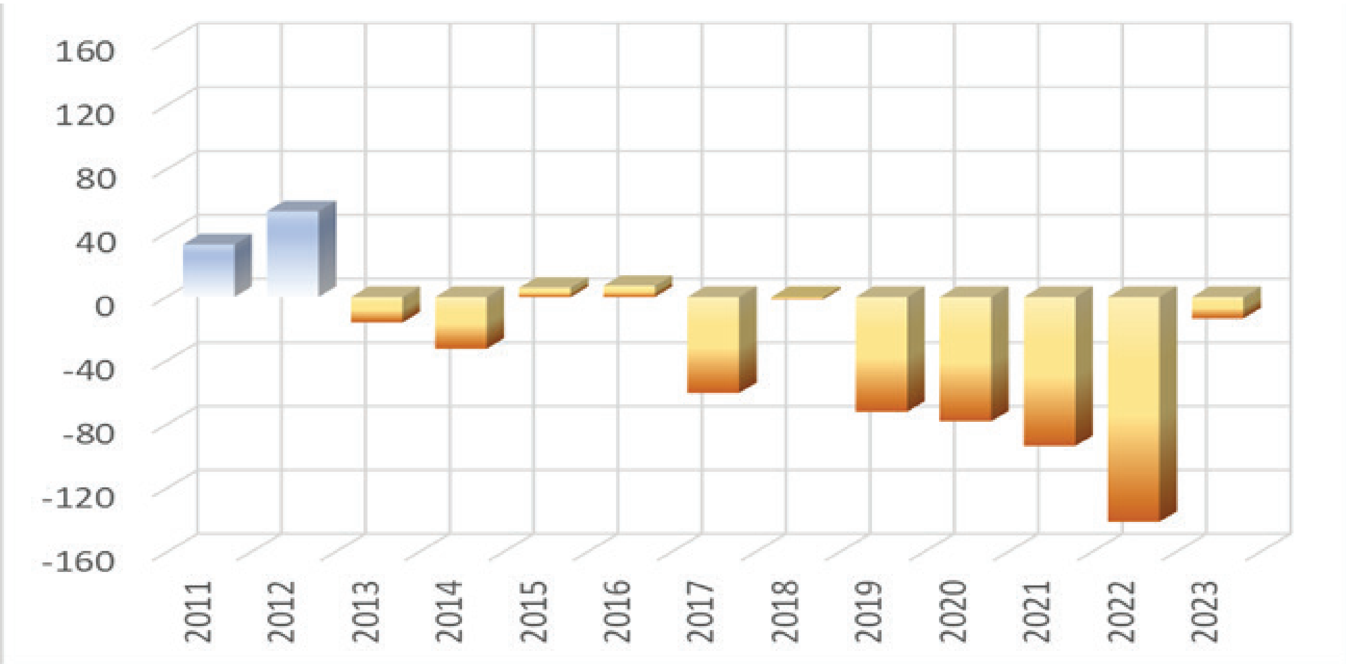
Over the past 13 years, the average amount of precipitation in the Daghlig Shirvan region has decreased by 80 mm, which is 16% of the 1971-2000 norm (497 mm). The highest anomaly in region was -226.6 mm in 2021, which is 45.6% of the 1971-2000 norm (497 mm).



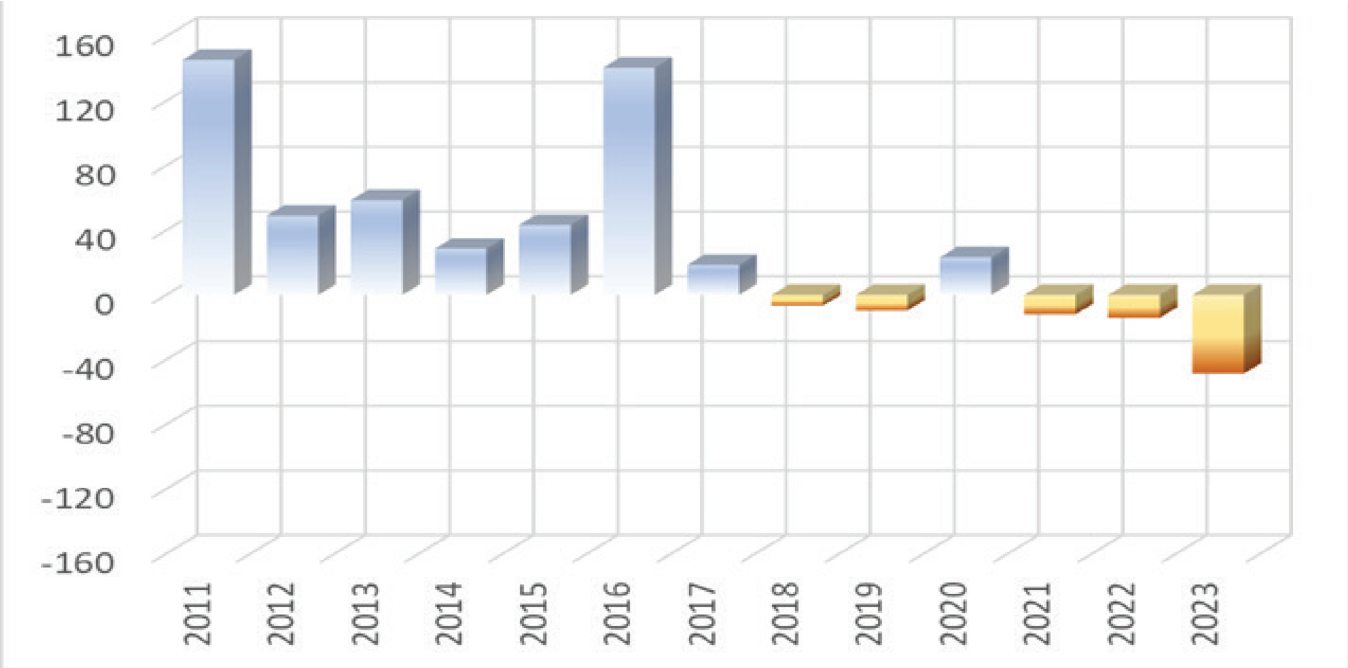
Over the past 13 years, the average amount of precipitation in the Western region has decreased by 28 mm, which is 6.5% of the 1971-2000 norm (427 mm). The highest anomaly in region was -161.4 mm in 2022, which is 37.8% of the 1971-2000 norm (427 mm).



Over the past 13 years, the average amount of precipitation in the Nakhchivan AR has decreased by 31 mm, which is 11% of the 1971-2000 norm (280 mm). The highest anomaly in region was -141 mm in 2022, which is 50% of the 1971-2000 norm (280 mm).



Over the past 13 years, the average amount of precipitation in the Nakhchivan AR has decreased by 31 mm, which is 11% of the 1971-2000 norm (280 mm). The highest anomaly in region was -141 mm in 2022, which is 50% of the 1971-2000 norm (280 mm).



Over the past 13 years, the average amount of precipitation in the Absheron region has increased by 32 mm, which is 14% of the 1971-2000 norm (229 mm). The highest anomaly in region was -48.7 mm in 2023, which is 21.3% of the 1971-2000 norm (229 mm).

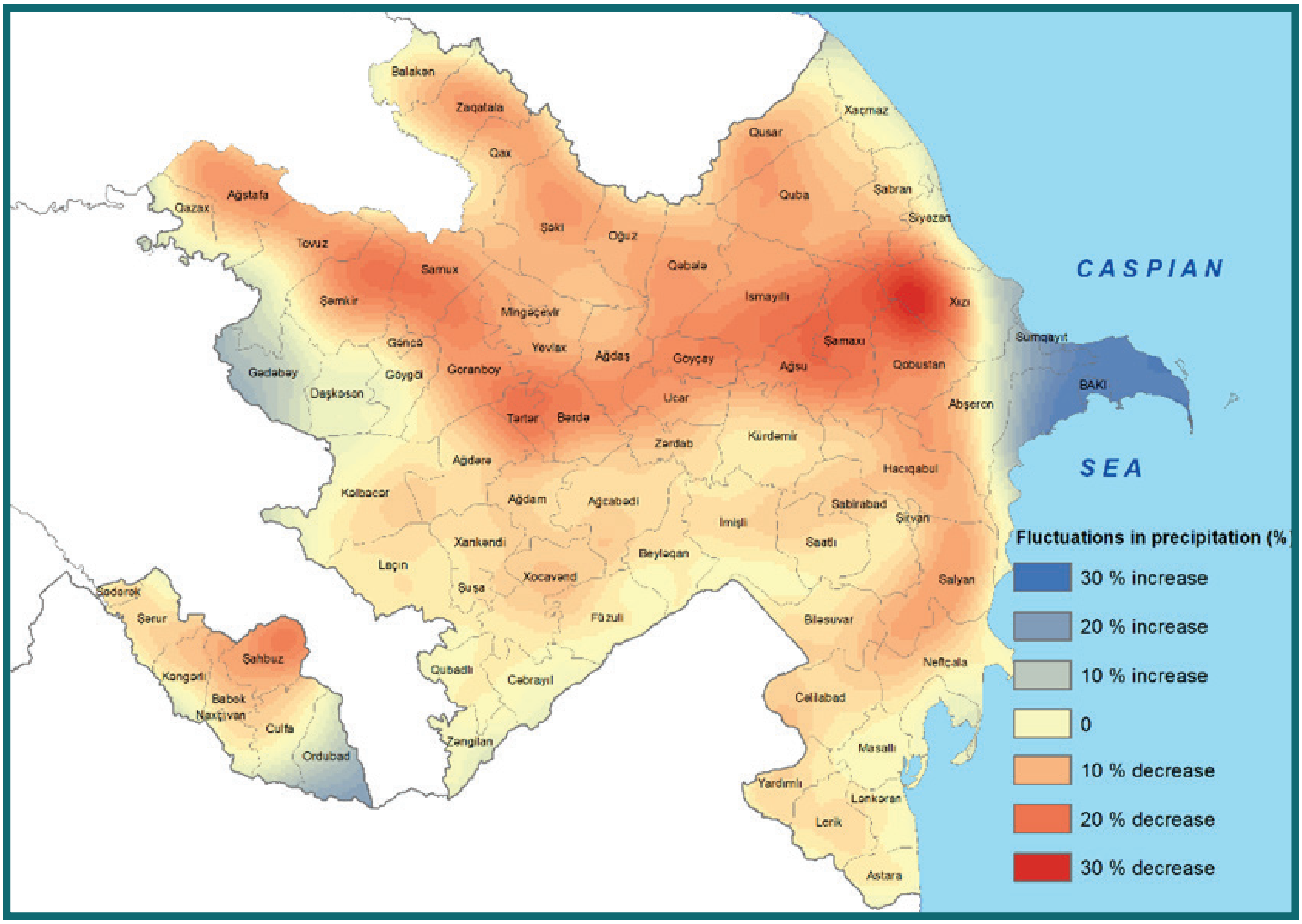


Figure 61. Precipitation changes over the last 23 years relative to 1971-2000.

Extreme climate-borne hazards

Main climatic hazards in Azerbaijan are heat waves, storms, extreme temperatures, heavy rains, droughts, floods, hails and landslides. However, these circumstances may vary in time and space. For example, flat regions of the country are mainly prone to droughts, while mountain areas are prone to landslides and flash floods. Urban and rural lowlands, which include mainly Baku and Absheron peninsula, as well as central lowland districts of Azerbaijan are the places, where intensity of heat waves are very high. In terms of damage to infrastructure, floods, landslides, and droughts are the most dangerous hazards. For example, because of 2010 floods in the downstream part of the Kura River, nearly 50,000 ha of land was flooded, or 2014 droughts reduced agricultural production at least by 50%.

It is projected that climate change will have a slow but long-term impact on the frequency of all types of hazards in Azerbaijan. The water cycle will be affected by warmer temperatures of the climate change resulting in misbalance of evaporation and precipitation. As a result, in some areas will be affected by intense droughts, led by excess evaporation, while other places by floods caused by long-term rains. Besides, warm temperatures in winter cause more rain than snow and early melting, which alters water flows into rivers. Natural disasters, like floods, drought, and storms directly affect water resources to be used by different sectors, including hydropower (Anderson et al, 2008). As water from reservoirs can be used in different sectors, e.g., agriculture, recreation, and fishing. Water scarcity often results in conflict between sectors. A constant conflict further arises between the hydropower demand for filled reservoirs and the flood protection demand for empty reservoirs and respective space for flood water retention.

Compared to the period between 1961-1990, all stations recorded an increase in both the frequency and duration of heat waves. During the earlier period, Baku experienced 2 heat waves, Ganja and Sheki each recorded 5, while no heat waves were observed in Lankaran. In the following decades, these numbers rose significantly, reaching 29 cases in Baku, 16 in Ganja, 41 in Sheki, and 5 in Lankaran.

Floods are common both for lowland and mountain regions. Flash floods, mud, and debris flows are the most common phenomena in mountain regions. These hazards are mainly observed in Great Caucasus region. Gabala, Ismaili, Sheki, Oguz and Gakh districts are very prone to flash floods. It is estimated that average annual flood damages in this region amounts to $18-25 million for infrastructure alone. Based on the analysis, the most flood and flood-risk areas of the country are in the Balaken-Sheki region of the southern slope of the Greater Caucasus: Talachay - 30 cases, Ayrishay - 21 cases, Kurmukchay - 17 cases, Kishchay - 12 cases, Girdimachay - 21 cases in the Gabala-Ismayilli region, Pirsaatchay - 16 cases, Demiraparanchay - 14 cases, Goranchay 22 cases on the northern slope of the Lesser Caucasus, Ganjachay 17 cases, Dastafurchay 16 cases, Esrikchay 13 cases, and 13 cases occurred in the Gabirli river in transboundary rivers.

Landslides are the movement of masses of rock, debris, or earth down a slope due to gravity – cause serious problems for all mountain regions. Permanently observed landslides create high disaster risks in Absheron peninsula, Lerik, Yardimli and Shamakhi districts. High intensity of landslides exists Guba, Sheki, Gabala and Gusar districts. Baku also has its landslide zones, including Masazir, Bail, Zikh, Hovsan, Yeni Gunashli, and Ahmadli. Construction works on the slopes of Baku and the Absheron Peninsula, and intense irrigation, which increase groundwater table, and many other activities are the cause of landslides, which have been a problem in the past as well. It is believed that human activity is the reason for 80 percent of the landslides, as their agricultural activity increases the risk of landslides.

Meteorological droughts are common hazard in all the regions. The duration of droughts has increased by 19%. Over the past 10 years, the decrease in the total amount of precipitation by 10% had a significant impact on agriculture. The fact that agricultural production is directly dependent on climate conditions has made it the most vulnerable sector to climate change.

Central Aran region is a most vulnerable area in terms of droughts. The 2020-2023 droughts have most strongly affected the Shamakhi, Agsu, and Hajigabul districts. Crops have been damaged beyond recovery in some parts of the country, and vegetation of the summer pastures died out, impacting tens of thousands of livestock.

Small rivers (Pirsaatchay and Agsuchay) in this region went completely dry during July and August. The river flow in Girdimanchay River decreased significantly and people residing near basins of these rivers are seriously affected by the drought. Vegetation of summer pastures in Guba-Gusar region has significantly reduced and caused damage to livestock and increased risk for degradation of plan cover, which in turn, increased risks for landslides. According to the Third National Communication, droughts are likely to reduce water supply by 23% during the 2021 to 2050 period in the country.

The number of days with strong winds exceeding 15 m/sec in the country has increased by 3.5 times compared to the 1971-2000 average. This increasing has been observed across all regions. Strong winds above 20 m/s are most often observed in the Absheron Peninsula, Neftchala, mountainous areas in the western region of the country and on the shores of the Mingachevir reservoir (figure 62).

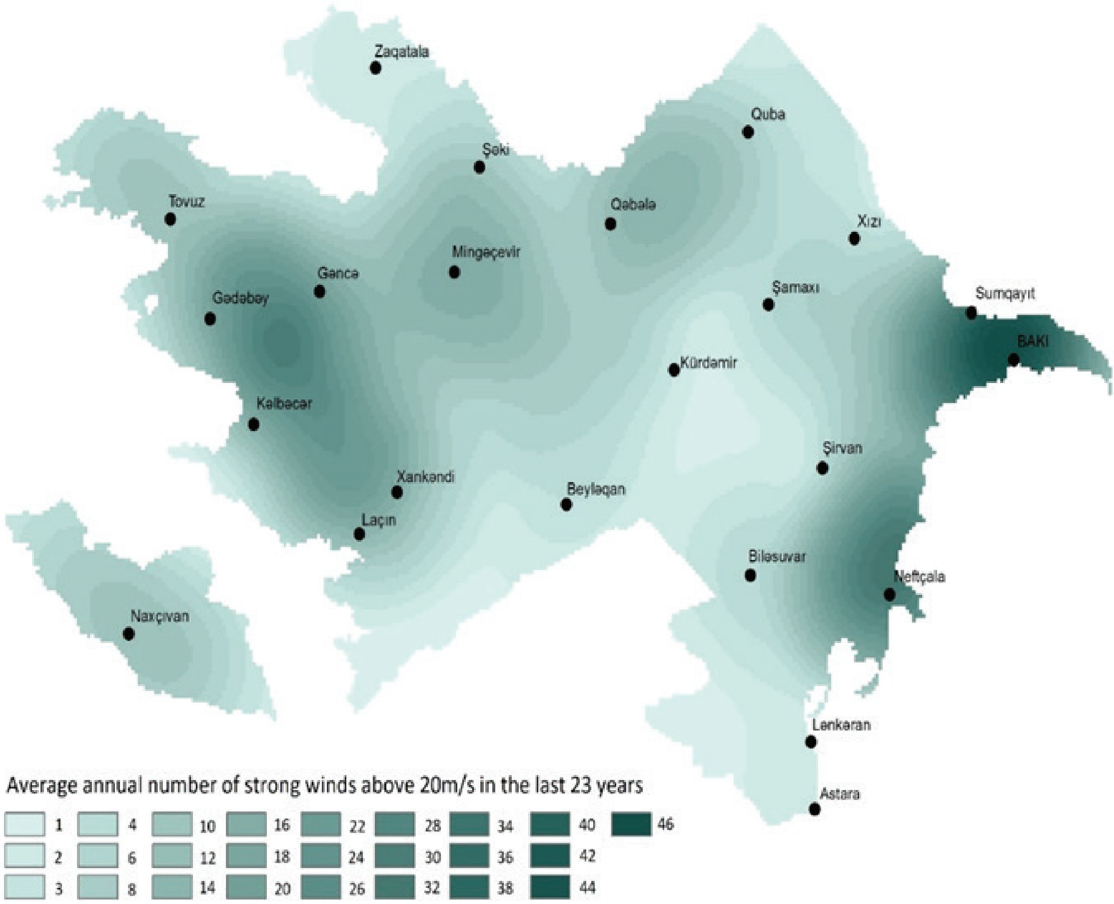


Figure 62. Strong winds with 20 m/s and more velocity

Water scarcity

Long-term projections show that in 2020-2100, against the background of rising temperatures in the territory of Azerbaijan, atmospheric precipitation will decrease, and water content in all freshwater basins, including rivers, lakes and ponds will decrease (FNC AZ, 2021). According to the “HadCM3 modeling of MAGİCC/SCENGEN” scenario in 2011-2040, 2041-2070 and 2071-2100 in the condition of increase in temperature and decrease in precipitation (especially in the Lesser Caucasus) the water resources over the country predicted to decrease by 10-15% in 2011-2040, by 15-20% in 2041-2070, by 20-25% in 2071-2100 years (FNC AZ, 2021).

Raising temperatures, combined with changes in rainfall will intensify the frequency and intensity of water shortages in the country. Country reliance on surface water can be dramatically affected as supply from river waters becomes more variable, and more demand is placed on other sources, such as groundwater, storm water and desalinated sea water. Given that climate change is also likely to negatively affect groundwater resources, the role of storm and desalinated waters becomes more important (Abbasov, 2018).

Climate change will also influence water needs. Warmer temperatures will likely increase evaporation rates and extend dry seasons, thereby increasing the amount of water that is needed for the irrigation of many crops, urban landscaping, and environmental water needs. Raising temperatures will also affect household water use, considerably increasing demand in potable water. This will increase expected water withdrawals from the country's rivers and groundwater sources.

