Republic of Armenia

ARMENIA'S First Biennial Transparency Report

Under the United Nations Framework Convention on Climate Change

Republic of Armenia

Ministry of Environment

First Biennial Transparency Report

Under the United Nations Framework Convention on Climate Change

The First Biennial Transparency Report of Armenia was developed by the Ministry of Environment of the Republic of Armenia with the funding of the Global Environment Facility and support of the United Nations Development Programme in Armenia within the framework of "Development of the First Biennial Transparency Report and the combined Fifth National Communication and Second Biennial Transparency Report of Armenia to the UNFCCC" Project.

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Foreword

The Republic of Armenia reaffirms its commitment to the United Nations Framework Convention on Climate Change and the Paris Agreement by submitting its First Biennial Transparency Report. The report marks an important milestone in Armenia's efforts to enhance transparency and accountability under the Enhanced Transparency Framework. It provides comprehensive information on greenhouse gas emissions, progress in implementing Nationally Determined Contributions (NDCs), adaptation measures, resilience-building initiatives, as well as needs and support received for climate action.

Recent years have been characterized by significant global and national challenges, including economic crises and the impacts of changing geopolitical realities. However, addressing the impacts of climate change remains a pressing priority for Armenia. As a landlocked, mountainous country, Armenia is particularly vulnerable to climate impacts, especially in the areas of water resources management, agriculture, and ecosystem protection. These circumstances underscore the urgency of adaptation and climate mitigation measures in all sectors.

Although Armenia's share of global greenhouse gas emissions is modest, the country is determined to contribute to global efforts to limit global warming. Following the ratification of the Paris Agreement in 2017 and the update of its Nationally Determined Contributions in 2021, Armenia recently adopted more ambitious commitments under the NDC 3.0. The new approach sets economy-wide emission reduction targets of 44% (unconditional) and 52% (conditional) by 2035 compared to 1990 levels. Achieving these goals requires consistent and sustained actions, including structural reforms in the energy sector and accelerating the deployment of renewable energy technologies.

The preparation of this Biennial Transparency Report reflects Armenia's progress in strengthening institutional arrangements, improving data quality, and aligning national systems with international reporting requirements. It also reaffirms Armenia's approach that transparency is a fundamental condition for trust, partnership, and effective cooperation within the global climate community.

The Republic of Armenia expresses its deep gratitude to all national stakeholders, technical experts and international partners whose professional input played a significant role in the preparation of the report. We also express our gratitude to the Global Environment Facility and the United Nations Development Programme for their continued support for the preparation of Armenia's climate reporting and capacity building.

Hambardzum Matevosyan

Republic of Armenia
Minister of the Environment

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Abbreviations

AASAT	Average annual surface air temperature
ADB	Asian Development Bank
AFOLU	Agriculture, forestry and other land-use
AMD	Armenian dram
AME	Adaptation monitoring and evaluation
ANPP	Armenian nuclear power plant
Armhydromet	Hydrometeorology and Monitoring Centre SNCO
BAU	Business as usual
BTR	Biennial Transparency Report
BUR	Biennial Update Report
CBA	Central Bank of Armenia
CBIT	Capacity-Building Initiative for Transparency
CCF	Climate change finance
CDM	Clean development mechanism
CEPA	Comprehensive and Enhanced Partnership Agreement
CJSC	Closed Joint-Stock Company
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CNG	Compressed natural gas
COVID 19	Coronavirus Disease 2019
CTF	Common tabular format
DAC	Development Assistance Committee (OECD)
DRM	Disaster risk management
DRR	Disaster risk reduction
E5P	Eastern Europe Energy Efficiency and Environment Partnership
Eba	Ecosystem-based adaptation
EBRD	European Bank for Reconstruction and Development
EE	Energy efficiency
EF	Emission factor
EIB	European Investment Bank
ENA	Electric Networks of Armenia
EPIU	Environmental Projects Implementation Unit
ETF	Enhanced Transparency Framework
EU	European Union
EUR	Euro
EURO V	European Emission Standard V
EV	Electric vehicle
FAO	Food and Agriculture Organization
FGDs	Focus-group discussions
FHH	Female-headed household
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GGGI	Global Gender Gap Index