All of the above highlights the importance of water governance and water management; improved agricultural productivity, particularly water productivity in agriculture; sustainable intensification and diversification in agriculture; and better water demand management.

2.2. OBSERVED AND POTENTIAL IMPACTS OF CLIMATE CHANGE, INCLUDING SECTORAL, ECONOMIC, SOCIAL AND/OR ENVIRONMENTAL VULNERABILITIES

Climate Change Impacts on Agriculture

The Agricultural sector of Azerbaijan is highly dependent on irrigation. Most of the territory of Azerbaijan has rather dry climate, and therefore, irrigation very important in the Kura-Aras plain that occupies nearly 40% of the country's territory. The main economic districts that largely depend on irrigation are Nakhichevan, Karabahk, Mil-Muğan, Shirvan-Salyan and Central Aran. All these districts produce important agricultural goods, like wheat, grape, cotton, fruits and vegetables. Agricultural products produced in irrigated areas make up to 90% of the total country's agricultural production.

The impact of climate change on agricultural crops is mainly due to rising temperatures and declining precipitation. Rising temperatures increase the water requirements of the soil as well as the agricultural crops. Evaporation from the soil also increases, which leads to additional water losses in the soil. The reduction of atmospheric precipitation reduces the natural water supply of plants and creates the need for additional irrigation water. In addition to these main effects, climate change has many side effects on agricultural crops, the most important of which are the exposure of microorganisms in the soil to additional thermal stresses and the lack of conditions for the formation of some beneficial substances in the soil, such as nitrogen. Less snowfall in winter in Azerbaijan also has an adverse effect on the physical and chemical processes in the soil and increases the risk of erosion in sloping areas. The dependence of crop production on irrigation is also a sign that the reduction of water resources as a result of climate change will pose a serious problem for agriculture. Thus, more than 70% of the country's water supply falls on transboundary flows, which means that in the future water resources will decrease due to both climate change and transboundary water abstractions.

Acute water scarcity has become a major problem in agricultural sector. Drought and water wastage, and the resulting water shortages, have been major limiting factors affecting agricultural productivity. For example, the drought in Azerbaijan in 2014 reduced the productivity of major grain crops by 20%. Water shortages and droughts in 2017 have reduced the productivity of vegetables and legumes by 10-15%.

The impact of climate change on livestock is mainly due to the deterioration of the living conditions of animals due to the increase in heat waves. The frequency and intensity of increased temperature and heat waves can lead to metabolic disorders, infections, weakened immune systems and death. In addition, the deterioration of the quality of feed and drinking water can be harmful to animal health.

Nomadic livestock, which is very characteristic of the country's livestock, also has problems with climate change. In this sense, it should be noted that the productivity of summer and winter pastures is gradually declining. As a result, declining pasture fodder stocks are forcing more and more people to abandon nomadic pastoralism.

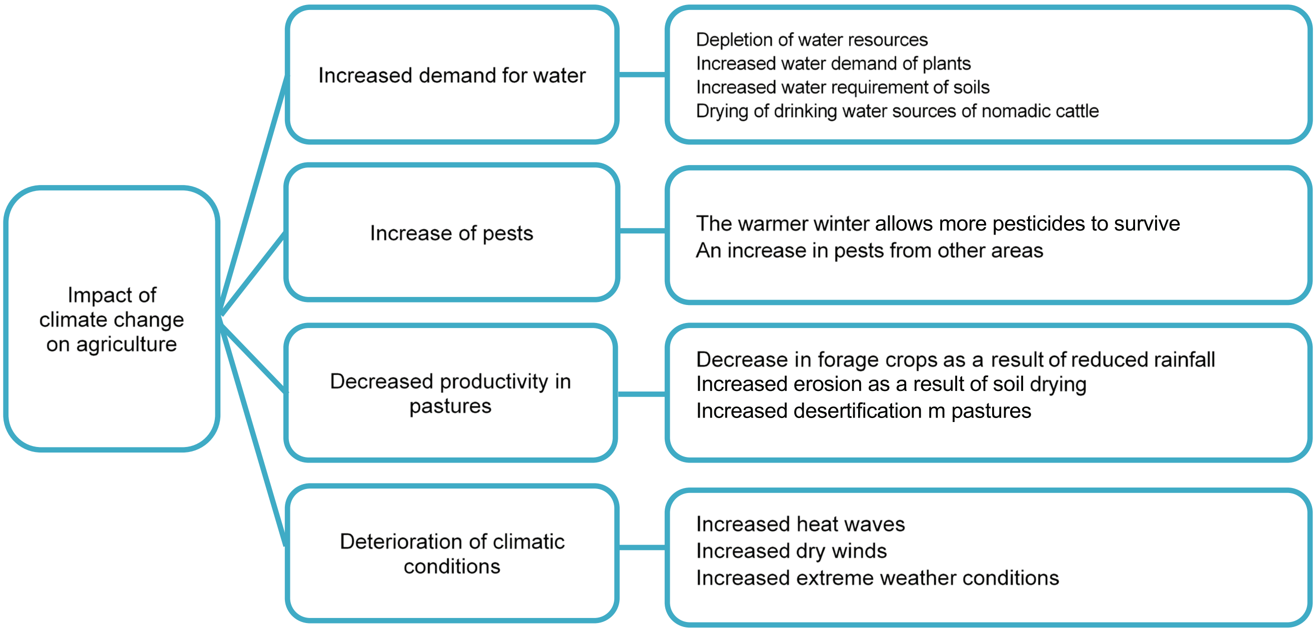


Figure 63. Impact of climate changes on agriculture

The negative consequences of climate changes in agricultural production may include:

- Increased frequency of the heat waves is a reason of heat stress in flowering agricultural plants, which may decrease productivity in lowland territories.
- Higher temperatures in mountain areas increase evapotranspiration, significantly changing the soil and plant water budgets.
- Increased evaporation rates in lowland areas reduce land humidity and increase salinization of agricultural lands.
- Higher winter temperatures increase the rate of flowering of fruit trees, which may increase the risk of the impact of late spring frosts to trees and other agricultural plants;
- Due to increased temperatures, forms of animal infections can be altered and the growth in the density of organisms and geographical coverage is possible;
- Reduced precipitation in most will reduce agricultural productivity;
- Increasing temperature leads to reduced snowfalls, which will cause lower spring moisture that plants need in the spring.
- Increased forest fires may cause negative effects on agricultural fields, located near the forested areas.

Caspian Sea level changes

Over the last two centuries, the level of the Caspian Sea fluctuated dramatically due to climatic variations, and this dynamic profoundly affected Azerbaijan’s coastlines. Stationary observations, which were carried out over the period 1830–2005, illustrate rapid sea level fluctuations. The last short-term sea-level cycle started with fall of 3m from 1929 to 1977, and a sea-level rise of 2.5 m from 1977 onwards, reaching a peak in 1995. Since 1995, the sea level has been falling rapidly again, currently reaching nearly -29 meters Mean Sea Level (MSL).

Several scientific studies predict that the level of the Caspian Sea will decrease further because of climate change, which will increase evaporation from the sea surface.[36] As a result, the level of the Caspian Sea is expected to fall to 9-18 meters, and the northern part of the sea may disappear

[36] Koriche, S. A., Singarayer, J. S., Cloke, H. L., Valdes, P. J., Wesselingh, F. P., Kroonenberg, S. B., ... & Yanina, T. A. (2022). What are the drivers of Caspian Sea level variation during the late Quaternary?. Quaternary Science Reviews, 283, 107457.

altogether.[37] According to other scientific studies, the sea level is expected to rise, not fall, and these rises could flood coastal areas up to 3 meters. Though scientific models differ in projections for the Caspian Sea's future levels, they are unanimous in the conclusion that changes will be observed in future, and therefore hazardous circumstances will arise in coastal area. Therefore, the establishment of coastal management mechanisms using contemporary approaches is an important consideration for Azerbaijan.[38]

Fluctuations in sea level cause a broad range of problems. For example, from 1978 to 1995, because of rising sea levels more than 400,000 hectares of coastal areas along the Caspian Sea were flooded, of which about 50,000 hectares were in Azerbaijan. During that period, 50 settlements in Azerbaijan were subject to long-term inundations. This flooding affected 250 production facilities, 20 km of the Baku-Astara railway, 60 km of highways, and tourist facilities with capacity for 100,000 people. During that period, very valuable subtropical forests in the Astara region, and houses in the Lankaran, Astara, Absheron, Salyan, and Khachmaz regions, were severely damaged. Rising sea levels have severely damaged coastal infrastructure, ports, roads, parks, and agricultural lands. Rising water levels have caused flooding of contaminated areas on the shores of Absheron, and led to additional sea pollution. According to independent sources, by 1995, more than 1,500 hectares of oil-contaminated land had been submerged, seriously damaging the marine ecosystem.

Since 1995, there have been numerous problems as a result of falling sea levels. Low sea levels primarily affect the biodiversity of coastal areas and coastal ecosystems. Drying and shallowing of coastal areas also harm the growth of fish populations, and are sometimes accompanied by significant fish losses. Declining sea levels have left numerous fish trapped in small lagoons in coastal areas, eventually resulting in their deaths. The shallowness of the sea has also led to a rise in temperature in coastal waters, and thus a decrease in dissolved oxygen. As a result, living conditions in fish habitats have deteriorated.

In tourist areas, the shallowness of the sea also reduces the sea's recreational potential. Because of the shallowness of coastal areas, there are fewer opportunities for marine leisure activities (e.g. surfing), and access to oceans can now require additional walks of 100-200 meters to reach sea areas suitable for swimming.

Decreases in sea level have also damaged infrastructure. For example, the Shimal thermal power plant has serious difficulties in obtaining cooling water from the Caspian Sea. The shallowness of the sea also harms the operation of ports, preventing ships from docking. For example, in the ports of Alat and Zira, special canals had to be dug to bring ships closer to shore, and wharves were extended into the sea. Shallow seas also present problems for the oil industry, as it can become difficult for ships and tankers to approach oil rigs.

In the Absheron Peninsula, the retreat of the sea is often accompanied by the emergence of oil-contaminated areas. Newly exposed oil wastes then evaporate into the air during hot weather conditions.

The expansion of coastal areas due to declining sea levels may lead to the formation of dust and salt deposits in the future. If the sea continues to fall, large saline and sandy areas will form along the coast, which can lead to sandstorms in the surrounding areas.

Due to the retreat of the sea, the combined sea-river ecosystem is seriously affected. Thus, fish that cross the Caspian Sea to spawn in rivers cannot reach spawning grounds, and thus numbers are gradually declining.

The retreat of the sea can also lead to the drying up of wetlands and lakes, thus destroying the wintering grounds of migratory birds. Most of these cases are found in the Gizilagaj, Agzibirchala, and Yashma areas. The table below summarizes problems resulting from sea-level fluctuations (table 56)

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[37] Chen, J. L., Wilson, C. R., Tapley, B. D., Save, H., & Cretaux, J. F. (2017). Long-term and seasonal Caspian Sea level change from satellite gravity and altimeter measurements. Journal of Geophysical Research: Solid Earth, 122(3), 2274-2290

[38] Abbasov, R., Karimov, R., & Jafarova, N. (2022). The Caspian Sea and Its Values in Azerbaijan. In Ecosystem Services in Azerbaijan (pp. 1-28). Springer, Cham.

Sea Level Fluctuations	
Sea level rise	Sea level fall
Flooding of coastal areas, agricultural fields, coastal infrastructure	The appearance of saline lands along the coastal line, Salinization of lands due to salt storms
Sea pollution due to inundation of contaminated coastal areas	Damage to river-sea ecosystems, damage to the fishery
Backwater effect to rivers flowing into the sea, siltation of river outlets	Problems in coastal infrastructure, ports, and ship traffic
Problems in recreation and tourism facilities due to sea-level rise, damage to tourist infrastructure	Problems in recreation and tourism facilities, loss of beaches
Damage to residential areas along the coastline	Gradual drying of coastal swamps, loss of wintering grounds for migrating waterfowl

Table 56. Problems related to sea-level fluctuations along with the coastal areas of the Caspian Sea

2.3. APPROACHES, METHODOLOGIES AND TOOLS, AND ASSOCIATED UNCERTAINTIES AND CHALLENGES

The climate scenarios have been developed based on recommendations from the IPCC and in collaboration with the Turkish Meteorology Organization and Azerbaijan's National Hydrometeorology Service. The GCMs used for Azerbaijan follow emissions scenarios such as RCP4.5 and RCP8.5, which cover four specific periods from 1970 to 2100:

- First period (1971–2000): Represents the baseline climate.
- Second period (2020–2040): Scenario-based projections.
- Third period (2041–2070): Scenario-based projections.
- Fourth period (2071–2098): Scenario-based projections.

The calculations provide a comprehensive characterization of past and future climate, accounting for demographic, economic, technological, energy, and agricultural development factors.

RCP4.5 Climate Scenario According to the MPI model, the period 2020–2040 projects an increase in average annual temperatures in Azerbaijan by 0.5°C to 1.5°C. During the same period, precipitation is expected to decrease by up to 20% in some areas and increase by 30% in others, compared to 1971–2000. For 2041–2070, the MPI model projects a temperature increase of 1°C to 2°C, with precipitation decreases of up to 40% in certain regions and increases of up to 10% in others. The period 2071–2098 shows further warming, with average annual temperatures increasing by 1°C to 2.5°C, while precipitation is expected to decrease by up to 40% in most areas and increase by up to 30% in a few regions.

RCP8.5 Climate Scenario For the period 2020–2040, the MPI model predicts an increase in average annual temperatures of 0.5°C to 1.5°C across Azerbaijan, with precipitation decreasing by up to 20% in some areas and increasing by up to 30% in others. By 2041–2070, the average annual temperature increase is projected to be 1.5°C to 3°C, while precipitation is expected to decrease by up to 40% in most regions and increase by up to 20% in others. The period 2071–2098 is projected to see temperatures rise by 2.5°C to 5°C, with precipitation decreases of up to 40% expected across most areas, except for some regions like Babek and Julfa, where the changes will be less significant.

Uncertainties arise due to regional climate variability across Azerbaijan's diverse landscapes, complicating uniform climate projections. Data availability is another challenge, as historical climate records for remote areas are limited, leading to gaps in forecasting precision. Despite these challenges, the use of multi-model ensembles and cross-institutional collaboration helps reduce uncertainties in climate projections.

Uncertainties arise due to regional climate variability across Azerbaijan's diverse landscapes, which complicates uniform climate projections. Data availability is another challenge, as historical climate records for remote areas are limited, leading to gaps in forecasting precision.

In addition to GCMs, scenario-based approaches have been applied, such as the "HadCM3 modeling of MAGİC-C/SCENGEN," which covers temperature and precipitation projections for 2011-2040, 2041-2070, and 2071-2100. This scenario predicts that Azerbaijan's water resources may decline by 10-25% depending on the time period. Climate risk assessments are conducted periodically, and reports such as the Climate Risk Country Profile 2021[39] indicate that temperatures in Azerbaijan are expected to rise faster than the global average, with the strongest warming predicted in summer months (July to September).

In addition, the transboundary nature of water resources poses significant challenges. Over 70% of Azerbaijan's freshwater originates from rivers shared with neighboring countries, making international cooperation crucial for sustainable water management. However, the success of these efforts is contingent upon neighboring states also signing and adhering to international agreements, which is not always guaranteed. This creates uncertainties in the long-term planning for climate adaptation. Therefore, enhancing cross-border coordination, data governance, and joint management agreements is essential to effectively address shared water resource challenges and mitigate the impacts of climate change.

3. ADAPTATION PRIORITIES AND BARRIERS

3.1. DOMESTIC PRIORITIES AND PROGRESS TOWARDS THESE PRIORITIES[40]

Azerbaijan's climate change adaptation priorities focus on enhancing resilience to the adverse impacts of climate change, particularly in vulnerable sectors such as agriculture, water resources, infrastructure, public health, and ecosystems. These priorities are aligned with national development goals and international commitments, such as the Paris Agreement and the Sustainable Development Goals (SDGs). As a country located in a rather arid area, Azerbaijan prioritizes the following directions for adaptation:

Agriculture and Food Security: Agriculture is a key sector in Azerbaijan's economy, and it's highly sensitive to climate variability. Adaptation strategies include diversifying crop varieties, developing drought-resistant crops, improving soil conservation techniques, and expanding modern farming practices to enhance resilience.

Caspian Sea Level changes: The Caspian Sea is the world's largest inland body of water, and has been described as the world's largest lake by surface area. It is only about a third as saline as normal seawater, but is still about twelve times as salty as most freshwater lakes. Along the western shores of the Caspian Sea, the Republic of Azerbaijan's coastline stretches for over 825 km, representing the country's entire coastal landscape. The densely populated Baku, Guba-Khachmaz, Shirvan-Salyan, and Lankaran-Astara economic regions - each of which have significant economic potential - all about the Caspian Sea, and economic activity in these regions relies heavily on the marine environment.

Ecosystem Protection and Biodiversity Conservation: Azerbaijan is home to unique ecosystems that are threatened by climate change. The country is focusing on forest management, reforestation, and the conservation of its biodiversity, including the preservation of coastal ecosystems along the Caspian Sea. The increases territory area of the protected areas promotes the preservation of rare and endangered species of plants and animals. Azerbaijan has a total area of 893 thousand hectares of specially protected natural areas, including 10 national parks, 10 state nature reserves and 24 state nature sanctuaries. These areas has increased almost 2 times in the last 20 years and now account for 10.31% of the country's territory.

[39] https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15835-Azerbaijan%20Country%20Profile-WEB.pdf

[40] Azerbaijan National Ecosystem Assessment

The Azerbaijan National Ecosystem Assessment (NEA), which was completed in 2024 provides an information on the country's biodiversity and ecosystems which can then be used for national reporting on regional and international biodiversity-related frameworks. According to the NEA, climate change is one of the main drivers in negative shifts of biodiversity. NEA developed recommendations to reduce negative impacts of climate changes, which is considered in National Biodiversity Action Plan. The country currently develops NBSAP which takes into account negative changes of the climate changes.

Mountain regions: Mountain areas are very vulnerable to adverse effects of climate changes. Risin temperatures and reduced precipitation increase risk of land degradation, climate-borne hazards and forest fires. Mountain areas was one of the priority directions for NEA, which revealed major shifts in forest and alpine pastures.

Gender issues in adaptation: The Constitution of the Republic of Azerbaijan guarantees equal rights for women and men, the right of everyone to freely choose their type of activity, profession, occupation and place of work on the basis of their ability to work. This is the legal basis for women's participation in building a democratic society. The 21-article Law of the Republic of Azerbaijan on State Guarantees of Equal Rights for Women and Men, adopted in 2006, aims to eliminate all forms of gender-based discrimination and ensure gender equality in the political, economic, social and cultural spheres.

National Action Plan on Gender Equality (2019-2023): This plan outlines strategies to improve gender equality, focusing on education, healthcare, economic empowerment, and reducing domestic violence. The main objectives of the National Action Plan are as follows:

- Prevent conflicts, as well as all forms of structural and physical violence against women and girls.
- Include women's and girls' interests and increase their participation in processes aimed at prevention.
- Management and resolution of conflicts.
- Protect the human rights of conflict-affected women and girls and ensure their physical, psychological, social and
- Economic security.
- Consider the special needs of women and girls during conflict and in post-conflict period.

Indigenous and local knowledge:[41] Azerbaijan National Ecosystem Assessment consider ILK in one of the most important directions should be taken into account in future adaptation activities. Institutionalizing the use ILK and promoting the use of this knowledge through different management approaches is emphasized as one of the main recommendations in NEA. NEA also found that ILK is under danger due to intense migration of local people from the mountain areas to cities. NEA also recommended to the government of Azerbaijan that protection of ILK knowledge through protection of traditional lifestyle of Indigenous and local communities in mountainous regions is essential for future sustainable use of ILK in various development programs.