GHG	Greenhouse gas
GHGI	Greenhouse gas inventory
GHI	Global horizontal irradiance
GII	Global innovation index
GIS	Geographic information systems
GIZ	The Deutsche Gesellschaft für Internationale Zusammenarbeit
GSP	Global Support Programme
GWP	Global warming potential
HACCP	Hazard analysis and critical control points
HFHA	Habitat for Humanity Armenia
HPPs	Hydropower plants
HVAC	Heating, ventilation and air-conditioning
HVEN	High voltage electric networks
IACCC	Inter-Agency Coordinating Council on Climate Change
ICT	Information and communications technology
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
INFORM	Index for risk management
IPCC	Intergovernmental Panel on Climate Change
IPCC 2006	Intergovernmental Panel on Climate Change 2006 guidelines for national GHG inventories
IPCC AR5	Intergovernmental Panel on Climate Change fifth assessment report
IPPU	Industrial processes and product use
ITMO	Internationally transferred mitigation outcome
IWRM	Integrated water resource management
LED	Light emitting diode
LPG	Liquefied petroleum gases
LT-LEDS	Long-Term Low-Emission Development Strategy
LULUCF	Land-use, land-use change and forestry
M&E	Monitoring and evaluation
MAB	Multi-apartment buildings
MHH	Male-headed household
MoE	Ministry of Environment
MoF	Ministry of Finance
MPGs	Modalities, procedures and guidelines
MRV	Measurement, reporting and verification
NAP	National Adaptation Plan
NbS	Nature-based solutions
NC	National Communication
NDC	Nationally Determined Contribution
NGOs	Non-governmental organizations
NID	National Inventory Document
NIR	National Inventory Report

PaMs	Policies and Measures
PCCB	Paris Committee on Capacity-Building
PDD	Project design document
PDNA	Post-disaster needs assessment
PJSC	Public Joint-Stock Company
PPP	Purchasing power parity
PSRC	Public Services Regulatory Commission
PV	Photovoltaic
QA	Quality assurance
QC	Quality control
R&D	Research and development
R2E2	Renewable Resources and Energy Efficiency Fund
RA	Republic of Armenia
RCP	Representative concentration pathway
RE	Renewable energy
SCF	Standing Committee on Finance (UNFCCC)
SDGs	Sustainable development goals
SECAPs	Sustainable energy and climate action plans
SHPP	Small hydropower plant
SMEs	Small and medium-sized enterprises
SNCO	State non-commercial organization
TACCC	Transparency, accuracy, consistency, comparability and completeness
TERs	Technical expert reviews
TNA	Technology needs assessment
TPP	Thermal power plant
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USD	United States dollars
WAM	With additional measures
WB	World Bank
WHO	World Health Organization
WM	With measures
WSAP	Water sector adaptation plan

Units of Measurement

^{0}C	degree Celsius
g	gram
Gg	gigagram (10^9g. or thousand t)
GJ	gigajoule (10^9J)
GWh	gigawatt hour (10^9 Wh)
ha	hectare
kWh	kilowatt hour (10^3 Wh)
MW	megawatt
TJ	terajoule (10^{12} J
t	tonne
toe	tonne oil equivalent
V	Volt
W	Watt

Chemical Combinations

CH_4	Methane
CO_2	Carbon dioxide
$CO_{2\ eq.}$	Carbon dioxide equivalent
CFC	Chlorofluorocarbons
HCFC	Hydrochlorofluorocarbons
HFC	Hydrofluorocarbon
PFC	Perfluorocarbon
N_2O	Nitrous oxide
NF_3	Nitrogen trifluoride
SF_6	Sulphur hexafluoride

Energy Units Conversion

1 toe = 41.868 GJ= 11.63 MWh
1 GWh = 3.6 TJ = 86 toe

Executive summary

This First Biennial Transparency Report (BTR) of the Republic of Armenia was prepared under the Enhanced Transparency Framework (ETF) of the Paris Agreement (PA) in accordance with Decision 18/CMA.1 of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA). It demonstrates the commitment of Armenia to transparency, accuracy and continuous improvement in climate reporting, while applying flexibility provisions appropriate for a Non-Annex I Party.

The report covers the period 2021–2022 and consists of five chapters providing comprehensive information as per the Modalities Procedures and Guidelines (MPGs) of the United Nations Framework Convention on Climate Change (UNFCCC).

Chapter 1: National circumstances and institutional arrangements – provides geographic, climatic, socioeconomic context, governance structure, and legal frameworks, including the Climate Law, which recently passed the first reading in the National Assembly, and measurement, reporting and verification (MRV) system development.