Cultural Landscape of Khinalig People and "Koch Yolu"[42] Transhumance Route. This cultural landscape is comprised of the high-mountain Khinalig village in northern Azerbaijan, high-altitude summer pastures and agricultural terraces in the Greater Caucasus Mountains, winter pastures in the lowland plains in central Azerbaijan, and the connecting 200-kilometre-long seasonal transhumance route called Koch Yolu ("Migration Route"). The village of Khinalig is home to the semi-nomadic Khinalig people, whose culture and lifestyle are defined by the seasonal migration between summer and winter pastures, and who retain the ancient way of long-distance vertical transhumance. The organically evolved network including ancient routes, temporary pastures and camping sites, mausoleums, and mosques illustrates a sustainable eco-social system adapted to extreme environmental conditions.
In 2022, the country conserved the ILK customs and traditions of the local Khinalig ethnic group in order to protect the wealth of local and ethnic knowledge. "Khinalig and Koch Yolu" Cultural Reserve has been nominated to UNESCO for the preservation of human-nature relations, transhuman way of life, knowledge of dealing with the climate and recognized as a UNESCO cultural heritage.

[41] National Ecosystem Assessment

[42] State Tourism Agency of Azerbaijan/ https://khinalig.heritage.org.az/en/history

UNESCO site: Historic Centre of Sheki with the Khan's Palace. The historic city of Sheki is located at the foot of the Greater Caucasus Mountains and divided in two by the Gurjana River. While the older northern part is built on the mountain, its southern part extends into the river valley. Its historic centre, rebuilt after the destruction of an earlier town by mudflows in the 18th century, is characterized by a traditional architectural ensemble of houses with high gabled roofs. Community based fire and flood management, nature-human relations in this historical area have been recognized by UNESCO as an Outstanding Universal Value.

Water sector

Water Resource Management: Azerbaijan is vulnerable to water shortages, especially in the agricultural sector, due to changes in precipitation patterns and reduced river flows. One of the top priorities is ensuring sustainable water management through improved irrigation techniques, water-saving technologies, and the modernization of water infrastructure. NAP consider water sector is one of the main sectors that need adaptation. There are broad range of activities related to water management and protection of water bodies.

The main structural adaptations in Azerbaijan are to protect against extreme water-borne hazards. These extreme events are characterized by both high and low water. Too much water means floods, and too little water means droughts and water shortages. A key harmonization strategy should reduce disparities between these extremes and serve to achieve better water management.

Climate Change impacts	Specific measures	Adaptation functions and/or co-benefits	Areas of implementation	Responsible organizations
Increased flood risk	Developing of Early warning systems	Reduction of effects of extreme weather and water hazards	All the areas	Ministry of Ecology and Natural Resources
Increased flood risk	Strengthening dams around rivers İncreasing water holding capacity of reservoirs Reforestation in basins Improvement of roads Flood risk zonings	Prevention of floods İncreasing water carrying capacity of river channels	Small rivers of Great Caucasus (Kish, Shin, Damiraparanchay, Goychay, Girdman, Aghsu rivers)	MoES ASWA Local government Local municipalities
Increased flood risk	Designing retention areas	Release of flood water during floods	Kura and Araz river downstream areas	MoES
Increased flood risk	Construction of buildings away from flood prone places	Flood risk reduction	Flood prone areas	Local municipalities Urban and rural residents
Increased drought risks	Construction of infrastructure to reduce water losses in irrigation Making paved canals in irrigation network	Adaptation to droughts and water shortages	Central Aran of Azerbaijan, al irrigated areas	ASWA
Drinking water shortage		Prevention of water losses in water supply network		ASWA Local Municipalities

Drinking water shortage		Application of water-saving techniques at home Vacuum and pressure assisted toilets Water saving shower heads	Cities and villages of Azerbaijan	Local communities Urban and rural residents Business representatives
	Contraction of sea water desalination stations	Non-conventional water source		Local communities Local municipialities ASWA

Table 57. Average annual temperature changes over the years

Non-structural adaptation targets water demand and supply by management adjustments of water users and improve water control systems. These possibilities constitute a range of non-traditional elements as shown in table 57 which include investing in water users in water management, water pricing, water allocation, water scheduling, water restriction, water marketing and recycling of water. Nonstructural adaptations may comparatively be cost effective than structural adaptations. However, putting non-structural and structural adaptations against each other is not the right approach. On the contrary, the simultaneous application of both approaches gives better results in adapting to climate change. Such approaches should apply to both the drinking water and irrigation sectors.

The role of secondary and higher education in increasing public literacy and adapting society to climate change is also great. The integration of climate change into the school curriculum and the holding of additional classes on effective management of the environment and water resources in universities are among such activities.

The following diagram shows the main directions of non-structural adaptation to climate change in the water sector.

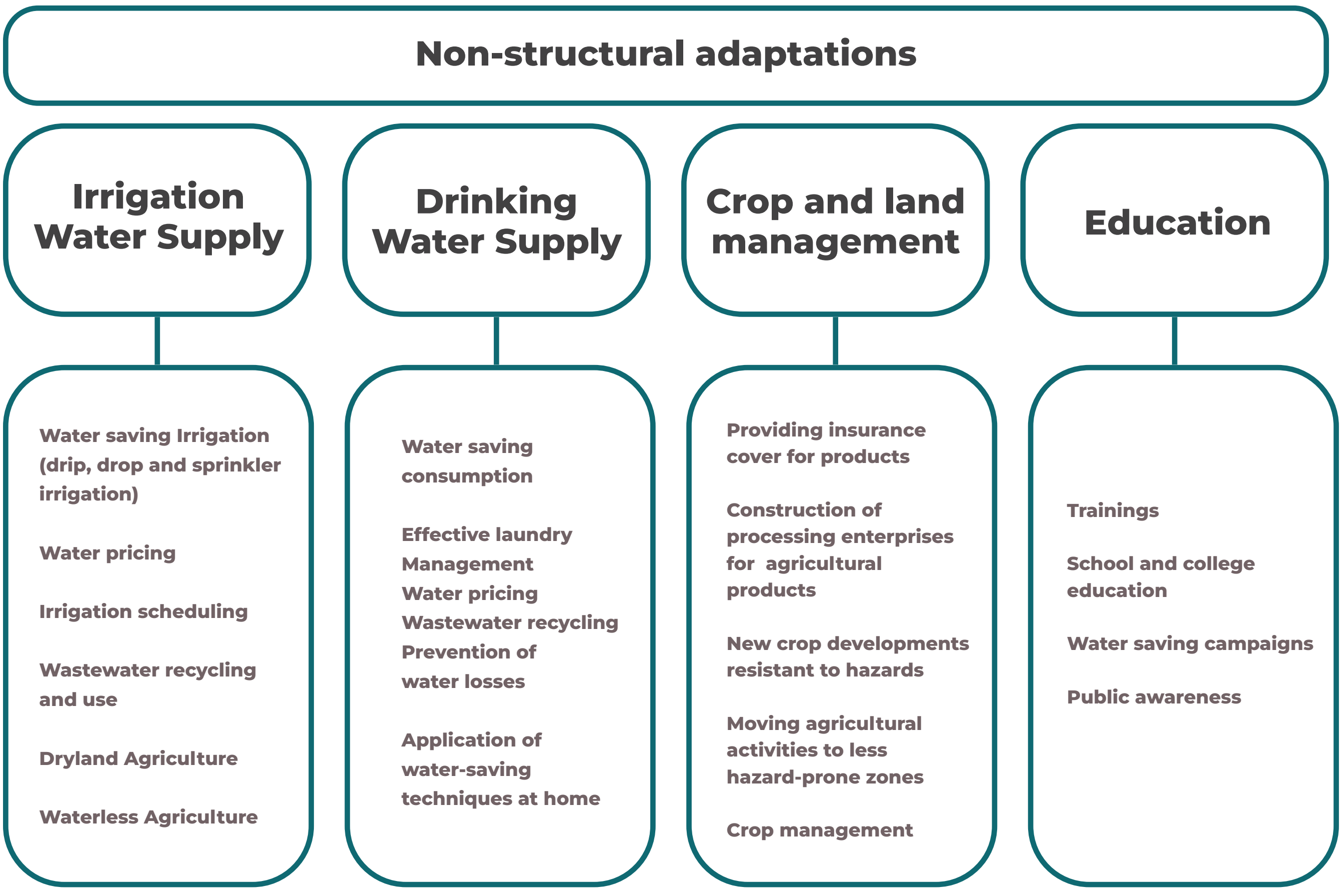

Figure 64. Non-structural adaptations in irrigation and drinking water supply

Adaptation in agricultural sector

The adaptation activities carried out or planned to be carried out in Azerbaijan cover several directions and include the reduction of water use, increasing the resistance of plants to high temperatures and the introduction of new climate-resistant plant species. In animal husbandry, adaptation is mostly directed to the more efficient organization of nomadic animal husbandry and increasing the tolerance of animals living in closed conditions. Creating new capacities for managing droughts is also considered one of the main directions. The organization of trainings for increasing literacy has a special place in adaptation mechanisms, and these trainings mainly involve decision-makers, municipalities and farmers, as well as women's groups. Below we list the main directions of adaptation to climate change in the agricultural sector.

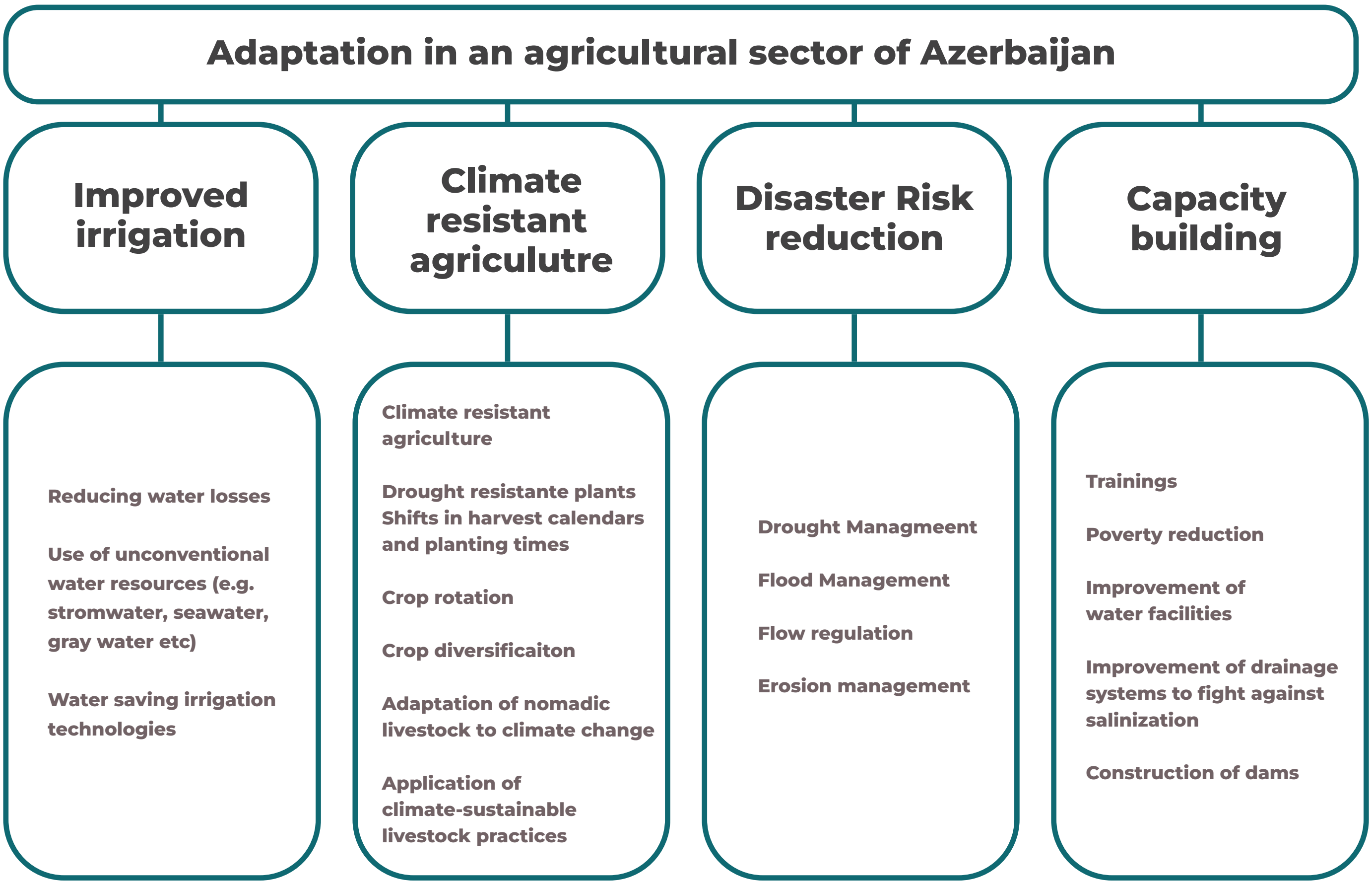

Figure 65. Adaptation in agricultural sector of Azerbaijan

Specific measures	Adaptation functions and/or co-benefits	Areas to be implemented	Available agricultural products	Responsible organizations
Rainfed agriculture	No need in irrigation. Relies on rainwater	Medium and high mountainous areas	Grapes, tomatoes, pumpkins, beans, and other summer crops.	MoA ASWA Local communities Farmers
Dryland/waterless Agriculture	No need in irrigation. Relies on rainwater	Foothills and medium mountain areas	winter wheat, maize, beans, sunflowers, grapes, lavandula	MoA ASWA Local communities Farmers
Waterless Agriculture	No need in irrigation	All mountain areas	,	

Water Efficient irrigation (Drip, drop, sprinkler etc.)	Water use reduction	All irrigated lands	All agricultural goods	MoA
Recycled water use	Water saving	All irrigated lands	All agricultural goods	MoA
Collector-Drainage water use	Non-conventional water source	Central Aran	Salt tolerant agricultural plants	MoA
Water desalination	Non-conventional water source	Coastal areas and areas close to drainage collectors	All agricultural plants	Local farmers, MoA, local municipialities
Rainwater Harvesting	Non-conventional water source	All areas	All agricultural plants	Local farmers, MoA, local municipialities

Table 58. Adaptation activities in agricultural sector of Azerbaijan

Depending on their nature, adaptation measures can be short-term or long-term. At the same time, adaptation can be aimed at partial or complete prevention of any expected complications. CCA measures can be implemented both at the national level and at the community or group level. For example, if the amount of water entering a community's land has decreased as a result of climate change, the community can develop a plan to make more efficient use of the water resources available to it. This plan should include both water-saving and the cultivation of more drought-tolerant varieties. The same plans and programs can be implemented at the national level, with the sole purpose of preventing any adverse effects of climate change.

As noted, the impact of climate change in Azerbaijan will be complex and therefore is expected to affect all areas of human life and the economy. For this reason, CCA must cover all areas of the population's livelihood and economy.

6430 mln m^3 of water is currently used for irrigation and agricultural supply in Azerbaijan. And according to the statistics for 2014, one-third of the water supply was lost before it reached consumers, which's large proportion were attributed to agricultural water. Taking into account water losses, it is very important to minimize the amount of water used for irrigation and water losses.

To reduce the amount of water used for irrigation, it is recommended to abandon traditional methods and switch to new irrigation methods. To implement this, large financial investments are required in the irrigation sector. While the state has a great responsibility in this matter, private organizations can also participate in this process.
The project implemented by UNDP in Azerbaijan's Shaki region. İn Shaki, more than half the population works in the agriculture sector, contributing to 14% of the country's wheat harvest. In 2019, farmers are receiving new irrigation methods, small grants and training in the Shaki region. UNDP predicts that after receiving these resources, farmers can efficiently harvest more produce using less water. There will be economic benefits that enable farmers to buy more food themselves while providing more food for citizens. So far, four farming families have changed their irrigation methods to the drip method.

However, since the measures taken cover a very small part of the country, we can say that the work done is not enough. It is very important to replace the old methods with new ones in much of the irrigated lands, no matter how costly, because the lost water not only harms the economy but also contradicts the principles of sustainable development and is a serious risk for the country's future water supply in all sectors.

On average, about 26 % of total freshwater abstraction is lost during transport. Given that the a considerable part of water use belongs to agriculture, it can be assumed that the bulk of water losses relates to this sector too. As 70-73% of the existing networks in Azerbaijan and are ground channels, in order to reduce water losses during transportation, measures should be taken to minimize the amount of water lost as a result of evaporation from open ground water facilities. Irrigation channels, collector-drainage networks, and hydraulic structures built in the 50s and 80s of the last century are one of the main causes of water losses too. Repairing expired water installations can be another option to avoid water loss.

Agriculture water reuse is a rediscovered as an important sustainability, conservation and cost-reduction opportunity. Reuse of water and rainwater harvesting are good ideas to avoid waste of water. Multiple use of water and wastewater has many opportunities to produce sustainable and more stable access to water rather than single pass use, as well as for generating valuable products such as agricultural nutrients, soil amendments. Farmers are benefiting from wastewater recycling, and industries also can achieve cost reductions by more water recycling. Currently 6430 mln. m^3 of water is used for irrigation and agricultural supply in the country. Every year 7-8 billion m^3 of water is discharged into the Caspian Sea through collectors. The water collected in the collector drainage networks can be collected and used for re-irrigation.

Cultivation of drought resistant plants

Although most of the cultivated soils of Azerbaijan are based on irrigation, since various plants have different resistance to water, the demand for water of the cropland is different in accordance with the product being grown. Given that Azerbaijan is among the countries suffering from water scarcity, we recommend the cultivation of drought-tolerant crops.

As can be seen from the figure, the most water-demanding crops grown in Azerbaijan are corn, vineyard, cotton and grain (figure 66).

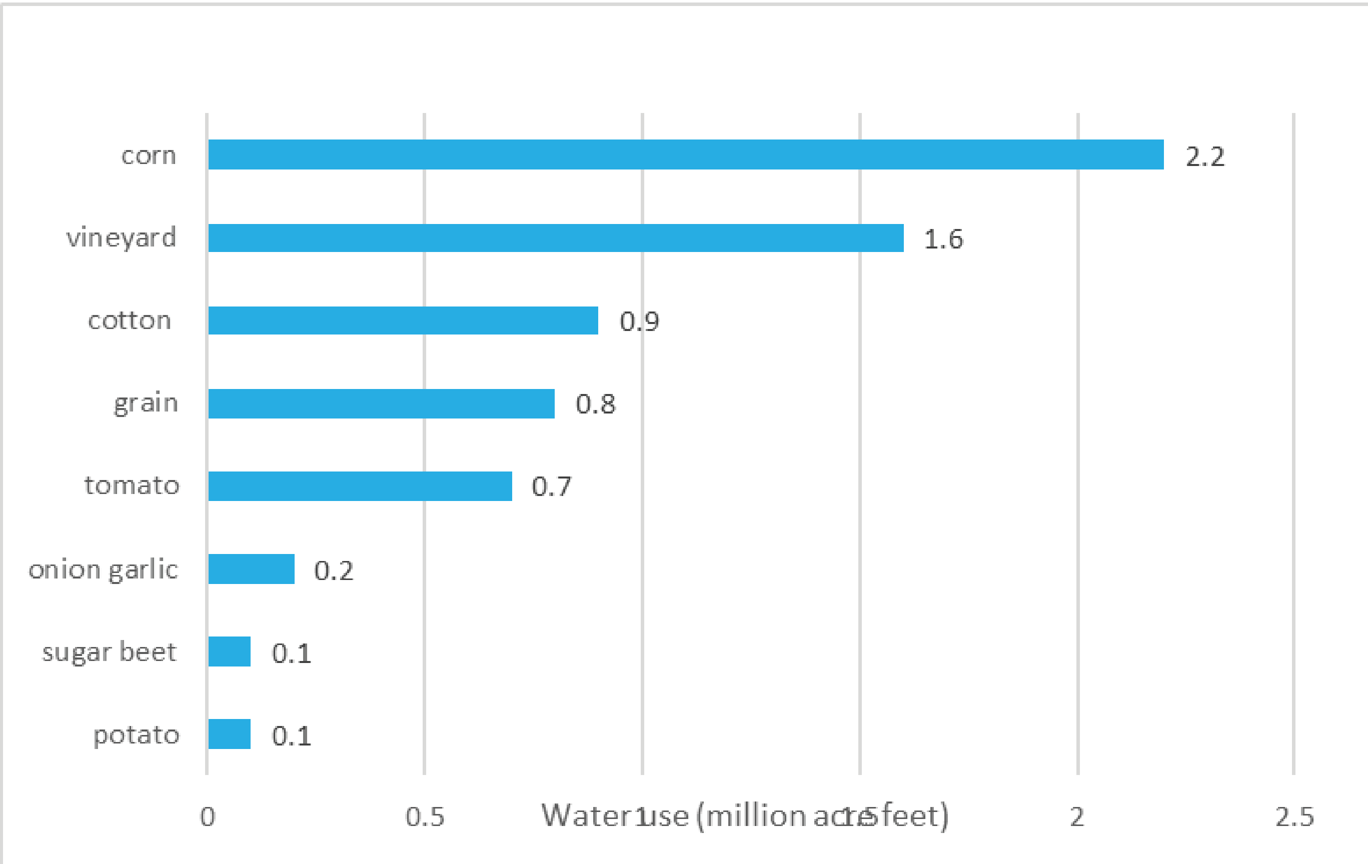

Figure 66. Irrigation water requirements of crops

3.2. ADAPTATION CHALLENGES AND GAPS AND BARRIERS TO ADAPTATION

Key barriers and gaps addressed. Based on the stocktaking and fact-finding exercises, the status of CCA in Azerbaijan was assessed and needs were identified under three main intervention areas: i) Improved data and information access and sharing by stakeholders; ii) Existing institutional and technical capacity gaps and needs for CCA at the managerial, individual and community levels; and iii) Mainstreaming of CCA into national, region, local and sectoral planning. This NAP effort will build on existing investments and policies to directly address gaps in the baseline of these three intervention areas.