Armenia is a landlocked, mountainous country of 29,743 km^2, having an arid climate, located in a seismically active zone. It bears a high risk of natural disasters. It is an upper-middle-income country with a gross domestic product (GDP) of 26.0 billion United State dollars (USD) and a per capita GDP of 8,5560.0 USD in 2024. In 2025, 64 per cent of its population of 3 million people lived in urban areas. The principle of sustainable development is embedded in the Constitution of the Republic of Armenia, and several legal documents on climate change are established or under preparation. The Inter-Agency Coordinating Council on Climate Change (IACCC) chaired by the Deputy Prime Minister, provides high level coordination of climate action. The Ministry of Environment (MoE) acts as the focal point for the UNFCCC.

Chapter 2: National greenhouse gas (GHG) inventory (1990–2022) – presents emissions/removals by sectors, methodologies, quality assurance and quality control (QA/QC) procedures, uncertainty analysis and planned improvements.

The economic transition of 1990 resulted in a sharp drop of GHG emissions due to the shift of economic focus from industries to trade and service. However, emissions in Energy, Industrial Processes and Product Use (IPPU), and Waste sectors had a gradual increase starting from the 2000s. Between 1990 and 2000, GHG emissions from the Energy sector decreased by about 80 per cent, the IPPU sector decreased by 76 per cent, and the Agriculture sector declined by 28 per cent, reflecting reduced industrial and agricultural activity during the post-transition period. In contrast, Waste sector GHG emissions increased by 19 per cent, driven by growing solid-waste generation and wastewater loads, while LULUCF removals declined by 34 per cent, indicating reduced carbon sequestration capacity.

After early 2000s, GHG emissions began to rise gradually as economic activity recovered. Over 2001–2022, GHG emissions from the Energy sector increased by 90 per cent, driven

by rising fossil-fuel combustion in electricity generation, transport, industry, and households. IPPU sector emissions increased nearly tenfold (957 per cent) over 2001-2022, largely due to expanding industrial activity and rapid growth in F-gas consumption. Agriculture sector emissions increased by 24 per cent, while Waste sector emissions rose by 31 per cent due to increased solid-waste disposal and wastewater discharges over 2001-2022. Meanwhile, the LULUCF sector's carbon sequestration capacity declined by a further 22 per cent between 2001 and 2022. The Intergovernmental Panel on Climate Change (IPCC) methodologies and tier one, two or three approaches were used for the calculation of GHG emissions in different sectors depending on data availability.

Chapter 3: Tracking progress on nationally determined contribution (NDC) implementation – describes updated NDC of Armenia, mitigation policies and measures, emission projections, and progress indicators, in different sectors.

Mitigation measures of Armenia mainly focus on Energy, Waste, IPPU, Agriculture and Forestry sectors. The Government is committed to implementing an MRV system in line with the European standards and principles. This BTR tracks progress towards the Second NDC (2021–2030), which aims to achieve a 40 per cent reduction of emissions by 2030, from the base year 1990. Sixteen (16) mitigation actions (MAs) are evaluated for the period 2021–2022 based on national data and expert input. Emissions and projections were calculated under Business as Usual (BAU), With Measures (WM), and With Additional Measures (WAM) scenarios, using Global Warming Potential (GWP) values from IPCC Annual Report 5 (AR5) and methodologies consistent with Clean Development Mechanism (CDM). An emission reduction of 42 per cent is predicted by 2030 under the WAM scenario, indicating that Armenia is on track to achieve its NDC commitments. These MAs also contribute to Sustainable Development Goals (SDGs) such as improving the livelihoods and living conditions of women and children, provision of clean energy to the population, and improving the health and well-being among others.

Chapter 4: Climate change impacts and adaptation – provides an overview of observed and projected climate trends, sectoral vulnerabilities, adaptation priorities, strategies, key barriers and monitoring frameworks drawing on information available up to 2024, as relevant.

Mean annual temperature of Armenia has risen by 1.7°C since 1935 and is predicted to increase by up to 4.7°C by 2100 relative to the 1961-1990 baseline. Average annual precipitation has declined by 18.9 per cent since 1935, compared to the same baseline and is projected to decrease further by 8.3 per cent. Intensifying climate hazards, including prolonged heatwaves, droughts, heavy rainfall leading to flash floods, hailstorms, late spring frosts, landslides, mudflows and wildfires - are driving high vulnerability across key sectors, such as water, agriculture, health, energy, tourism and settlements. Therefore, adaptation priorities focus on water resource management, resilient and risk-informed infrastructure, climate-smart agriculture and inclusive, gender-responsive planning. National efforts, like the National Adaptation Plan (2021-2025), sectoral plans for water, agriculture, health, strengthened early warning systems

and various pilot initiatives aim to enhance, the resilience of Armenia. However, progress remains constrained by limited technical capacity, data gaps and insufficient and unstable financing.