The overarching problem for adaptation planning in Azerbaijan is that adaptation considerations are not mainstreaming into the country's development processes, including of the three priority sectors of NAP that this proposal focuses on (water, agriculture and coastal areas).

To address the difficulties arising from the effective integration of CCA considerations into the development process of the prioritized sectors, a robust CCA strategy and planning process are needed. To support such adaptation strategy planning process, the stocktaking process identified the need to address gaps and barriers on data/information, institutional/technical capacity and organization to integrate adaptation considerations into the development process and develop and implement an adaptation activities in selected sectors and areas.

The main barriers identified for the water, agriculture and coastal areas sectors include:
Limited Financial Resources: Postwar situation has increased country's expenses in liberated territories which create pressure on the state budget. Budget constraints hinder the implementation of resilient infrastructure and long-term adaptation strategies.

Institutional and Governance Challenges: Coordination among various government agencies and stakeholders is often ineffective. This lack of cross-sectoral coordination can slow down the planning and implementation of adaptation measures. Additionally, there is a need for more robust legal frameworks to support climate adaptation efforts.

Capacity and Knowledge Gaps: There is a lack of technical expertise and knowledge on climate change adaptation, especially at the local level. Capacity-building programs and the integration of climate science into planning processes are necessary to address these gaps.

Public Awareness and Engagement: While the government has made efforts to raise awareness about climate change, public understanding of its impacts and the need for adaptation is still limited. Encouraging community involvement and promoting climate-resilient practices is crucial but remains a challenge.

Data Availability and Climate Projections: Limited access to high-quality climate data and projections can hamper effective adaptation planning. Improved climate modeling and forecasting are essential to better understand future risks and inform decision-making.

4. ADAPTATION STRATEGIES, POLICIES, PLANS, GOALS AND ACTIONS TO INTEGRATE ADAPTATION INTO NATIONAL POLICIES AND STRATEGIES

Initial NAP document was submitted to UNFCCC. The NAP prepared by the government of Azerbaijan currently considers three important areas, agriculture, water management and Caspian Sea level fluctuations. According to the NAP Azerbaijan, main outcomes will be improved data access and sharing for decision making, increased institutional and technical capacity, and increased mainstreaming of adaptation activities at national, regional and local planning, through the development of applied tools, improved legal framework and monitoring. Within the framework of the set goals, it is planned to prepare a NAP for the management of water, agriculture and coastal areas.

The National Strategy for the Efficient Use of Water Resources[43]

The National Strategy for the Efficient Use of Water Resources, covering a 16-year period, has been implemented through an Action Plan for 2024–2027, which aligns with key priorities. Subsequent action plans will be developed for 2028–2030 and 2031–2040 to continue addressing these priorities. The 2024–2027 Action Plan will be monitored based on specific target indicators outlined within the strategy. This monitoring will consider different stages of implementation, including initial, intermediate, and final outcomes.

[43] President.az

- Surface Water Assessment: Initial phases involve preparing feasibility studies and project documentation, with surface water resources assessment set to reach 90% by 2027. (100% by 2030)
- Groundwater Assessment: Initial phases involve preparing feasibility studies and project documentation, with groundwater resources assessment set to reach 80% by 2027. (100% by 2030)
- Integrated Management Systems: Transitioning to an integrated water resources and basin management system, with goals to achieve 60% integration by 2027. (65% by 2030, 80% by 2040)
- Water Loss Reduction: Progressive reductions in losses across both drinking water and irrigation systems, aiming to bring down drinking water losses to 33% (30% by 2030, 20% by 2040) and irrigation losses to 42% by 2027. (30% by 2030, 10% by 2040)
- Sanitation Services: Expanding the coverage of sanitation services to 43% by 2027. (47% by 2030, 50% by 2040)
- Meeting the demand for drinking water: Ensuring 85% of water demand is met by 2027. (90% by 2030, 100% by 2040)
- Meeting the demand for Agriculture and Other Sectors: Ensuring 90% of water demand is met by 2027. (95% by 2030, 100% by 2040)
- Modern Irrigation Systems: Applying modern irrigation technologies, targeting 10% coverage by 2027. (15% by 2030, 30% by 2040)
- Water Resource Expansion: Planning to create four new reservoirs by 2027, with design and construction initiatives set to begin in this phase. (9 by 2030, 13 by 2040)

The strategy also emphasizes ongoing automation of data transmission through the "Electronic Water Management" information system and continues improvements to water infrastructure and resilience to meet future water demands effectively. This approach aligns with both national priorities and international sustainable development goals.

2022-2026 Social and Economic Development Strategy of Azerbaijan

Azerbaijan 2026: Social-Economic Development Strategy for 2022-2026, where efficiency water use and climate change adaptation measures development is expected to be one of priority areas.

In this period, the socio-economic development model will be implemented based on the achievements of previous periods. A strong leader with international reputation, high state and citizen solidarity in difficult times, a society that is open to innovation and puts knowledge above all else, as well as high economic potential formed over many years are the guarantee of the successful implementation of the new national socio-economic development model.

The State Program is a comprehensive policy framework aimed at fostering sustainable economic growth, enhancing social welfare, and promoting regional development across the country. The program is designed to address both short-term and long-term development challenges, with a focus on improving infrastructure, social services, employment opportunities, and environmental sustainability.

Azerbaijan 2030[44]

Azerbaijan 2030: National Priorities for Socio-Economic Development is a strategic framework that outlines the country's vision for sustainable growth and development through the year 2030. These priorities were formulated in alignment with global sustainable development goals (SDGs) and are designed to address key socio-economic, environmental, and governance challenges in Azerbaijan. Promotion of the sustainable environmental policies and transition to a green economy, addressing the impacts of climate change and reducing environmental degradation is one of the main goal of the Azerbaijan 2030.

[44] Azerbaijan 2030/ president.az

Strategic Road Map for the production and processing of agricultural products

The strategic roadmaps developed for the national economy and key sectors of the economy aim to further increase the competitiveness, inclusion and social welfare of the economy in Azerbaijan on the basis of sustainable economic development. Stimulating agricultural production in Azerbaijan, increasing food security and reducing poverty in rural areas are the main goals of the Strategic Road Map for the production and processing of agricultural products in the Republic of Azerbaijan (SR-Agro) document, and these goals include the most diverse and colorful adaptation activities. Existing activities to reduce poverty and increase food security have the following main objectives:

- Support for the development of small farms in rural areas
- Facilitate farmers' access to financial resources
- Stimulation of production of important agricultural products
- Creating conditions for farmers to receive the most diverse assistance
- Supporting farmers' access to domestic and foreign markets

One of the main priorities of SR-Agro is the development of mechanisms to reduce the negative impact of climate change and other natural factors on agriculture (Priority 7.1) and the improvement of environmental protection mechanisms in the agricultural sector (Priority 7.2). The following measures will be taken in this direction:

- Assess the impact of climate change on agriculture and develop an adequate adaptation plan
- Improving agrometeorological database
- Consideration of the possibility of creating a system of weather interference and hail protection for agricultural purposes
- Improving the legal framework and strengthening coordination between relevant agencies
- Laying of protective forest strips
- Application of economic approach to environmental protection
- Conservation of agrobiodiversity

SR-Agro also envisages the implementation of a comprehensive and comprehensive action plan to improve mechanisms for sustainable use of agricultural land and water resources (Priority 7.3). The main goal of this action plan is to use water resources efficiently, reduce water losses and implement climate-sustainable water management. According to the SR-Agro document, the following measures are expected to be implemented in this direction:

- Establishment of a mechanism for assessing the environmental impact of the process of land reassignment
- Ensuring efficient use of land and implementation of land reclamation measures
- Improving pasture management
- Reduction of irrigation water losses
- Improving the reclamation of irrigated lands and preventing re-salinization
- Water resources assessment and information provision
- Improving water use in arid regions
- Management of mountain river hazards (floods)

The SR-Agro document also provides an action plan for the activities mentioned, and the name of the body that will implement or oversee the implementation of individual measures and the schedule of the event.

Measures to ensure the efficient use of water resources

The Order of the President of the Republic of Azerbaijan (July 27, 2020) on additional measures to ensure the efficient use of water resources aims to streamline the use of water resources in the country and improve water supply. According to the decree, given the limited water resources in Azerbaijan, the country's water supply system should be further improved, compatible with the development of the ecosystem, and the introduction of innovations for this purpose should be encouraged.

- The action plan covers the following activities and is planned to be implemented in 2020-2022:
- Assessment, protection and sustainable use of water resources
- Electronic water management, improvement of accounting and information provision
- Improving the efficiency of water use in the energy sector
- Ensuring efficient and economical use of water for irrigation, creation of water resources
- Improving the drinking water supply system
- Increasing efficiency in financing infrastructure projects
- Awareness rising

A water commission has been set up to implement the action plan and the MoA has done the following activities:

- In 2018-2020, 34.2 million manat subsidies were provided for the construction of irrigation systems on 10.4 thousand hectares through the MoA.
- Relevant proposals prepared by the MoA on a new mechanism for preferential use of irrigation water
- More than 674,000 irrigation schedules have been signed by farmers
- Three months before the start of the irrigation period and the autumn sowing, the water requirements for irrigating agricultural crops were determined.
- Submitted to Azerbaijan Amelioration and Water Management OJSC, taking into account the recommendations of relevant scientific research institutions on the norms and schedule of irrigation of plants in the regions
- Specialists of the MoA conducted trainings for agricultural producers on water saving and efficient use and compliance with irrigation schedules. 551 trainings on 66 topics are planned to be held in 60 regions of the country.
- Within the framework of the Integrated Rural Development Project through the Agrarian Development and Credit Agency, training was conducted for employees of 17 Water Users Associations (WUAs) in Yevlakh and Agdash districts.
- Rules for designing and drilling subartesian wells have been developed
- Necessary information has been collected on the optimization of the structure of agricultural crops and types of crops, which are suitable for cultivation in these areas, in order to effectively use the water of the Yengija, Alijanchay and Vilashchay reservoirs for irrigation purposes.
- Relevant working groups have been established to provide irrigation water to 11,300.0 hectares of arable land through the Upper Shirvan Canal and the Kura River and 4,500.0 hectares through the Turyanchay River in the Agdash region.

"Azerbaijan 2020: A Look into the Future" - Concept of Development

The main strategic goal of the concept is to achieve a stage of development in Azerbaijan characterized by sustainable economic growth and high social welfare, effective governance and the rule of law, full protection of all human rights and freedoms and the active status of civil society in the country. One of the main goals of the concept is to achieve environmentally sustainable socio-economic development. The main harmonization activities envisaged in this concept are forest protection, preparedness for dangerous events such as floods and floods, reduction of water use and application of water conservation measures in all economic spheres and all spheres of life.

The State Program on Socio-Economic Development of regions for 2019-2023

Although the main goal of the SPSED (2019-2023) program is not direct CCA, this program envisages several activities to increase the adaptation capacity of the population and the economy, and some of them have already been implemented.

The main goal of the SPSED (2019-2023) program is to ensure the sustainable development of the provinces in Azerbaijan, to create a competitive economy based on the principles of sustainable development on the ground, to ensure social welfare and environmental security that meet high standards.

The following is a list of activities that will be implemented under this program and are important in terms of climate adaptation:

- Strengthening local economic potential through the application of advanced technical equipment and technologies.
- Increase production and employment and income diversification.
- Improving the country's self-sufficiency in basic food products.
- Increasing the production of environmentally friendly products.
- Accelerate the development of entrepreneurship, including SMEs, strengthen their financial sustainability.
- Improving the living standards of the population in the provinces, reducing poverty, as well as strengthening the social protection of vulnerable groups.
- Improving the reliability of environmental protection and sustainable management of natural resources.
- Improving the level of education, medicine and other social services in the provinces;
- Development of road and transport infrastructure in villages;
- Improving the supply of irrigation water to arable lands
- Development of insurance system in the provinces;

“The State Program on socio-economic development of regions (2014-2018)”

"The State Program on Socio-economic Development of the Regions of the Republic of Azerbaijan for 2014-2018" (SPSED 2014-2018) considered large infrastructure projects, improvement of the communal services, and eventually, further improvement of social wellbeing and poverty reduction.

Many of the activities envisaged under the SPSED state program include improving water supply, land reclamation, reducing water losses, support of resilient agriculture, support of food production, disaster risk reduction that are seen as CCAs. These activities were carried out both nationally and regionally and include:

- Support expansion of agrarian-technical service networks, as well as improve provision with machinery, mineral fertilizers and pesticides in agriculture sector
- Support to creation of large farmer enterprises
- Support to introduction of advanced technologies at processing enterprises aiming to increase competitiveness of agricultural products
- Implementation of measures required for recirculation of eroded and saline lands owned by agricultural producers with implementation of technical and biological measures
- training, experience sharing events and scientific research for increasing management skills and knowledge of farmers
- Tree plantation works along highways in droughty-arid zones, including building of an irrigation system and plantation works along Chayli-Jangi section of Baku-Shamakhi highway
- Works on improvement of water supply and sanitation systems in regions
- Develop and implement the “National Plan for Integrated Water Management” (Action Plan)
- Strengthen control over use of water facilities
- Improvement of water supply and sanitation systems in regions
- implementation of works aimed at improvement of water supply of land in regions
- Improvement of the water supply systems
- amelioration-irrigation works for improvement of supply of water to land
- works to improve water supply and sanitation systems in the Sumgait and adjacent settlements
- Continue amelioration and irrigation works in order to improve water supply to land in the district, including drilling sub artesian wells
- Installation of modular water purification systems in the settlements
- Support development of processing industry
- Support to livestock breeding, gardening (pomegranate, persimmon, etc) and crop production sectors
- Support development of large wheat enterprises
- Strengthen material and technical base of infrastructure providing services for agricultural production
- Support flood protection works in areas prone to floods
- Coast reinforcement activities along the Caspian Sea;

State Program on Poverty Reduction and Sustainable Development (2008-2015)

Although not directly related to CCA, this program aims to reduce poverty and pursue sustainable development goals. At the same time, SPPRSD has set itself the goal of sustainable use of natural resources. Environmental sustainability is a cross-cutting issue, and environmental concerns have been taken into account in other issue areas of the SPPRSD, particularly the sections on Economic Development and Education.

In order to achieve targets for sustainable environmental management, SPPRSD calls for implementation of activities in the following priority directions that would ensure sustainable use of natural resources and increase adaptation capacity of rural communities:

- Sustainable forest management.
- Sustainable management of water resources.
- İmproved management of land resources and prevention of desertification.
- Sustainable management of biodiversity.
- Sustainable management of the atmosphere.
- Expansion of use of alternative energy sources.
- Comprehensive waste management.
- Overall management of mountainous and coastal ecosystems.
- İmproving the legal and regulatory framework, monitoring systems and resources for
- Environmental management.
- İncreasing environmental education and awareness

SPPRSD aimed to implement following activities that are directly related to CCA:

The following work has been done under the SSRBD project to increase agricultural production and ensure food security and, ultimately, adaptability to climate change:

- The insurance mechanism improved to reduce damage to producers as a result of natural hazards.
- Improvement of fertilizer supply to farmers
- Expansion of private veterinary services, and increase capacity of regional veterinary departments, phytosanitary services, plant protection stations and quarantine stations.
- Reduction of pasture erosion and restoration of pasture productivity, prevention of overgrazing and regulation of pasture loads.
- Conducting training and increase of knowledge of farmers.

National Program on Environmentally Sustainable Socio-economic Development for 2003-2010

The purpose of the National Program on Environmentally Sustainable Socio-economic Development for 2003-2010 (SSED) is to protect the existing ecological systems, economic potential and efficient use of natural resources to meet the needs of present and future generations in the Republic of Azerbaijan. The SSED prioritized the following activities in the agricultural sector in terms of CCA:

- Strengthening cooperation between government agencies, the private sector and non-governmental organizations in the field of sustainable agricultural development.
- Simplification of the work of individual farms and their associations with the funds allocated for the sustainable development of agriculture.
- Creation of special privileges for state and private farms applying modern agricultural methods.
- Expanding the use of optimized planting systems and advanced irrigation technologies in the irrigation of agricultural crops in order to prevent soil erosion and salinization.

The following activities implemented within the framework of the national program:

- Development and implementation of a state program on efficient use of water resources
- Expansion of regional and international cooperation for the protection of transboundary rivers from pollution and efficient use of water resources by upstream states
- Expanding water reuse in industry and other facilities to address water shortages
- Development of a national action plan to protect and increase the fertility of agricultural land resources
- Implement appropriate measures to prevent erosion and salinization

The State Program on Reliable Food Supply of Population (2008-2015)

The "State Program on the reliable food supply of population in the Azerbaijan Republic" (SPRFSP) developed is directed at implementing activities that will support the food production and reduce vulnerability pf population in terms of food security.

This state program had the following goals and objectives:

- Increase food security of the population
- Production, processing of animal products and pedigree cattle-breeding
- Provision of fertilizers and plant protection resources
- Training of human resources for agrarian field
- Preparatory activities to natural hazards

5. MONITORING AND EVALUATION OF ADAPTATION ACTIONS AND PROCESSES

Azerbaijan has begun developing a national framework for M&E of climate adaptation, but it is still in the early stages. Key institutions involved in monitoring and evaluating adaptation measures include:

- **Ministry of Ecology and Natural Resources (MENR):** As the lead agency responsible for climate change adaptation, MENR plays a central role in coordinating monitoring efforts and reporting on adaptation progress.
- **State Statistical Committee:** This body collects and provides relevant data related to climate indicators, including environmental, social, and economic metrics that are important for monitoring adaptation outcomes.
- **Ministry of Emergency Situations:** This ministry oversees disaster risk reduction (DRR) measures, monitoring their effectiveness in reducing vulnerabilities to climate-related disasters.
- **Ministry of Agriculture and Ministry of Health:** These institutions are involved in sector-specific adaptation actions, particularly in monitoring the resilience of agricultural systems and public health to climate impacts.
- **State Commission on Climate Change:** The commission supports coordination by overseeing the integration of adaptation measures into broader national policies and monitoring progress toward national adaptation goals.

In Azerbaijan, there is no special mechanism for monitoring and adaptaiton of activities. Therefore, monitoring and evaluation of government programs, strategic road maps and all activities related to adaptation are carried out in many different ways. Some indicators for tracking progress in specific adaptation areas, particularly within projects funded by international organizations like the UNDP, the World Bank, and the Green Climate Fund (GCF). These indicators are used to assess changes in vulnerability, resilience, and the effectiveness of adaptation interventions.

Evaluation of adaptation measures in Azerbaijan has been largely project-based, focusing on specific interventions funded by international organizations and the national government. World bank data is essential to evaluate long-term and short-term changes in adaptation.

Evaluation methods often include:

- Project evaluations: Many adaptation projects undergo independent evaluations upon completion to assess their impact and lessons learned. For example, projects funded by the Green Climate Fund (GCF) and the Global Environment Facility (GEF) are subject to M&E procedures to assess their contribution to building climate resilience.

• Sectoral assessments: Some sectors, particularly agriculture and water management, conduct periodic assessments of adaptation efforts. These assessments typically evaluate the effectiveness of policy measures, infrastructure improvements, and capacity-building initiatives in improving sectoral resilience to climate change.
• Cost-benefit analyses: In some cases, cost-benefit analyses are used to evaluate the economic viability and long-term sustainability of adaptation investments. This helps determine whether adaptation actions are cost-effective and whether they deliver value for money.

State Statistical Committee makes official statistics through the implementation of complex measures to improve statistical work in accordance with socio-economic processes and modern challenges in the country and internationally. These measures include the organization of statistical observations in social, economic and other fields and the development of methodologies, metadata and classifications, legal, administrative and informational support to produce official statistical materials, increasing user satisfaction, international cooperation, activities that include the strengthening of the material and technical base and personnel potential.

The State Statistic Committee of Azerbaijan regularly makes monitoring and activities of all organizations in Azerbaijan and prepare a sectoral report that reflects current state of government programs and roadmaps. The committee has developed specific indicators to track the effectiveness of adaptation actions. These indicators are tailored to measure resilience in key sectors, including:
• Water Resource Management: Metrics include water use efficiency, water quality indicators, and drought frequency and intensity. Water losses in irrigation and urban water supply is one of the metrics that consider efficiency of the water resources management.
• Agricultural activities: Indicators focus on crop yield variability, irrigation efficiency, and adoption rates of climate-resilient agricultural practices. State Statistical Committee use broad range of indicators that measure effectiveness of agricultural activities. For example, crop yield per ha, water use per ha, labor cost for per unit of the production are the main economic indicators of agricultural enterprises and private farms.
• Disaster Risk Reduction: Metrics include response times to extreme weather events, the number of communities with early warning systems, and reductions in flood-affected areas. National Hydrometeorological Service release annual statement on the extreme weather events, heat waves and other weather and climate circumstances.
• Ecosystem Protection and Biodiversity Conservation: Progress is measured through forest cover restoration rates, coastal zone health, and biodiversity indexes in protected areas. Number of wild animals, area of the protected places, state of pollution and many other indicators are used to evaluate state of the ecosystems. Forest fires, extreme hazards in protected areas are also counted and analyzed. NBSAP has a protection plan targeted up 2030, use different indicators to evaluate state of the biodiversity in the country.

The annual progress reports provided by State Statistical Committee are regularly compiled to assess adaptation action outcomes and inform policy adjustments. These reports cover all the sectors, including agriculture, water management, health and infrastructure etc.

Azerbaijan relies on a combination of national data collected through sectoral monitoring systems and field surveys conducted by relevant ministries and agencies. MENR is responsible for compiling these data into comprehensive reports, which are then used to update and revise national adaptation strategies as needed. These reports align with the country's commitment under the Paris Agreement to report on adaptation progress in a transparent and accountable manner.

Evaluations are conducted to determine the effectiveness of adaptation measures in reducing vulnerability and enhancing resilience to climate impacts. These evaluations utilize both quantitative and qualitative methods, drawing on data from monitoring systems and stakeholder feedback. Regular evaluations enable Azerbaijan to refine its adaptation strategies by identifying successful practices and areas needing improvement. Key focus areas include evaluating the long-term sustainability of water resource management practices, the effectiveness of agricultural adaptation interventions, and the resilience of infrastructure to climate risks.

Expanding training for local officials involved in monitoring activities could further strengthen data collection and analysis capabilities, involving communities and local organizations in monitoring activities may provide valuable insights and promote a more inclusive evaluation process and leveraging global resources and expertise could support Azerbaijan in enhancing its monitoring and evaluation systems in line with international best practices.

6. INFORMATION RELATED TO AVERTING, MINIMIZING AND ADDRESSING LOSS AND DAMAGE ASSOCIATED WITH CLIMATE CHANGE IMPACTS

As noted, Azerbaijan is vulnerable to various climate-related risks, including extreme heat, droughts, floods, landslides, and coastal erosion, which are exacerbated by climate change. These hazards have led to significant losses in the agricultural sector, damaged infrastructure, and threatened biodiversity. Notably, the central and lowland areas experience increased frequency and severity of droughts, while mountainous regions face heightened landslide risks. The economic costs associated with these impacts are substantial, with flood-related damages alone estimated at $18-25 million[45] annually in affected regions.

The Ministry of Emergency Situations of the Republic of Azerbaijan prepares an overview of the actions taken against natural hazards occurring in the country and sends it to the relevant institutions. The Ministry provides annual statistics of the work done against dangerous events such as fires, floods, and droughts.

To reduce the risks and impacts of climate-related loss and damage, Azerbaijan has implemented various strategies focused on resilience building and risk mitigation. The National Hydrometeorology Service has prioritized developing and implementing early warning systems and disaster preparedness plans for floods, landslides, and other extreme events. These systems enhance community readiness and improve response times, thereby reducing loss and damage.

The country Azerbaijan has adopted measures to improve water use efficiency and drought resilience, especially in agriculture. Programs include modernizing irrigation infrastructure, promoting water-saving techniques, and diversifying water sources to address shortages and minimize water-related loss and damage.

Reforestation and sustainable land management practices are being implemented to restore degraded lands and enhance natural buffers against climate impacts, particularly in areas prone to erosion and landslides.

The country is actively engaged in international collaborations to enhance its capacity to address loss and damage. Through partnerships with organizations such as the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF), Azerbaijan accesses technical support and funding for adaptation projects. These collaborations support the country in developing climate-resilient infrastructure and enhancing its disaster risk reduction frameworks.

Limited financial resources and competing budget priorities, especially given the country's economic reliance on fossil fuels, can restrict the scale and scope of adaptation measures. The government has recognized the need for financial mechanisms to support communities affected by climate-related loss and damage. Insurance Programs has already achieved significant positive results, however, further improvements needed to align existing funds with needs of the farmers.

[45] https://unfccc.int/resource/docs/natc/azenc2.pdf

7. COOPERATION, GOOD PRACTICES, EXPERIENCE AND LESSONS LEARNED

Azerbaijan actively participates in numerous international agreements and partnerships that address climate change adaptation. As a signatory to the Paris Agreement, Azerbaijan collaborates with various organizations such as the United Nations Development Programme (UNDP), the Global Environment Facility (GEF), and the Green Climate Fund (GCF). These partnerships provide essential technical and financial resources to support adaptation efforts across vulnerable sectors like water, agriculture, and infrastructure. Additionally, Azerbaijan engages with regional frameworks such as the Covenant of Mayors for Climate & Energy, which fosters collaboration with neighboring countries on resilience and sustainability initiatives.

Within the UNDP-implemented "EU4Lankaran: Promoting competitiveness, collaboration, and modernization in the fruit and vegetable sector in the Lankaran-Astara economic region" project, financial assistance was provided to selected fruit and vegetable value chain actors to enhance the competitiveness of the value chain, considering EU Green Deal (Farm to Fork Strategy) initiatives. A circular economy strategy was developed for the selected value chains, and financing and beneficiary selection were conducted based on criteria aligned with this strategy. The project team raised awareness about the competition among the regions, and applications were collected by the project office. Only group initiatives were accepted. An evaluation team was created, and proposals were assessed according to EU Green Deal and circular economy requirements. Grants were provided in kind.

Within FAO-implemented "Development of sustainable and inclusive local agrifood systems in the north-west region of Azerbaijan" project, the objective was to contribute to improving rural livelihoods and reducing socio-economic disparities in the north-west region (Gakh, Zagatala, and Balakan) by supporting the development of inclusive agri-food systems that promote local food heritage through the Globally Important Agricultural Heritage Systems (GIAHS) and the creation of inclusive and efficient value chains for selected food products. The project's financial assistance was delivered through a matching grant approach. Selection criteria were developed, and selected value chain actors were trained on how to apply. Formal local food producer groups were formed, an evaluation team was established, and in-kind (materials) assistance was provided to beneficiaries according to the evaluation team's decisions. Priority was given to developing marketing initiatives around rural food heritage, local brands, quality labels, and biodiversity resources. The focus was on ethnic food campaigns, particularly addressing the needs of women and rural youth involvement in local agri-food systems. The project provided targeted support to local agri-food producers in the selected pilot regions, highlighting the unique characteristics of local production systems and their potential for agricultural tourism opportunities. Within the project framework, a matching grant was utilized to support the development and enhancement of local value chains by providing small-scale processing machines and tools. The project aimed to bolster the agricultural sector through targeted equipment donations to improve processing capabilities and overall efficiency.

In the FAO implemented "Catalysing the Efficiency and Sustainability of Azerbaijan`s Hazelnut Sector – HAZER" project empowered smallholder farmers to adopt Good Agricultural Practices (GAP) to increase production efficiency of hazelnut, with adapted mechanization technologies and services and to increase the quality of nuts produced, with specific focus on reducing the risk of aflatoxin contamination. The project empowered the newly established Government institutes and state agencies while linking to private sector actors. Following the smallholder farmers' adoption of modern mechanization technologies and access to services through 50 GAP demonstration sites, yields increased from an average of 1.1-1.2 tonnes per hectare in 2021, to 1.7-1.8 tonnes per hectare in 2023. Combining different Good Agricultural Practices, such as improved pruning and using agricultural equipment, farmers achieved increased yields of up to 70 percent in the project areas, resulting in higher incomes .

Within FAO implemented "Lifecycle Management of Pesticides and Disposal of POPs Pesticides in CA countries and Turkey" project the jointly with Agrarian Service Agency of MoA the demo plots tomato production was established to promote and raise awareness about alternative agricultural methods to Highly Hazardous Pesticides. As part of this project, organic farming and Integrated Pest Management (IPM) methods were demonstrated in a pilot area in the Khachmaz district.

The project was not limited to Khachmaz but also included regular educational activities conducted by specialists from the Agrarian Services Agency in various regions of the republic, including Samukh, Shamkir, and Goranboy. Initially, a farmer field school was established with 100 farmers in the Sabirabad village of Khachmaz, where tomatoes were cultivated using IPM and organic agriculture technologies. The project utilized three different agricultural production technologies: organic farming, integrated pest management, and traditional farming methods. Additionally, in Khachmaz, a 5-hectare demonstration area was used to grow tomatoes employing organic farming and IPM methods. Based on the results obtained from these demonstration plots, while the yield in organic and IPM-treated areas was slightly lower compared to traditional methods, the price was higher, resulting in greater overall revenue from these plots.

Agricultural Support to Azerbaijan Project (ASAP) in 2016. Under the Orchard Value Chain component, the project provided technical assistance to persimmon growers, enabling them to expand and modernize their production activities. This included improvements in pruning, fertilization, pest, disease, and weed control, as well as irrigation, harvesting, and post-harvest practices. These efforts resulted in increased productivity, and dried-fruit processors were able to improve product quality through the implementation of a new water purification and filtration system, leading to better compliance with international quality standards. To help farmers take advantage of export opportunities created by recent changes in customs regulations, ASAP supported the introduction of new technologies and the adoption of certifications such as GlobalG.A.P., ISO 22000, and other international quality and safety standards. Additionally, marketing assistance was provided to help identify potential buyers in the EU and Middle East, reducing reliance on the Russian market. In one selected persimmon demonstration farm located in the Khachmaz region, covering 1 hectare of persimmons, the proper application of insecticides helped control an insect infestation. Green mulching (mowing weeds under the trees) helped maintain the required moisture level, which was crucial due to a lack of irrigation water in the orchard.

In the Pomegranate Value Chain, results were achieved through proper disease and pest control, fertilization, and reducing the problem of skin cracking and splitting, thanks to the introduction of gibberellic acid. The application of this organic compound was a completely new practice introduced to Azerbaijani farmers by ASAP project. The Pomegranate Value Chain also expanded its geographic focus to include new farmer beneficiaries in Beylagan, Salyan, Neftchala, Sabirabad, and Goranboy rayons. ASAP also extended its technical assistance in marketing. One beneficiary in Kurdamir successfully stored pomegranates and sold them later at a price three times higher than during the harvest period. Additionally, the project promoted the application of Integrated Pest Management (IPM), business management practices, GlobalG.A.P. quality and traceability standards, post-harvest handling, and marketing strategies for the international fresh and processed food markets.

The Azerbaijan Competitiveness and Trade (ACT) Project has successfully revitalized pomegranate orchards in the Goychay and Kurdamir regions, transforming once-abandoned lands into productive farms. The project introduced modern orchard management techniques, including intensive pruning, soil preparation, and improved irrigation systems, which have led to significant increases in productivity. By adopting Good Agricultural Practices (GAP) and Integrated Pest Management (IPM), farmers reduced crop losses by 20-25% and improved the quality of their produce. Farmers eagerly embraced the training provided by ACT's technical experts, which covered essential topics such as pruning, fertilization, pest control, and the introduction of high-density planting techniques. The hands-on demonstrations and continuous support helped farmers apply these new methods effectively. As a result, about 150 hectares of pomegranate orchards have been completely renovated, with yields expected to increase from 1.5 tons to 2.5-3 tons per hectare in just one year, and even higher in the future. The economic impact of the project was evident, as farmers reported better prices for their higher-quality produce and improved livelihoods. A farmer noted that trainings were a breakthrough for the region, and with the new approach, they expect continued growth in productivity. The success of the ACT Project serves as an inspiring example of how targeted technical assistance can transform agriculture and improve social welfare.

Through a joint project by UNDP and ABAD (Facilitated Support to Family Business), farmers in Balakan received training sessions focused on enhancing local entrepreneurial capacity. Inspired by these sessions, three persimmon-farming families in the community came together to unite under a single brand to produce and sell high-quality dried persimmon snacks on a larger scale.

Together, they applied to the project as a cooperative. The cooperative benefitted from the project's training on branding, business development, and securing supermarket clients. Their strong business plan earned them professional drying ovens and refrigerators, enabling them to meet the certification standards required for supermarket sales. With support from ABAD, their persimmon crisps, branded under "Caravan," are now sold in major supermarkets, including in Baku. This success has had a ripple effect on the community, as the cooperative now employs seasonal workers and creates new local jobs. This best practice demonstrates how targeted training, and technical assistance can empower rural farmers to innovate, collaborate, and succeed in competitive markets.

To ensure success in drying persimmons, several key practices were implemented as part of the project supporting sustainable local agri-food systems in Azerbaijan's north-west region. The cooperative received essential equipment, including a dehydration chamber, fruit washing machines, and drying ovens, which significantly enhanced their ability to produce high-quality dried persimmons. However, the physical equipment alone was not enough. Success depended on a detailed, step-by-step process that began with thorough fruit washing and precise peeling techniques. Peeling persimmons lengthwise not only ensured a more consistent drying process but also improved the aesthetic quality of the final product. Experience with the new machinery also played a crucial role; frequent monitoring and adjustments to temperature and humidity were necessary for optimal drying results. Collaboration within the cooperative helped pool knowledge and labor resources, and the collective effort ensured the consistency of output. Regular evaluation of processes and attention to detail in every step, from peeling to drying, led to a higher-quality product that met market certification standards. This best practice highlights that while technological advancements are critical, hands-on experience, collaboration, and continuous learning are equally vital for success in agribusiness, particularly in traditional practices like fruit drying.

The “Mina Shirin” pomegranate, developed by the “Red Valley” LLC, exemplifies a successful blend of innovation, research, and branding in agriculture. In a region where pomegranates typically have a sour flavor, the “Mina Shirin” variety stands out with its unique sweet and sour taste, differentiating it from other varieties. The journey began in 2007 when the company initiated the development of a new pomegranate variety characterized by large seeds, a deep red color, and a balanced sweet-sour flavor. By 2012, after planting 32,000 trees, the selection process for the “Mina Shirin” variety was underway. Six years of rigorous selection and cultivation efforts led to the successful breeding and patenting of the “Mina Shirin” pomegranate in March 2018, making it the ninth officially recognized pomegranate variety in Azerbaijan. Under the brand “Mina Shirin,” the “Red Valley” LLC achieved a historic harvest, collecting 32 tons per hectare from their 40-hectare plantation—a record yield for Azerbaijan in the past 70 years. This success is attributed to the company's commitment to quality and innovation, which has propelled them to become a leading domestic agricultural producer. The “Mina Shirin” brand offers a range of products including fresh pomegranates, seedlings, pomegranate sauce, and purified pomegranate. The company has successfully expanded its market reach, exporting to Russia, Hong Kong, the Netherlands, Germany, France, and several Arab countries. All products under the “Mina Shirin” brand adhere to international standards, including ISO 9001:2015 and ISO 22000:2015, ensuring high-quality production and certification. This success story highlights the importance of combining thorough research, quality control, and effective branding to achieve outstanding results in agricultural innovation and market expansion.

Decarbonization and Climate Resilience project

The overall objective of the “Decarbonisation and Climate Resilience in the Eastern Partnership” Project is to support the green transition, enhance decarbonisation, boost energy security and increase resilience to counter the effects of climate change in the EaP countries.

The specific objectives are to:

1. Increase countries' capacities to adequately measure and reduce national emissions and adapt to the impact of climate change, and advance the implementation of the climate policy framework;
2. Demonstrate the benefits of climate adaptation through specific projects; and
3. Support the establishment of credible regulatory frameworks on green finance in line with EU norms and to support the diversification and scaling-up of bond issuance.

These objectives will be achieved by technical support for the 2025 updates of the Nationally Determined Contribution (NDC), improving the regulatory framework as well as further improving the institutional capacities to continuous updates the NDC. The Project will also help to elaborate and implement Monitoring, Reporting and Verification (MRV) systems and mainstream climate change into sectoral and regional policies. The Project will act on a local level by supporting the implementation of local climate adaptation projects, increasing the preparedness and resilience of cities and municipalities against short- and long-term climate risks. To mobilise additional sustainable investments, the introduction of innovative financial instruments such as green bonds will be supported. In Ukraine, the Action will address the reconstruction needs that resulted from Russia's war of aggression against Ukraine.

Covenant of Mayors in Azerbaijan

Azerbaijan joined the **Covenant of Mayors** in 2011. Although the central government is the primary driver of national climate policies, local authorities in Azerbaijan have begun to play an increasingly important role in climate mitigation and adaptation.

Key Cities and Municipalities Involved:

Several cities in Azerbaijan have signed the Covenant of Mayors and committed to climate and energy goals, including:

Ganja: As one of Azerbaijan's largest cities, Ganja has been a notable participant in the Covenant of Mayors. The city has developed a Sustainable Energy Action Plan (SEAP), which outlines measures to reduce energy consumption, increase renewable energy use, and reduce GHG emissions.

2. Khirdalan: Known for its industrial base, Khirdalan has also joined the Covenant of Mayors and committed to transitioning to more sustainable energy use. The city's participation reflects a broader trend of industrial cities working to balance economic development with environmental sustainability.

3. İcharishahar: Several municipalities surrounding Baku, Azerbaijan's capital, have taken steps toward energy efficiency and climate adaptation measures under the Covenant's framework.

4. Mingechevir. The city has signed CoM initiate and developed its SECAP document, which consider mainly adaptation planning and activities related to adaptation, such as greening of the city, drip irrigation based parks and resillent buildings.

8. ADDITIONAL INFORMATION RELATED TO CLIMATE CHANGE IMPACTS AND ADAPTATION UNDER ARTICLE 7 OF THE PARIS AGREEMENT

- **2020-2024 State Program for the Geological Study of the Earth's Subsurface**[46] prioritizes sustainable resource management and efficient utilization of mineral resources as crucial elements for climate change adaptation. By emphasizing comprehensive geological research—including hydrogeological and geoecological studies—the program aims to enhance understanding of environmental vulnerabilities and improve natural resource governance. Furthermore, the initiative incorporates monitoring and assessment of geological processes to mitigate potential risks, ensuring that resource extraction aligns with environmental protection goals. This approach not only addresses immediate economic needs but also fosters long-term resilience against climate-related challenges.

- **"I State Program on the Great Return to the liberated territories of the Republic of Azerbaijan**[47] program focuses on the sustainable reintegration of internally displaced persons, emphasizing climate change adaptation and resilience-building in affected areas. It aims to enhance environmental sustainability through the restoration of ecosystems and the implementation of green infrastructure, which will not only support the livelihoods of returnees but also strengthen community resilience against climate impacts. Additionally, the program prioritizes the development of climate-smart agricultural practices to ensure food security and efficient resource management in newly resettled communities. By integrating climate adaptation strategies into its framework, the 'Great Return' initiative seeks to create a sustainable future that addresses both social and environmental challenges.