Chapter 5: Support needed and received – details financial, technological and capacity-building support requirements and contributions from international partners for the period 2021–2022, in line with the mitigation and adaptation action plans of the country. However, more recent information up to December 2023 was included when such information was available.

To address NDC commitments and climate vulnerabilities, support is needed for energy efficiency and renewable energy, resilient agriculture, waste management and development of MRV systems. Major providers of financial, technological and capacity-building support include the Global Environmental Facility (GEF), Green Climate Fund (GCF), Adaptation Fund (AF), and other climate special funds and bilateral and multilateral donors. Further support is needed to achieve climate goals of Armenia and build resilience.

The BTR report, including all CTF tables, was developed using ClimateSI's Smart ETF tool. The report integrates expert input for each chapter with mitigation calculations and projections generated by the tool.

1 National circumstances and institutional arrangement

1.1 National circumstance

Introduction

The Republic of Armenia (RA) adopted the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratified same in May 1993 as a developing country not included in Annex I to the Convention.[1]

Armenia ratified the Kyoto Protocol in December 2002, and the Doha Amendment to the Kyoto Protocol in February 2017. Although Armenia is responsible only for a small share of anthropogenic greenhouse gas emissions, it has joined the global call to combat climate change and ratified the Paris Agreement (PA) in February 2017.

Armenia has submitted its Intended Nationally Determined Contributions (INDC) to the UNFCCC in September 2015. It started with a preparatory period 2015-2019 followed by the next phase from 2020, with a time horizon extending to 2050.[2]

In 2021, the NDC of Armenia was approved for a ten-year period (2021-2030), setting a new mitigation target to be achieved by 2030 through mainstreaming and integrating climate change concerns into national and sectoral development policies.

In December 2023, the Government of the Republic of Armenia approved the Long-Term Low-Emission Development Strategy (until 2050) (LT-LEDS) of the country.

In December 2024, the MoE has initiated the preparation of NDC 3.0 covering the period 2025-2035.[3] This was formally approved on 25 of December 2025.

As another significant step towards combating climate change, Armenia is in the final stage of approval of the Climate Law by the National Assembly, which will establish the legal and institutional framework for climate policy outlining the powers and responsibilities of national, regional and local government bodies for the first time.[4] Through the adoption of this Law, the country aims to ensure effective action against climate change, promote technological modernization and strengthen international cooperation.

Government structure

RA was declared an independent, democratic state in 1991, following the referendum held on September 21. In accordance with the constitutional amendments adopted in 2015, a transition was made to a parliamentary government system in 2018.

State power is exercised in accordance with the Constitution and laws, based on the separation and balance of legislative, executive and judicial powers.

Administrative-territorial units of Armenia consist of marzes (regions) that are made up of both rural and urban communities. The country's administrative divisions include 10

[1] Intended Nationally Determined Contribution of the Republic of Armenia under the UN Climate Change Framework Convention | ESCAP Policy Documents Management
[2] NDC of Republic of Armenia 2021-2030.pdf
[3] https://nature-ic.am/en/news/work-underway-on-armenia%E2%80%99s-nationally-determined-contributions-(ndc-3.0)-2025%E2%80%932030
[4] https://www.e-draft.am/projects/7726

marzes and the capital city, Yerevan, which is considered a community. Local self-governance is exercised at the community level.

Geographic context

Armenia is a landlocked country in the South Caucasus region with a land area of 29,743 km^2. Armenia is located in the South Caucasus region of Western Asia, primarily on the north-eastern part of the Armenian Highlands, bordering with Georgia in the north, Azerbaijan in the east, Türkiye in the west and southwest, and the Islamic Republic of Iran in the south.

Armenia is characterized by a high risk of natural disasters due to seismic activity, and complex mountainous terrain which covers 47 per cent of the country. Approximately 90 per cent of the country lies more than 1,000 m above sea level, while 40 per cent is higher than 2,000 m. The highest peak is Mount Aragats, which is at 4,090 metres above sea level, the lowest point at the downstream of the Debed River is at 375 m, and the average absolute altitude of the country is 1,830 m above sea level.