[46] https://e-qanun.az/framework/44766

[47] https://e-qanun.az/framework/52757

- **"Azerbaijan 2030: National Priorities for Socio-Economic Development"** highlights the importance of creating a clean environment and a "green growth" economy as a key component of the country's development strategy. It emphasizes the need for effective implementation of ecologically clean[48] technologies, the utilization of renewable energy sources, and the restoration of polluted areas to mitigate the impacts of climate change. The document also outlines a commitment to enhancing the quality of the ecological environment and promoting sustainable use of natural resources, which are critical for ensuring the resilience of communities against climate-related challenges. By integrating these principles into national policies, Azerbaijan aims to foster a more adaptive and sustainable socio-economic landscape that meets the needs of its citizens while addressing global climate goals.

- **"The State Program on Ensuring Food Security in the Republic of Azerbaijan for 2019–2025** integrates climate change adaptation measures to enhance the resilience of the agricultural sector against environmental challenges. This program emphasizes the importance of sustainable agricultural practices, which include[49] the promotion of climate-smart farming techniques and efficient water resource management to mitigate the impacts of climate variability. Additionally, it aims to strengthen the capacity of farmers through training and the provision of resources, ensuring that food production systems are robust and adaptable. By aligning food security goals with climate adaptation strategies, the program seeks to safeguard livelihoods and promote sustainable development in the face of climate change.

- **"The State Programme on Socio-Economic Development of Regions for 2019-2023** Focused on regional adaptation, this program enhances local economic potential through advanced technologies and supports self-sufficiency in food production. It includes projects to improve irrigation, infrastructure,[50] and environmental management, which are essential for enabling communities to adapt to climate-related challenges.

- **The Strategic Road Map on the Production and Processing of Agricultural Products in the Republic of Azerbaijan for 2017-2020**[51] emphasizes the assessment of climate change impacts on agriculture across different regions, with plans to develop adaptation strategies aimed at minimizing potential losses. It outlines the importance of enhancing agro-meteorological data quality to establish a robust Early Warning System, which will facilitate timely and informed decision-making for farmers. Additionally, the strategy calls for improved accessibility to climate-related information, including the monitoring of soil moisture and evaporation rates, to support effective agricultural practices in the face of climate variability.

[48] https://president.az/az/articles/view/50474

[49] https://e-qanun.az/framework/42111

[50] https://e-qanun.az/framework/41320

[51] https://president.az/az/articles/view/22110

- **"The National Program on Environmentally Sustainable Socio-economic Development for 2003-2010"**[52] is designed to protect existing ecological systems while enhancing the economic potential of the Republic of Azerbaijan and ensuring the efficient use of natural resources to meet the needs of both current and future generations. The program emphasizes the importance of climate change adaptation (CCA) within the agricultural sector by prioritizing initiatives that strengthen collaboration among government agencies, the private sector, and non-governmental organizations in the pursuit of sustainable agricultural practices. Key activities include simplifying operations for individual farms and their associations, creating incentives for state and private farms adopting modern agricultural methods, and expanding the use of optimized planting systems and advanced irrigation technologies to mitigate soil erosion and salinization. Additionally, the SSED outlines a series of planned actions, such as developing a state program for efficient water resource management and promoting regional cooperation to protect transboundary rivers from pollution, which are crucial for enhancing the resilience of the agricultural sector against climate impacts."
- **The "National Strategy for the Conservation and Sustainable Use of Biological Diversity 2017-2020"**[53] emphasizes integrating climate change adaptation measures into biodiversity protection efforts. It focuses on the restoration and protection of ecosystems vulnerable to climate change impacts, such as wetlands and high-mountain areas, through adaptive management and sustainable land use practices. Additionally, the strategy promotes the use of climate-resilient species in reforestation and ecosystem rehabilitation to mitigate the effects of climate change. By enhancing ecosystem resilience, the program aims to safeguard biodiversity and ecosystem services critical for both human well-being and environmental sustainability.
- **The "State Strategy on Hazardous Waste Management in Azerbaijan"**[54] (2004-2010) ;emphasizes the need for addressing climate change impacts by minimizing the environmental risks associated with hazardous waste. It integrates climate resilience into waste management by promoting sustainable waste disposal practices that prevent soil and water contamination, which are critical in mitigating climate change effects. The strategy also focuses on reducing greenhouse gas emissions from waste, adopting eco-friendly technologies, and enhancing the capacity to manage hazardous waste sustainably, thereby contributing to both environmental protection and climate adaptation efforts

- **The Action Plan to ensuring the efficient use of water resources for the period from 2020 to 2022.**[55] This strategy addresses water scarcity and the impacts of climate change on Azerbaijan's water resources. It emphasizes the modernization of infrastructure, reducing water losses, and implementing resilient systems for drinking and irrigation. The strategy includes innovative technologies to ensure sustainable water use, especially in regions like Qarabagh and Shargi Zangazur, where water security is crucial for climate resilience.

- **The State Program on the Efficient Use of Summer and Winter Pastures and Hayfields in the Republic of Azerbaijan and the Prevention of Desertification**[56] focuses on sustainable land management to bolster climate resilience and mitigate the effects of desertification. This program targets the preservation and improvement of pasture productivity, the prevention of soil erosion, and the restoration of degraded lands. Key actions include modernizing pasture management practices, implementing anti-erosion measures, and enhancing biodiversity conservation. By integrating sustainable agricultural practices, the program aims to protect natural resources, support agricultural adaptation to climate change, and ensure the long-term sustainability of rural communities and ecosystems.

[52] https://e-qanun.az/framework/1975
[53] https://president.az/az/articles/view/21261
[54] https://e-qanun.az/framework/5514
[55] https://e-qanun.az/framework/45487
[56] https://e-qanun.az/framework/5994

- **National Action Plan on "Reducing the negative impact of plastic packaging waste on environment in the Republic of Azerbaijan for 2019-2020 years"**[57] Focused on reducing plastic pollution, this action plan includes waste management improvements and legislative measures to limit plastic use. It encourages recycling, biodegradable alternatives, and public awareness initiatives to reduce environmental damage from plastic waste, supporting sustainable development goals and adaptation efforts.

- **State Program for the Development of Remote Monitoring Services for the Earth's Surface by Satellite in the Azerbaijan Republic for 2019-2022:**[58] This program enhances Azerbaijan's climate resilience by improving satellite-based monitoring of environmental changes and natural disasters. It supports sectors like agriculture and water management by providing accurate data for better decision-making, which is crucial for adapting to climate variability

- **The National Strategy for Improving Solid Waste Management in the Republic of Azerbaijan for 2018-2022**[59] focuses on enhancing Azerbaijan's waste management systems to support climate resilience and sustainability. The strategy prioritizes reducing waste, improving collection and disposal infrastructure, and increasing recycling efforts, particularly in urban areas like Greater Baku. This includes establishing new waste treatment facilities and adopting advanced sorting and incineration technologies to minimize landfill reliance. By implementing these measures, the strategy aims to mitigate environmental pollution, protect public health, and reduce greenhouse gas emissions, aligning with Azerbaijan's broader goals for climate change adaptation and sustainable development.

- **The Comprehensive Action Plan on Improving the Environmental Situation in the Azerbaijan Republic for 2006-2010**[60] is designed to tackle environmental challenges and enhance climate resilience across the country. This plan prioritizes the reduction of air, water, and soil pollution through actions such as modernizing waste management systems, rehabilitating contaminated sites, and addressing industrial emissions. Key projects within the plan include the restoration of the Caspian Sea coastline, the revitalization of forests, and measures to secure water resources from pollutants. These initiatives collectively aim to mitigate environmental impacts, promote public health, and support sustainable development as part of Azerbaijan's broader climate adaptation and resilience efforts.

- **The Development Program of Hydrometeorology in the Republic of Azerbaijan**[61] is focused on improving Azerbaijan's climate resilience and adaptation to changing environmental conditions. This program enhances the country's hydrometeorological services through modernized weather monitoring and forecasting systems, which are crucial for managing climate impacts. It includes efforts to strengthen early warning systems for natural hazards like floods and droughts, contributing to disaster risk reduction. Additionally, the program aims to improve data accuracy and availability for climate-related decision-making, ensuring that water resources and agricultural sectors can adapt to climate variability effectively.

- **The State Program for the Use of Alternative and Renewable Energy Sources**[62] in Azerbaijan focuses on enhancing climate resilience and adaptation by reducing dependence on fossil fuels and expanding renewable energy capacity. This program outlines initiatives to increase the use of wind, solar, biomass, and hydroelectric power, which not only mitigate greenhouse gas emissions but also promote sustainable economic growth. By advancing renewable energy infrastructure and technologies, the program supports Azerbaijan's efforts to improve environmental sustainability and reduce vulnerability to climate change impacts. The program's alignment with national priorities underscores its role in fostering a resilient, low-carbon energy system that contributes to long-term climate adaptation goals

[57] https://e-qanun.az/framework/41394
[58] https://e-qanun.az/framework/40724
[59] https://e-qanun.az/framework/40445
[60] https://e-qanun.az/framework/12395
[61] https://e-qanun.az/framework/5433
[62] https://e-qanun.az/framework/5796

- **The National Program on Restoration and Expansion of Forests in the Azerbaijani Republic**[63] aims to combat deforestation and restore forest cover across the country. This program focuses on reforestation efforts, soil conservation, and the sustainable management of forest resources to mitigate soil erosion and enhance water retention. Additionally, it supports biodiversity conservation and promotes rural development through sustainable forestry practices, aligning with Azerbaijan's goals for climate adaptation and resilience

- **The Development Concept "Azerbaijan - 2020: The Vision of the Future"**[64] outlines Azerbaijan's strategic objectives to foster sustainable development and enhance the country's resilience to climate change. This concept emphasizes economic diversification, prioritizing sectors beyond oil to create a knowledge-based economy. Key components include promoting renewable energy, efficient use of natural resources, and integrating environmental sustainability into national planning. By advancing these goals, the concept aims to position Azerbaijan as a competitive and resilient nation that aligns with global sustainability and climate adaptation priorities.

9. PROGRESS ON IMPLEMENTATION OF ADAPTATION

A summary of the work done in adaptation is based on the documents and activities developed between 1992-2024. These documents are mainly National Communications to UNFCCC and the work done in their basis. These works can be grouped as follows:

Policy activities. These include Azerbaijan's policy work under the Kyoto Protocol and the Paris Agreements, CDM projects, and documents designed to make irrigation and water use more efficient.

Mainstreaming activities. These activities include real field activities that consider shifting to modern irrigation technologies, adaptation on coastal erosion and coastal managements. İmplemented projects' activities that consider mainstreaming into the development plans will be highlighted here as well.

Azerbaijan has integrated climate adaptation into national policy frameworks through a range of targeted strategies and programs, each addressing its unique climate vulnerabilities, such as water scarcity, biodiversity loss, soil degradation, and pollution. These initiatives support Azerbaijan's broader goals for sustainable development, climate resilience, and risk mitigation.

Disaster Risk Reduction and Resilience:
Azerbaijan faces increasing risks of floods, droughts, and landslides due to climate change. The Khudafarin and Giz Galasi Hydro Power Plants[65], located on the Araz River, have a combined capacity of 140 MW and generate 716 million kWh annually. Beyond energy production, these plants contribute to flood management, which is essential for safeguarding nearby communities and agricultural lands from climate-induced disasters.

The **Shimal Power Plant's** cooling system was recently adapted to address declining Caspian Sea levels, which have dropped by about two meters over the past two decades. With a 540-meter overpass allowing access to deeper water sources, the plant also incorporates a 300 kW hydropower station that generates 2.5 million kWh annually. This ensures operational stability and highlights Azerbaijan's commitment to resilient infrastructure.

"Green World Solidarity Year" initiative
To reinforce international solidarity in the global fight against climate change, 2024 was declared the "Green World Solidarity Year" in Azerbaijan by a decree from President Ilham Aliyev. In alignment with this initiative, under the slogan "Let's be united for a green world," executive authorities from 85 cities and districts across the country aim to plant trees and shrubs across the country. This nationwide effort not only supports the expansion of green spaces but also demonstrates Azerbaijan's commitment to environmental protection and mitigating the effects of global climate change.

[63] https://e-qanun.az/framework/1975
[64] https://e-qanun.az/framework/25029
[65] https://e-qanun.az/framework/25029

Urban Resilience and Infrastructure:
Urban areas, particularly Baku, are increasingly affected by extreme heat and flooding. In response, Azerbaijan has focused on improving urban infrastructure to withstand climate-related challenges. The Oghuz-Gabala-Baku Water Pipeline ensures reliable water supply, and ongoing climate-resilient urban planning initiatives are enhancing the city's ability to adapt to rising temperatures, reduce urban heat islands, and prevent flood damage. Smart city technologies are also being introduced to support efficient resource use and disaster preparedness.

Public Health and Climate Change:
The health impacts of climate change, such as heat-related illnesses and the spread of vector-borne diseases, are being addressed through Azerbaijan's adaptation efforts. The Ministry of Health has implemented enhanced monitoring systems and launched public awareness campaigns on climate-related health risks. These measures ensure that communities are better prepared to cope with extreme weather events, thereby reducing public health vulnerabilities.

Institutional Strengthening and Capacity Building:
Azerbaijan has developed specialized programs to build local authorities' capacity for implementing adaptation measures. For example, the Carbon Certification for Small Hydroelectric Power Plants in Kelbajar and Lachin facilitates access to voluntary carbon markets. This program not only helps secure funding but also supports Azerbaijan's proactive stance on climate adaptation by leveraging regional hydropower resources for mitigation.

Financial Support for Adaptation:
Azerbaijan utilizes funding from both national resources and international organizations, such as the Green Climate Fund (GCF) and the Global Environment Facility (GEF), to support its adaptation projects. Financial backing has been critical for large-scale initiatives, such as the Garadagh Solar Power Plant and the Shimal Power Plant enhancements. Azerbaijan's approach blends public and private investments, which is instrumental in fostering a resilient economy that can withstand climate-related disruptions.

Transportation Sector Adaptation Initiatives:
Promotion of Electric Vehicles (EVs):
In 2022, Azerbaijan introduced incentives, including a zero percent customs duty and VAT exemption on EVs under three years old. This policy change aims to reduce emissions from road transport, a significant source of the country's CO_2 emissions.

Stricter Import Regulations on Older Vehicles: Since 2022, Azerbaijan imposed higher import duties on older vehicles, reducing imports of less efficient vehicles by 40%.

Development of EV Infrastructure: Azerbaijan is expanding EV infrastructure, with a plan to reach 500 EV charging stations by 2025.

Through these comprehensive adaptation measures, Azerbaijan demonstrates a robust commitment to climate resilience and sustainable development. By addressing water security, renewable energy, disaster preparedness, and ecosystem conservation, Azerbaijan is building a resilient foundation that protects vulnerable communities, secures livelihoods, and minimizes climate-related risks. These initiatives represent a forward-looking approach to adaptation, aligning with Azerbaijan's national priorities and its obligations under the Paris Agreement.

Action	Executing Bodies	Implementation period
Definition and mapping of eroded, salty, salinized lands , preparation of proposals for their efficient use	ANAS, MoA, AMWM JSC, LEP and M	2008-2021
Definition of lands in need of amelioration, preparation of their large-scale maps	AMWM JSC, MoA, LEPM	2009-2022
Project implementation for re-cultivation of polluted and degraded lands	ANAS, MENR, LEPM	2008-2015
Expansion of activities to increase land fertility and fields of irrigated lands	MoA, State Committee for Land and Cartography, AMWM JSC, MENR, LEPM	2008-2015
Improve mechanism of access of agricultural producers to irrigation water, ensure its economic and financial efficiency	AMWM JSC, MoED, LEPM	2011-2015
Support to implementation of advanced irrigation technologies	MoA, AMWM JSC	2008-2015
Regular ecological monitoring of environment (soil and water), provision of relevant information to producers	MENR	2008-2015
Take relative actions so that shift cultivation system in crop production will be in accordance to local conditions	MoA, LEPM	2009-2015
Define optimal cropping patterns and production volume of agricultural crops by regions, give relevant recommendations to farmers and agro-businesses	MoA, LEPM	2008-2015
Testing and zoning of new productive brands	MoA, ANAS	2008-2015
Support the expansion of greenhouse system to grow vegetables	MoA, LEPM	2008-2015
Encourage the development of cattle breeding and its forage base on the basis of intensive technologies	MoA, MoED	
Improve water reserve management, efficient use of water	AMWM JSC, MoED, MoF, MoJ	2009-2015
Improve working regimes of amelioration and irrigation systems and increase their potential	AMWM JSC, MoF, MoED	2008-2015
Rehabilitation, reconstruction and construction of irrigation and collector-drainage network	AMWM JSC, MoED, MoF, MoA,	2008-2015
Continue flood prevention actions	AMWM JSC, MoES, MENR, MoED, MoF	2008-2015
Rehabilitation and reconstruction of water supply systems for winter pastures	AMWM JSC, MoA, MENR, MoED, MoF	2009-2015
Construction of water reservoirs and irrigation canals to extend irrigated land fields and improve water supply of land	AMWM JSC, MoED, MoF	2008-2015
Widely apply water saving techniques and technologies saving during irrigation	MoA, AMWM JSC, MoED, MoF	2010-2015
Drilling sub-artesian wells and rehabilitation of existing wells to improve water supply in the rayons	AMWM JSC, MoED, MoF, MENR, MoA	
Improve legislation on phyto-sanitary control according to international standards, rules and recommendations, develop international cooperation	MoA, MoJ	2008-2015
Strengthen logistics of sanitary-epidemiological control units in order to approximate food safety to international standards	MoH, MoED, MoF, SMP	2008-2011

During the state budget drafting, take into account annual financial demand for grain products to be procured to the State Wheat Fund	MoES, MoED, MoF	2008-2015
Define sorts and volumes of reserves for the formation of state food reserves	MoES, MoF, MoED	2008-2015
Capital repair of existing warehouses and other engineering equipment or construction of new warehouses in the entities keeping food reserves	MoES, MoF, MoED	2008-2015
Improve fire protection during the production and conservation of agricultural products and food stuff	MoES	2008-2015

Table 59. Action Plan on the State Program on Reliable Food Supply of Population in Azerbaijan

Water Resource Management: Azerbaijan has initiated several projects aimed at improving water management, focusing on modernizing irrigation systems and increasing water efficiency in agriculture.

Reconstruction of the Samur-Absheron Irrigation System

In 2004-2015, 1492 subartesian wells were drilled in order to satisfy the demand of the planting areas and the population for potable water. Within the project of "Reconstruction of the Samur-Absheron irrigation system", "Takhtakorpu water reservoir" with total water storing capacity of 268 million m3 and main channels with the length of 140 km were built and put into operation. Through the measures of "Development of the Amelioration and Irrigation system", water provision of lands was improved in 266 thousand ha of area, 43 thousand ha of area was added to the group of lands newly watered. At the same time, the ameliorative condition of lands in 218 thousand ha of area was improved. However, as more than 90% of irrigation and collector and drainage networks are soil-bound and open, water is lost highly, mineralized ground waters rise to the planting layer and surrounding lands get salinized. Apart from that, as a main irrigation method, traditional "surface irrigation" or "flooding" are applied. The implementation of modern irrigation methods such as 'drip irrigation" is within limited level.

Yengija Water Reservoir Construction

In response to climate change and growing water demand, Azerbaijan has initiated the construction of the Yengija Water Reservoir in Qabala. A decree by President Ilham Aliyev kickstarted this project, aligning with Azerbaijan's 2020–2022 Water Resource Efficiency Plan, which addresses the impacts of global warming, reduced water inflows from neighboring countries, and local water demand. The State Water Resources Agency oversees this project, coordinating with ministries and local authorities to ensure a resilient water supply system.

Reconstruction of the Shirvan Irrigation Canal

On April 16, 2024, the foundation was laid for the reconstruction of the Shirvan Irrigation Canal in Hajıgabul. Built in 1958, this canal is Azerbaijan's second largest, spanning over 122 km and providing irrigation and household water to over 112,000 hectares across multiple districts. Decades of continuous operation have led to substantial water losses and degradation, impacting agricultural productivity and regional water supply.