Ararat Valley, the country's most important agricultural region, is in the southwest of the country.

Climatic context

The annual average air temperature in Armenia ranges from -5°C in high mountainous areas to 15°C in the lowland, with an average annual temperature of 5.5°C. The average annual precipitation ranges between 200 mm and 1,000 mm, with an average of 592 mm.

Due to its complex mountainous terrain, Armenia features 10 distinct climatic zones, from strictly continental to cold mountain climates.

Armenia has climatic conditions favourable for solar energy production, with 2,500 annual average sunshine hours and an annual average global horizontal irradiance (GHI) of 1,720 kWh/m^2

Socioeconomic context

Since 2017, Armenia is classified as an upper-middle-income country according to the world classification of countries by income groups. In 2024, the GDP of Armenia reached USD 26.0 billion, and the GDP per capita was USD8,556.0.[5] By 2022, the energy intensity of GDP had declined to one-fifth of its 1990 level and to half of its 2000 level. This reduction is mainly attributed to structural changes in the economy, decline of industrial production, and growth of the services sector share, as well as the adoption of energy saving technologies.

Population profile

Population of Armenia was over 3 million people as at 1, January 2025.[6] It has decreased by 0.4 million between 1993 and 2025, due to reduced natural growth (2.7 per mille in 2024) and emigration rate exceeding the growth.

Life expectancy at birth has increased by 11.2 per cent to 78.6 years in 2024.[7] The share of women has increased by 1.2 per cent from 1990, to become 52.7 per cent.

[5] Source: Statistical Committee, https://armstat.am/am/?nid=202
[6] Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/
[7] Ibid

Approximately 64 per cent of the population resides in urban areas, and 36 per cent live in rural areas. The capital, Yerevan, accounts for approximately 37 per cent of the total population.

Average population density is 100.6 people/km^2 but there is a high variance due to the mountainous terrain and the disproportionate economic development of the regions. Yerevan has the highest density of 4,961 people/km^2 while in Vayots Dzor Marz has the lowest of 21 people/km^2.

Infrastructure

The country's infrastructure sector is highly vulnerable to climate change. The road network of the country is highly vulnerable to landslides, floods and extreme temperatures. Water infrastructure is also at a risk with scarcity during peak periods of irrigation water demand. Low efficiency and high losses during water transit exacerbate vulnerabilities especially during drought stress.

Financial mechanisms

In Armenia, climate-related expenditures are allocated to programmes and measures formulated in accordance with sectoral development policy goals. Armenia has well-developed public finance management and budgeting systems, which are well-adapted to sectoral development policies. Institutional level responsibilities for project results and financial management are primarily concentrated in specific sectoral agencies. Currently, the Government emphasizes setting clear financial and budgetary frameworks in the field of climate change and improving the link between climate change policy and the budget.

1.2 Institutional arrangement and legal mechanisms

The Ministry of Environment is the designated UNFCCC focal point which leads national climate policy. To reinforce cross-sectoral coherence for climate action, Armenia established an Inter-Agency Coordinating Council on Climate Change (IACCC) in 2012 by the Decree No. 955-A of the Prime Minister of RA, for the implementation of the requirements and provisions of the UNFCCC. However, it was not much functional since its establishment.

The Council was re-established with a new structure, composition and rules for its procedures in 2021, with the adoption of the Prime Minister's Decree N 719-A (2021).

The Council is chaired by the Deputy Prime Minister of RA. It brings together line ministries (including Environment, Economy, Territorial Administration and Infrastructure, Health, Labour and Social Affairs, Justice, Finance, High-Tech Industry, among others), the Statistical Committee, scientific research institutions, local self-government authorities and development partners for strategic coordination. The Council constitutes of three standing working groups (on i. national reporting of commitments under the UNFCC Convention, ii. climate change mitigation and adaptation issues, and iii. financing issues) to ensure the efficiency of the Council's activities, provide professional, expert support on sector-specific and cross-sectoral issues.

The national legislation on climate change is established under the Constitution, based on obligations of the country under international agreements. Guided by the principle of sustainable development with consideration for responsibilities to future generations, the Constitution guarantees preservation, improvement, and restoration of the environment, and the responsible utilization of natural resources.

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

2.1 Summary

This chapter provides an overview of the National Greenhouse Gas (GHG) Inventory of Armenia for the period 1990–2022[8].