The reconstruction project will modernize the canal with a SCADA system for efficient water management, significantly increasing its capacity to irrigate 230,000 hectares. The upgrade is anticipated to save approximately 346 million cubic meters of water annually, improve ecological balance around Hacıgabul Lake, and bolster sustainable agriculture across 10 districts.

Smart Water Systems

Azerbaijan is facing significant water challenges due to climate change and rising temperatures, which have led to reduced surface water availability, decreased river flows, and less frequent rainfall. This, combined with population growth, higher living standards, and agricultural development, has further strained water resources. To adapt to these impacts, Azerbaijan has implemented Smart Water Systems, which manage the entire water supply chain, from sourcing freshwater to wastewater treatment. Key adaptation projects include rebuilding water and sewage systems in Shusha and Xankendi, using modern technologies to address the increasing demand and climate-induced water shortages. Water and Amelioration Complex Design Institute is leading these initiatives under the State Water Resources Agency. Projects focus on creating sustainable water infrastructure, including reservoirs and advanced monitoring systems like SCADA, which ensure real-time control of water resources.

Reconstruction of Boztapa Irrigation Canal

In 2022, Azerbaijan began the reconstruction of the Boztapa Irrigation Canal, a 42.4 km canal that sources water from the Araz River, benefiting 9,775 hectares of farmland in İmishli and Beylaqan. The project includes 186 hydro-technical structures and aims to improve water supply for agriculture. Integrating the SCADA system enhances water resource management, making it more adaptable to climate challenges.

Water Infrastructure Restoration and Development in Karabakh and East Zangazur

Azerbaijan is actively working to rehabilitate and develop critical water infrastructure in the Karabakh and East Zangazur regions to adapt to climate change and secure water resources. Key completed projects include the restoration of the Suqovushan and Xachınchay reservoirs, as well as the Tartarchay Left Bank Canal. These projects are crucial for ensuring stable water supply and supporting local agriculture and communities.

Further projects are in progress, with the Kondalanchay 1, 2, and Lower Kondalanchay reservoirs nearing completion. Additionally, construction of the Zabukhchay reservoir in Lachın is underway, with future plans for new reservoirs like Hakarichay and Bargushadchay and their associated canals to improve water management across the region. These initiatives are vital to bolstering social and economic resilience in Karabakh and East Zangazur, making the region more adaptable to climate impacts.

Qarabagh irrigation canal is the largest in Azerbaijan, supplying critical water to 115,000 hectares of agricultural land across nine districts in the Karabakh region and surrounding areas. It also feeds into the Bahramtapa Hydropower Complex on the Araz River, supporting both household and agricultural water needs. The decree calls on the Ministry of Economy, Ministry of Ecology and Natural Resources, and local authorities to coordinate on the canal's modernization, ensuring efficient and sustainable water use that strengthens agricultural resilience against climate variability.

Suqovushan Reservoir in Tartar, originally built in 1976 with a capacity of 5.86 million cubic meters, had faced significant challenges due to prolonged occupation. Its restoration now supports water distribution for over 96,000 hectares across Tartar, Aghdara, Goranboy, and Aghdam, regions that previously experienced severe water shortages. The reservoir regulates inflows from the Tartarchay and Turaghaychay rivers, channeling water through its main canal with a capacity of 70 cubic meters per second. Additional facilities, including a new administrative building and pump station, were added to improve operational efficiency, enhance water distribution, and adapt to the increasing climate-induced demand.

These rehabilitation efforts mark significant strides in securing Azerbaijan's water resources, crucial for agriculture, livelihoods, and sustainable development across the liberated areas. Through these projects, Azerbaijan is not only safeguarding its current water supply but also building a resilient infrastructure foundation that can withstand future climate challenges.

Desalination of Seawater

Desalination Facility and Nursery Complex in Khıdırli, Salyan. Caspian Sea desalination facility in Khıdırlı village, Salyan, plays a key role in Azerbaijan's climate adaptation and water security initiatives. Operational since 2013, the facility's advanced reverse osmosis technology processes seawater daily, yielding 2,000 cubic meters of potable water. This desalinated water supports the irrigation of a vast 700-hectare green area, with 90% used for irrigation and the remainder for household needs.

In addition to seawater desalination, the complex desalinates saline water from the Shirvan collector, providing 5,000 cubic meters of drinkable water daily to irrigate 1,750 hectares of green spaces. The facility includes high-capacity storage, advanced electronic control systems, and water reservoirs for consistent supply.

A major nursery within the complex cultivates over 1.6 million seedlings, including olive, mulberry, pomegranate, and almond trees, contributing to afforestation and green space development.

Baku Seawater Desalination Pilot Project. On April 12, 2023, President Ilham Aliyev decreed the launch of a pilot desalination project for Baku and surrounding areas, focusing on converting seawater into drinking water. This initiative, part of Azerbaijan's National Water Efficiency Strategy, aims to ensure long-term water security and address the increasing demand for potable water due to climate impacts.

The project will leverage advanced desalination technology to meet Baku's growing water needs. The necessary infrastructure and efficient transport systems for distributing desalinated water to Baku and nearby regions are being developed. Scheduled for completion by the end of 2027, this facility is expected to provide a sustainable drinking water source, helping to mitigate the region’s water shortages.

This pilot project represents a strategic shift towards securing alternative water resources for Azerbaijan’s urban areas, showcasing the country’s proactive approach to climate adaptation and resilient water management.

ASCO’s Adaptation and Climate Resilience Measures

The Azerbaijan Caspian Shipping Company (ASCO), operating the largest fleet on the Caspian Sea, plays a critical role in the transport and service sectors both within the Caspian and beyond, particularly in the Black and Mediterranean Seas. ASCO’s fleet includes 51 transport ships, 198 specialized offshore vessels for oil and gas operations, and multiple port and ship repair facilities, all essential for regional connectivity and trade.

Climate Adaptation Challenges: ASCO’s operations face significant challenges due to the declining water levels in the Caspian Sea, which have reduced navigational depths and impacted ship loading capacities. The resulting limitations in loading capacity reduce energy efficiency and increase emissions, creating a feedback loop with climate change. ASCO has increased dredging activities to maintain access to ports and shipyards, but these efforts are costly and complex, requiring continuous adaptation of infrastructure to sustain operations.

Emission Reduction Strategy: In alignment with the International Maritime Organization’s 2030 and 2040 emission reduction targets, ASCO has developed a comprehensive energy efficiency strategy. Key initiatives include:

Fuel Efficiency Technologies: Installation of stern flow directors, air bubble systems on hulls, and robotic hull cleaning devices.

Shore Power Utilization: Enabling vessels to use shore power during docking.

Route Optimization with “Eco Pilot”: An electronic intervention system to automatically adjust speed and routes based on sea currents and weather, expected to reduce fuel consumption by up to 6%.

Methanol Fuel Adaptation: ASCO plans to transition to methanol-powered vessels by 2040, which will reduce emissions by 42–60%. Methanol offers a practical alternative due to its availability, cost efficiency, and lower emissions profile compared to traditional marine fuels.

ASCO’s initiatives underscore its commitment to sustainable maritime operations and resilience against climate impacts, aiming to meet international standards while ensuring the long-term viability of its essential services on the Caspian Sea.

Agriculture

Azerbaijan’s agriculture sector has been increasingly affected by climate-related risks, notably droughts, floods, and soil erosion, which collectively impact crop yields, livestock health, and rural livelihoods. In response, Azerbaijan has integrated disaster risk reduction (DRR) and adaptation measures into agricultural policies, emphasizing enhanced resilience and sustainable growth. Notable progress has been achieved in recent years across areas such as early warning systems, agricultural insurance, and agrometeorological services, with targeted milestones set for 2025 and 2030.

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Disaster Risk Reduction (DRR) Systems in Agriculture

Efforts to mitigate climate risks include strengthening early warning systems tailored for the agriculture sector. Between 2015 and 2020, Azerbaijan recorded a substantial number of natural hazard events, which included occurrences of extreme weather impacting agricultural productivity.[66] The government is developing a dedicated DRR platform to coordinate agricultural response mechanisms and efficiently manage climate-induced disasters. Expected to be operational by 2025, this platform will involve contributions from the Ministry of Agriculture and other relevant agencies to safeguard agricultural resilience.

[66] https://openknowledge.fao.org/server/api/core/bitstreams/ae677d2f-053a-46a2-9c69-984c695e1491/content

Expansion of Agrometeorological Services and Early Warning Systems

Since 2021, significant progress has been made in organizing and expanding agrometeorological services in Azerbaijan. The Ministry of Ecology and Natural Resources (MENR) has implemented a series of measures to improve the quality and accessibility of agrometeorological information for farmers. Daily, decadal, and monthly agrometeorological bulletins are now available online, and farmers can access real-time data via the National Hydrometeorology Service's platform *(https://meteo.az/).* These bulletins provide crucial information on daily, decadal, and monthly weather conditions, including minimum, average, and maximum air temperatures, precipitation amounts, and soil temperatures at various depths. The improved accessibility of this data allows farmers to make informed decisions regarding crop management, irrigation, and disease prevention, contributing to enhanced agricultural resilience to climate change.

Pilot Projects on Early Warning Systems (EWS)

In addition to agrometeorological services, pilot projects have been launched to establish early warning systems (EWS) for agricultural risks, such as drought and extreme weather events. For instance, the Ministry of Agriculture initiated a project in 2021 that covers regions such as Quba, Qusar, and Shamakhi. These systems are equipped with advanced sensors that monitor temperature, humidity, wind speed, and precipitation. Data from these stations are processed and analyzed to provide real-time alerts to farmers about upcoming risks, including potential pest outbreaks and weather-related disruptions. These early warning systems are designed to increase the preparedness and adaptive capacity of local farmers, helping to mitigate the impacts of climate-related disasters on agricultural production.

Agroinsurance: Azerbaijan has initiated a national agroinsurance program to bolster financial resilience for farmers facing climate risks. Launched under the Agricultural Insurance Fund, this initiative offers voluntary insurance options designed to mitigate losses from natural disasters and extreme weather events, such as drought and pest infestations. Introduced in 2020, the government has provided subsidies covering 50% of the insurance premiums, which has encouraged greater participation among farmers.

Although still in its early stages, the insurance scheme offers essential financial protection, stabilizing incomes and enabling farmers to invest in climate-resilient agricultural practices. The Ministry of Agriculture aims to further increase participation rates in the coming years, supporting a robust risk management framework within the agricultural sector and enhancing the resilience of farming communities to climate-related challenges.

Agriculture Adaptation Initiatives

Azerbaijan is proactively addressing climate adaptation challenges in agriculture through innovative crop selection and water management strategies aimed at enhancing resilience to changing climate conditions. As part of these efforts, drought-resistant crops are being trialed in saline soils to promote sustainable agriculture under adverse environmental conditions. In Bilasuvar, crops like quinoa and amaranth are being grown on 1 hectare of land under the guidance of local authorities and the Azerbaijan Research Institute of Crop Husbandry. These crops not only thrive in drought conditions but also contribute to soil desalination, helping agriculture adapt to ongoing climate challenges.

Subsidies for Efficient Water Use

Further strengthening climate adaptation in agriculture, Azerbaijan is implementing targeted subsidies to promote efficient water use and environmental sustainability. Beginning in 2025, the Agricultural Subsidy Council introduced an additional subsidy of 60 AZN per hectare for agricultural lands that employ modern irrigation systems, as part of the national strategy to mitigate water scarcity exacerbated by climate change. This subsidy supports farmers cultivating climate-resilient crops in designated regions, contributing to both sustainable agriculture and water conservation efforts. These initiatives reflect Azerbaijan's commitment to addressing climate risks by supporting adaptive practices that align with national priorities in water and environmental management.

CHAPTER IV

Information on financial, technology development and transfer and capacity-building support provided and mobilized under Articles 9–11 of the Paris Agreement

This chapter presents a detailed account of the financial, technological, and capacity-building support needed and received by Azerbaijan in 2021 and 2022, aligned with Articles 9–11 of the Paris Agreement. It reflects the country's commitment to enhancing transparency in climate action, as required under the Enhanced Transparency Framework (ETF) and demonstrates Azerbaijan's ongoing efforts to mobilize and utilize international support to meet its Nationally Determined Contributions (NDCs) and climate adaptation goals.

The chapter begins by outlining Azerbaijan's national circumstances and institutional arrangements, providing insights into the systems and processes used to track, report, and mobilize financial, technology and capacity building support. The underlying assumptions, definitions, and methodologies employed to ensure accuracy and transparency are also discussed, as per the guidelines set forth in the Paris Agreement.

Financial support is crucial for Azerbaijan to implement its NDCs and achieve its climate targets. The report highlights the financial resources required and those already received in 2021 and 2022 from bilateral and multilateral donors to support adaptation and mitigation activities. Furthermore, it highlights the challenges in mobilizing private climate finance and the ongoing efforts to enhance transparency through tools like climate finance tracking and budget tagging, as outlined in international best practices.

The transfer of modern technologies, supported by international partners, is also vital to meet Azerbaijan's climate adaptation and mitigation objectives. In addition to financial support, the chapter details the country's needs for technology development and transfer, crucial for scaling up climate action in sectors such as renewable energy, agriculture, industry, water and waste management. Moreover, it reflects on the technology support received in 2021 and 2022 and the challenges faced in accessing cutting-edge climate technologies.

Capacity-building support is also critical, and this chapter examines the projects aimed at strengthening Azerbaijan's institutional, technical, and human capacities. The report outlines Azerbaijan's initiatives to improve local expertise and build institutional frameworks to integrate climate considerations into policy-making processes, along with the international support received in these areas.

1. NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS AND COUNTRY-DRIVEN STRATEGIES

1.1. SYSTEMS AND PROCESSES USED TO IDENTIFY, TRACK AND REPORT SUPPORT NEEDED AND RECEIVED

In Azerbaijan, the Ministry of Ecology and Natural Resources (MENR) coordinates climate-related projects and policies, including the development of the NDCs and overseeing the country's reporting obligations under the Paris Agreement. However, there is a need to strengthen institutional mechanism for inter-agency coordination to ensure the accurate collection and reporting of all relevant data, particularly regarding financial, technology, and capacity-building support.

The established institutional arrangement for reporting on projects that externally funded through technical assistance or grants is defined by Cabinet of Ministers Decision No. 366 (August 22, 2019). This mechanism mandates that central executive authorities and state-owned entities submit periodic and final reports on the implementation of projects funded through technical assistance or grants to the Ministry of Economy. However, the current system does not differentiate between climate-specific projects and other types of assistance, posing a challenge to climate finance tracking.

In response to this gap, the MENR has taken steps to improve the reporting of climate-related support needed and received. A Technical Manual was developed by the international and local experts to support government institutions in preparing information on the financial, technology, and capacity-building support received and required for inclusion in the first BTR. This manual provides guidance on identifying, tracking, and reporting climate-related projects, aligning the reporting process with the transparency requirements under the Paris Agreement's ETF.

As part of its efforts to strengthen the institutional capacity for reporting on climate finance, technology transfer, and capacity-building support needed and received, Azerbaijan is implementing the project, titled "Capacity Building for Azerbaijan to Meet the Requirements of the Enhanced Transparency Framework of the Paris Agreement". The project is supported by the Global Environment Facility (GEF) and executed by the MENR, with support from the Regional Environmental Centre for the Caucasus (RECC). The primary objective of this project is to enhance institutional and human capacities for monitoring, reporting, and verifying climate actions, particularly those related to the NDCs.

One of the outcomes of this project is the establishment of a national system for tracking financial, technology, and capacity-building support. Through the project, the country is also developing a financial strategy that outlines methods for identifying funding sources and establishing a capacity-building and training program to help national stakeholders better understand how to identify and track support received for climate-related activities. These initiatives will significantly strengthen Azerbaijan's ability to meet its obligations under the ETF of the Paris Agreement by enabling more precise assessment of support needs, effective tracking of received financial, technology, and capacity-building support, and enhancing overall transparency in the reporting of climate actions. Moreover, several initiatives have been undertaken to implement Climate Budget Tagging (CBT) to improve the tracking and reporting of climate-related public expenditures. The United Nations Development Program (UNDP), through the EU4Climate project funded by the European Commission, developed guidelines for the implementation of CBT in Azerbaijan. The Ministry of Finance (MOF) has begun reporting climate-related expenditures by including a dedicated section in the Citizen Budget. This section highlights budget allocations aimed at combating climate change under the "2022-2026 Socio-economic Development Strategy"[67]. According to this strategy, the government allocated $374 million from the 2023 state budget for mitigation and adaptation measures, with 97% of the funds designated for public investment projects. In addition, the Asian Development Bank provided technical assistance to the MOF in supporting the implementation of CBT for 2023-2024.

However, there are some challenges and limitations in identifying, tracking, and reporting the support needed and received under the Paris Agreement's ETF. One of the primary challenges is the lack of capacity within relevant government agencies, state-owned enterprises (SOEs), and the private sector to report the required information. During the preparation of the first BTR, limited capacity and time constraints prevented the inclusion of all public sectors (such as education and health) as well as the private sector. To address these challenges, the MENR plans to conduct capacity-building training for relevant government organizations. Additionally, to cover the private sector, MENR intends to collaborate with the Central Bank as well as non-governmental stakeholders to develop institutional mechanisms that will enable the collection of information on financial support received by private companies through commercial banks and other financial institutions.

Another significant challenge is the lack of capacity to identify and calculate the grant equivalent of financial support provided through instruments other than direct grants. The MENR will need to work closely with the MOF and the Central Bank to develop the necessary expertise and capacity in this area.

1.2. COUNTRY PRIORITIES AND STRATEGIES

Azerbaijan has ratified the Paris Agreement and submitted its First NDCs in 2017. The first NDC foresees that by 2030 Azerbaijan targets a 35 percent reduction in GHG emissions compared to 1990. The country also took a 40 percent reduction by 2050 as a voluntary commitment at the 26th session of the Conference of the Parties to the UN Framework Convention on Climate Change (COP26).

Azerbaijan's climate strategy is closely linked to its NDCs, which outline the country's goals for reducing greenhouse gas emissions and adapting to climate change. The priorities under the NDCs include increasing the share of renewable energy in the national energy mix, enhancing energy efficiency across sectors, and implementing

[67] https://maliyye.gov.az/scripts/pdfjs/web/viewer.html?file=/uploads/static-pages/files/63b7dea4d5e69.pdf

A clean environment and "green growth" have been recognized as one of the country's five national priorities through 2030. This priority includes two key strategic goals: ensuring a high-quality environment and establishing a green energy zone.

The "Socio-Economic Development Strategy for 2022-2026," approved by the President of the Republic of Azerbaijan in 2022, emphasizes key measures to address climate change. These include promoting the use of environmentally friendly vehicles, advancing green technologies, and expanding renewable energy sources. The strategy also focuses on the efficient management of waste, conducting an inventory of greenhouse gases (GHGs), and developing a comprehensive monitoring, reporting, and verification (MRV) system. Additionally, it outlines the creation of a national climate change database, the preparation of a "State Program for Low-Carbon Development," and the formulation of a National Adaptation Plan for sectors vulnerable to climate impacts. Furthermore, the strategy calls for research and proposals on the use of carbon capture, utilization, and storage (CCUS) technologies in the energy sector to ensure greenhouse gas emissions meet international standards.

The Government also aims to increase the share of renewable energy in Azerbaijan's total energy production from the current 17% to 30% by 2030 and create a "Net Zero Emission" zone in the liberated territories (Karabakh and East Zangezur).

2. UNDERLYING ASSUMPTIONS, DEFINITIONS AND METHODOLOGIES

Collecting data and making use of the outputs requires engagement with the stakeholders including government ministries, agencies, local governments and communities, and support users or beneficiaries. The information on financial, technology transfer and capacity building support received and needed was collected from organizations that are either involved in channeling support to finance action, build capacity or apply technologies or organizations that are benefiting from the finance, capacity building or technology.

As the institutional arrangements are still in development as a UNFCCC National Designated Authority, the MENR took the lead on establishing data flows, expertise and in processing and compiling information on support for this report. Other central government organizations, as well as public legal entities and state-owned companies (SOEs) provided required information on support received and needed to the MENR.

Given that financial support encompasses not only grants but also concessional and non-concessional loans, equity, guarantees, insurance, and other financial instruments, the MOF, along with the State Agency for the Management of Public Debt and Obligations under the MOF, served as key data providers on support received through government debt instruments.

This is an interim step in order to do the first compilation and analysis for Paris Agreement Reporting. It can be refined and then parts or all of the tasks handed over to more appropriate organizations when the data flows, expertise and tools are better defined.

1. Definition of "support"

For the purposes of this report, the term "received and needed support" refers to climate-related support aimed at one of the following objectives:

Mitigation of Climate Change Impacts: This includes measures and activities aimed at reducing greenhouse gas emissions or enhancing the natural absorption of these gases. Examples include the adoption of renewable energy sources (solar, wind, hydro), energy efficiency measures in industries or buildings, and promoting the use of electric vehicles and public transportation to reduce private car use.

Adaptation to Climate Change: This includes measures and activities aimed at increasing the resilience of human and natural systems against the adverse effects of climate change. Typical examples include the implementation of early warning systems for natural disasters (e.g., hurricanes, storms, heatwaves), the construction of coastal defense structures (such as levees or nature-based solutions like mangroves), and the cultivation of crops resilient to water and heat stress.

Cross-cutting support: These refer to support that combine both mitigation and adaptation objectives.

Forms of support:

Received or needed support for climate action can be in four forms:

1. **Financial Support:** Financial support includes all funds provided, received or needed through various financial instruments for implementing mitigation and adaptation activities, including grants, concessional and non-concessional loans, equity, guarantees, insurance, etc.[68]

2. **Support for Technology Development and Transfer:** Climate-related projects encompass not only infrastructure projects but also the application of technologies, development of policies, strategies, roadmaps, and projects for training and capacity building. Support for technology development and transfer involves promoting, facilitating, and financing the acquisition and implementation of climate technologies. Climate technologies include those aimed at reducing emissions (e.g., renewable energy sources like wind, solar, and hydro) and combating the adverse effects of climate change (e.g., drought-resistant crops, early warning systems, sea walls, etc.).[69]

3. **Capacity Building Support:** This includes assistance aimed at creating, developing, strengthening, and improving the capacity needed to implement climate actions in line with national needs and priorities. Capacity-building measures can strengthen institutional capacities (e.g., integrating climate change considerations into national planning and budgeting) and technical capacities (e.g., using technical assessment, evaluation, and planning tools) needed for mitigation and adaptation actions.[70]

4. **Support for the Implementation of Article 13 of the Paris Agreement and Transparency Activities, including Capacity Building for Transparency:** This involves both financial and capacity-building support.

For the purposes of this report needed support was described as follows:

Needed support = total resource requirements (financial costs/technology needs/capacity-building needs) – available resources (budgetary resources) – expected resources (private sector involvement, international commitments).

Defining the organizational mandates of the key data providers and stakeholders is crucial in setting up the institutional arrangements. As a UNFCCC National Designated Authority, the MENR coordinated the preparation of BTRs.

The reporting on support was completed through a two-step process:

1. Identifying climate-related support, i.e., support contributing to mitigation, adaptation, or cross-cutting objectives. Since there is currently no national taxonomy for climate activities, the adjusted version of the OECD Development Assistance Committee (DAC) Rio Markers Indicative Tables (2024) were used to assess which types of projects qualify as climate-related support. These Indicative Tables include criteria that determine how sectoral and sub-sectoral activities contribute to climate change mitigation, adaptation, or cross-cutting objectives.

2. Including information to the Common Tabular Forms (CTFs). Information on climate-related support was provided according to the CTFs.

[68] This also includes projects implemented through financial flows for financial support, technology, and capacity building, which are therefore reflected in financial records.

[69] Support for technology development and transfer includes assistance that is not solely provided through financial aid and therefore does not appear as financial flows in accounts. This distinction is made to avoid double counting.

[70] Capacity-building support includes assistance that is not exclusively provided through financial aid and therefore does not appear as financial flows in accounts. This distinction is made to prevent double counting.

Identification of relevant information on climate-related support received

When identifying the climate-related support received, all types of assistance was considered, including grants and technical assistance, as well as support provided through other financial instruments such as concessional loans, non-concessional loans, equity, guarantees, and insurance.

Figure 67 illustrates the steps that were followed by data providers for identifying climate-related projects and elements by central executive authorities and state-owned legal entities. The steps are the same for different types of support (e.g., financial support, technology development and transfer, and capacity-building support). However, the focus primarily was on identifying climate-related financial support, as the majority of international support for climate action is provided by donors through financial instruments.

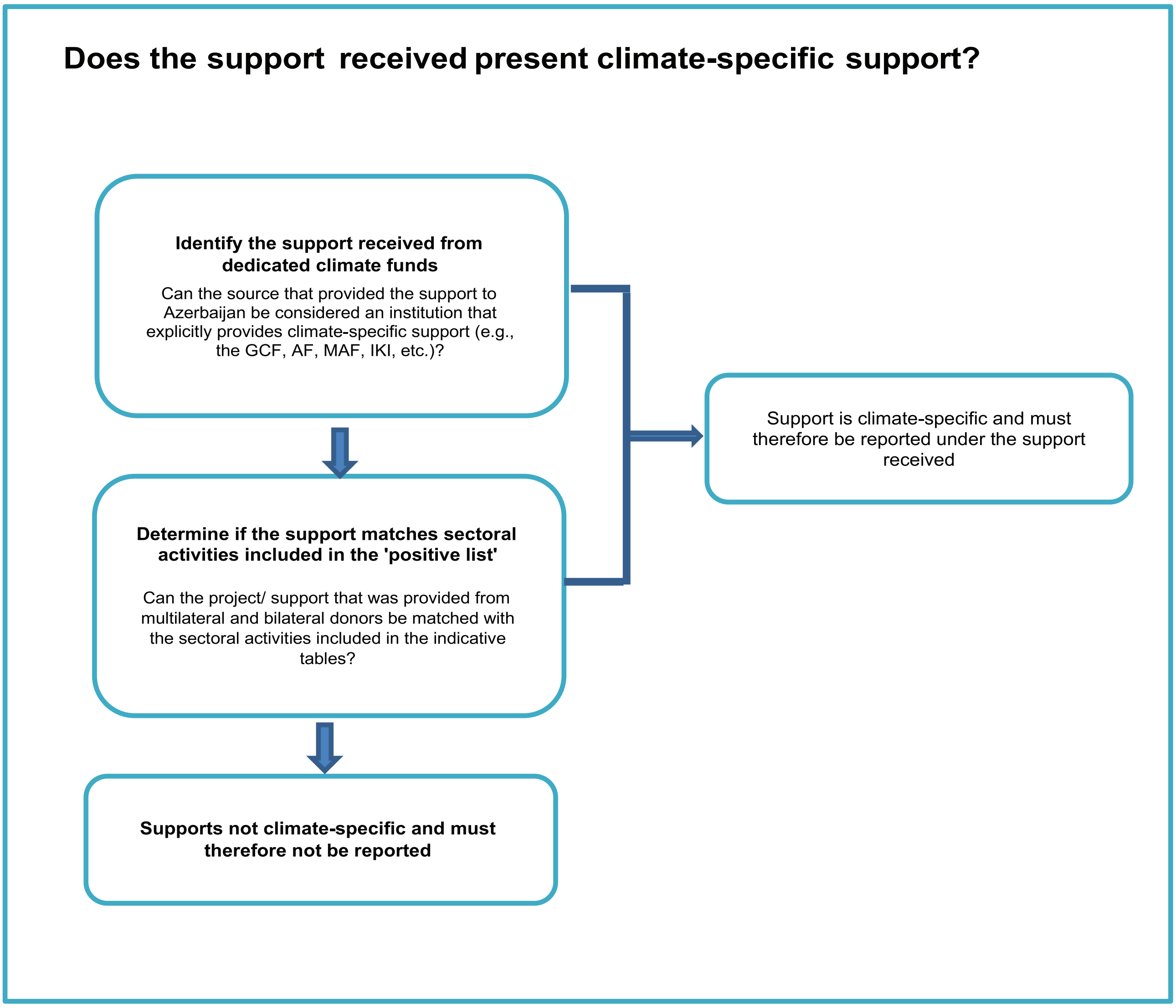

Figure 67. Decision tree for identifying the climate-specific support received

[71] For more info: https://web-archive.oecd.org/temp/2024-06-04/315401-climate-change.htm

The following steps were followed to determine whether the projects were climate-related:

1. Identification of the support received from dedicated climate funds

The consolidated data on international support received was screened and the sources that provide climate-specific funding and assistance (Green Climate Fund (GCF), the Adaptation Fund (AF), the NAMA / Mitigation Action Facility (MAF), the International Climate Initiative (IKI), etc.) were identified.

2. Determination if the support matches sectoral activities included in the 'positive list'

The Adjusted Indicative Tables were used to determine the climate-related support received from various bilateral and multilateral sources. These indicative tables present a 'positive list' of sectoral and sub-sectoral activities that contribute to climate change mitigation, adaptation and cross-cutting objectives. Information on all projects that can be matched to this list reported under the support received.

3. Filling the CTFs on support received

After the climate-specific support received by Azerbaijan has been identified, the data transferred into the established reporting format, which is operationalized through the CTFs.

Figure 68 presents practical guidance that was used on determining the correct CTF for reporting data on support received. The data providing agencies followed this guidance to ensure that double counting of support received and overreporting is avoided.

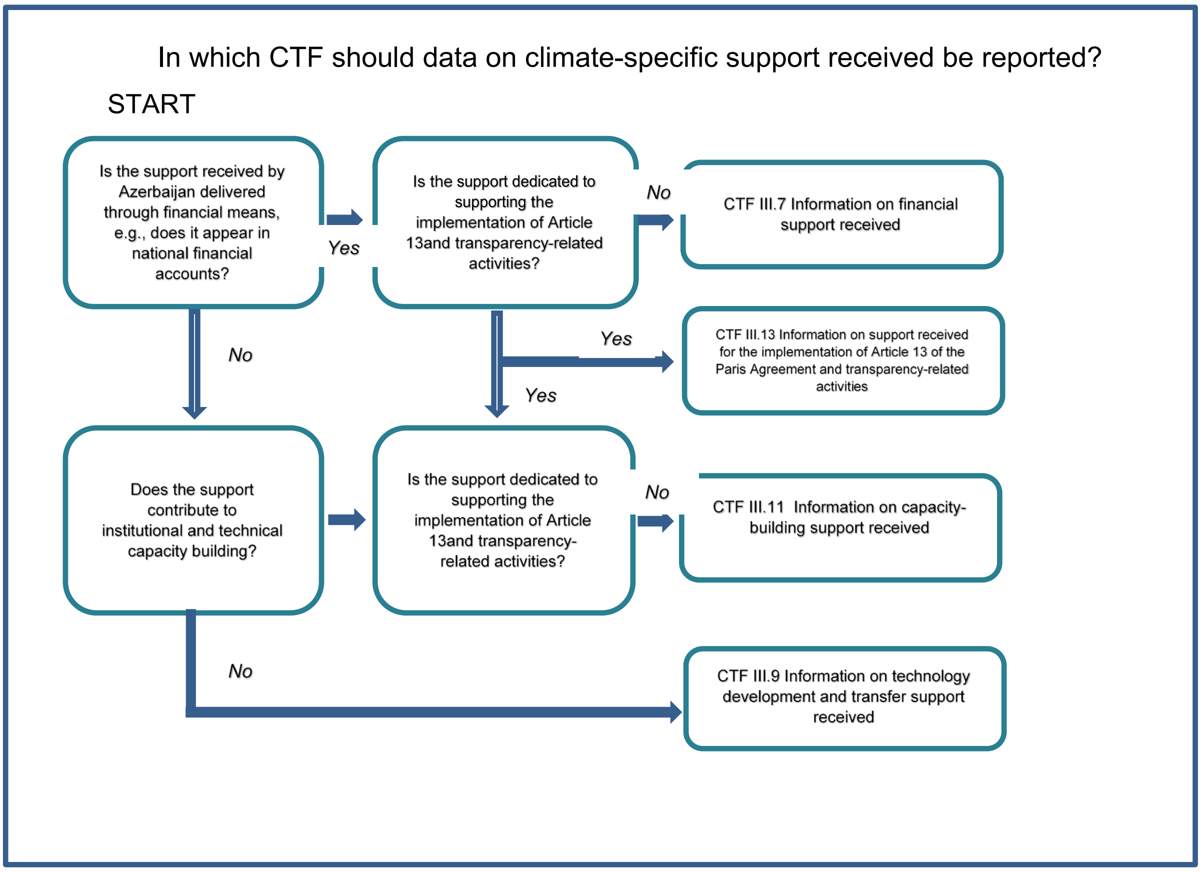

Figure 68. Decision tree for reporting the data on climate-specific support received in the CTF

Identification of relevant information on climate-related support needed

The responsibility of identifying the climate-specific support needed and providing respective data lies with the line ministries that are engaged in sectoral climate change planning (e.g., MENR, Ministries of Agriculture, Digital Development and Transport, Energy, etc.). Information on support needed for climate action has been collected and summarized by the MENR.

The following steps describe how climate-related support needs were assessed. The steps are similar to those for identifying climate-related support received and are the same for various types of support (e.g., financial support, technology development and transfer support, and capacity-building support).

1. Determining if the support needed matches with the sectoral activities included in the 'positive list'

The relevant central executive authorities and state-owned legal entities assessed the support needs based on the Adjusted Indicative Tables to determine whether this information should be included in the report. Any support needs that align with this list were reported as support needed in this report.

2. Determination the scope of support needed

The support needed relates to the gap between the required resources and the sum of domestically available resources (e.g., public resources) and additional resources that are expected to be received from other sources (e.g., private sector or international donors, based on existing commitments).

Support needed = total resource requirements (financial costs / technology needs / capacity needs)
– available resources (public resources, private sector or international donors, based on existing commitments)

3. Filling the CTFs on support needed

After the climate-specific support needed by Azerbaijan has been identified, the data transferred into the established reporting format, which is operationalized through the CTFs.

Figure 69 presents practical guidance that was used on determining the correct CTF for reporting data on support needed.

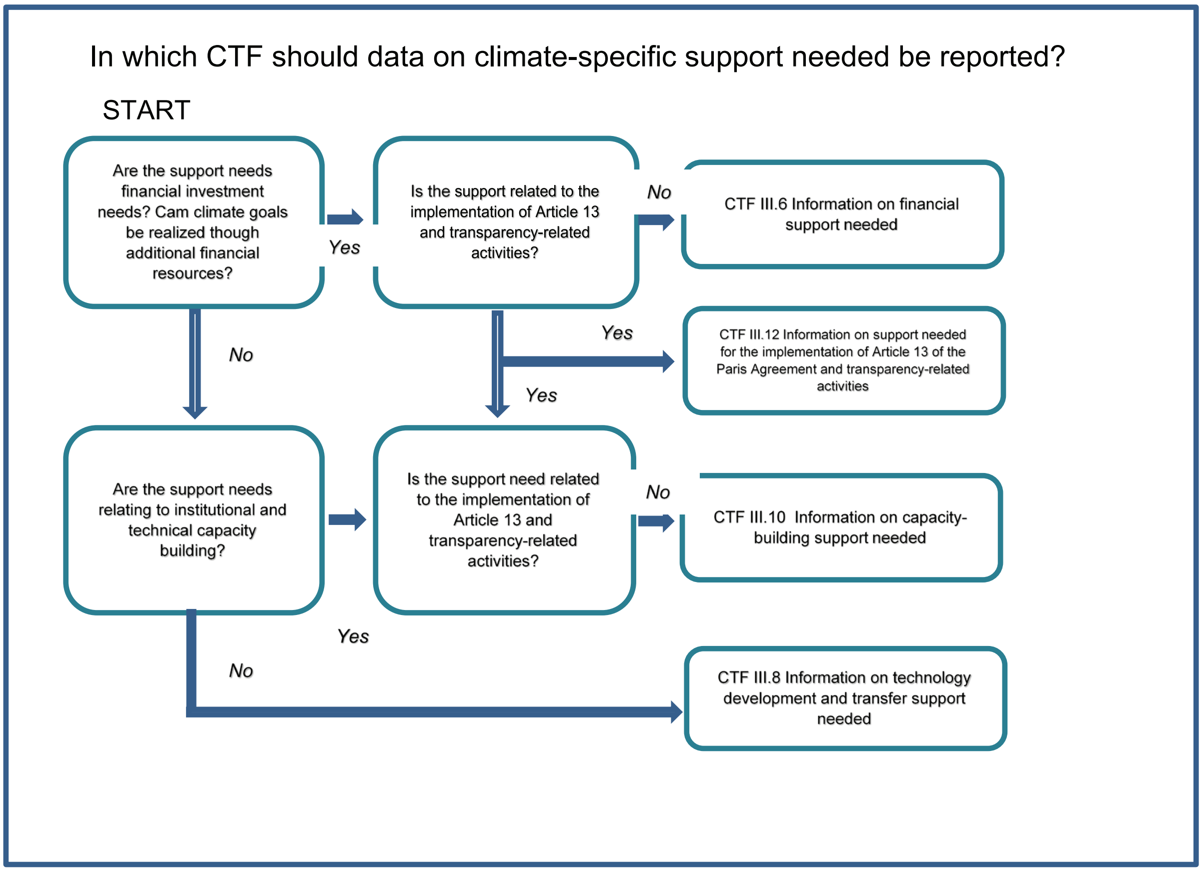

Figure 69. Decision tree for reporting the data on climate- specific support needed in the CTF

ANNEX 1

List of abbreviations

ADB	-	Asian Development Bank
AFOLU	-	Agriculture, Forestry and Other Land Use
BAU		Business As Usual scenario
BTR		Biennial Transparency Report
BUR		Biennial Update Report
CCA	-	Climate Change Adaptation
CRT	-	Common Reporting Tables
CO2 eq	-	Carbon Dioxide Equivalent
CCA	-	Climate Change Adaptation
CDM	-	Clean Development Mechanism
ETF	-	Enhanced Transparency Framework
EF	-	Emission factor
F-gases	-	Fluoridated Gases
FNC	-	Fourth National Communications
FOD	-	First Order Decay
FTZ	-	Free Trade Zone
GoA	-	Government of Azerbaijan
GHG	-	Greenhouse gas
GEF	-	Global Environment Fund
GCF	-	Green Climate Fund
GWP		Global Warming Potential
GDP	-	Gross Domestic Product
HFCs	-	Hydrofluorocarbons
HWP	-	Harvested wood products
İPCC	-	Intergovernmental Panel on Climate Change
IPPU	-	Industrial Processes and Product Use
LULUCF	-	Land Use, Land-Use change and Forestry
LCDS	-	Low-carbon development strategy
LDAR	-	Leakage Detection and Repair

MENR	-	Ministry of Ecology and Natural Resources
MRV	-	Measurement, Reporting and Verification
MPG	-	Modalities, procedures and guidelines
MCF	-	Methane correction factor
MES	-	Ministry of Emergency Situations
MoE	-	Ministry of Economy
MoF	-	Ministry of Finance
MoA	-	Ministry of Agriculture
MSW	-	Municipal Solid Waste
MW	-	Megawatt
NIR	-	National Inventory Report
NDA	-	National Designated Authority
NAMA	-	Nationally Appropriate Mitigation Actions
NIR	-	National Inventory Report
NDC	-	Nationally Determined Contributions
NID	-	National Inventory Document
NIIP	-	National Inventory Improvement Plan
NC	-	National Communication
NA	-	Not applicable
NE	-	Not estimated
NO	-	Not occuring
N2O	-	Nitrous oxide
NAP	-	National Adaptation Plan
PFCs	-	Perfluorocarbons
QA/QC	-	Quality Control/Quality Assurance
RA	-	Reference approach
SGC	-	Southern Gas Corridor
SDRM	-	The Strategic Development Road Maps
SA	-	Sectoral approach
SSPI	-	The State Service on Property Issues
SOC	-	Soil organic carbon stock
SSC	-	State Statistics Committee
SF6	-	Sulphur Hexafluoride
SOCAR	-	State Oil Company of Azerbaijan Republic
SWRA	-	State Water Resources Agency
TACCC	-	Transparency, accuracy, consistency, comparability, completeness
UNFCCC	-	UN Framework Convention on Climate Change
UNEP	-	UN Environment Programme
WMO	-	World Meteorological Organization
WUA	-	Water User’s Associations

ANNEX 2

LIST OF TABLES

ANNEX 3

LIST OF FIGURES

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