Armenia's National Inventory Report (NIR), submitted as a stand-alone report containing the National Inventory Document (NID) and the CRT tables, has been prepared in accordance with the Modalities, procedures and guidelines (MPGs) for the transparency framework for action and support referred to in Article 13 of the Paris Agreement agreed by the Conference of Parties serving as the meeting of the Parties to the Paris Agreement (Decision 18/CMA.1), and Guidance for operationalizing the modalities, procedures and guidelines for the enhanced transparency framework referred to in Article 13 of the Paris Agreement (Decision 5/CMA.3).

The NIR presents emissions and removals for each of the greenhouse gases as carbon dioxide equivalents ($CO_{2\ eq.}$) using the 100-year global warming potentials (GWPs) from the IPCC Fifth Assessment Report (AR5), 2006 IPCC Guidelines for National Greenhouse Gas Inventories and 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.

Greenhouse gas inventory provides information on the trends in national greenhouse gas emissions and removals since 1990.

Armenia would like to apply flexibility under MPG (Decision 18/CMA.1) paragraph 58, as the latest inventory submitted by Armenia is for 2022 and is 3 years prior to the submission of its national inventory report. Armenia is strengthening its national MRV and inventory data-collection processes with the aim of reducing this time gap and aligning the inventory year with BTR submission requirements in the next BTR cycle.

Besides, the NIR has continued to incorporate improvements (including methodological, data quality, and coverage) and the "Recalculations and Improvements" chapter of the NID includes a description on improvements and recalculations relative to the previous submission, consistent with the objective of continuous improvement. Within this process several important improvements to methods and data along with completeness improvements have been done.

It is particularly worth noting that in the Energy sector, the methodology for estimating country-specific emission factors for fugitive emissions from natural gas transmission (including storage) and distribution systems in the Republic of Armenia has been updated to reflect recent changes in the country's gas supply system. This is particularly important given that fugitive emissions from natural gas transmission and distribution is a key source category, ranking among the top five by both level and trend assessments in all recent inventories.

Recalculations were also carried out for the entire time series of national greenhouse gas emissions and removals since 1990 due to the use of 100-year time-horizon global warming potential (GWP) values from the IPCC Fifth Assessment Report (AR5) instead of

[8] https://drive.google.com/file/d/187Z4Kmf3E8cG4UBRk8-MVsJgijxz1Hgb/view?usp=drive_link

those from the IPCC Second Assessment Report (AR2) used in the previous National Greenhouse Gas Inventory.

Institutional arrangements

The Ministry of Environment is the authorized state body responsible for the development and implementation of state policies aimed at addressing climate change issues and for implementing the country's commitments under the UNFCCC and the Paris Agreement.

In 2015, a Climate Change Policy Division and in June 2020 - a separate department were established under the Ministry of Environment with the main functions of coordinating the fulfilment of the country's commitments under the UNFCCC and Paris Agreement.

In 2024, the Government of the Republic of Armenia adopted Decree No. 54-N "On Approval of the Procedure for Developing Greenhouse Gas Emission Inventory", thereby establishing the national greenhouse gas emissions monitoring and reporting system. The national inventory arrangements are based on laws and regulations of the Republic of Armenia related to the Atmospheric Air Protection and Climate Change-Related Actions.

National inventory arrangements are designed and operated to ensure transparency, consistency, comparability, completeness, accuracy and timeliness of greenhouse gas emission inventories.

According to this regulation, the Ministry of Environment of the Republic of Armenia is the state authorized state body for greenhouse gas emissions inventory and State Hydrometeorological Service of the Ministry of Environment of the Republic of Armenia is designated as the Implementing body. The State Hydrometeorological Service is in charge of the compilation of the national greenhouse gas emissions inventory and its quality management according to the UNFCCC inventory reporting guidelines and the Paris Agreement, including all stages of the process – from the preparation of the inventory to the development of a draft report on the national greenhouse gas inventory and its submission to the authorized body-ensuring the quality of national inventories.

2.2 Trends of greenhouse gas emissions and removals

In 2022, Armenia's greenhouse gas emissions totalled 13,314.1 kilotons of carbon dioxide equivalent (kt $CO_{2\ eq.}$), excluding the LULUCF sector.

The total emissions in 2022 were approximately 50 per cent (13,442 kt) below the 1990 emissions level. Net emissions (including sinks) were 12,932.2 kt CO_2 eq. in 2022. Overall, net emissions decreased by 50.3 per cent from 1990 levels.

Between 2020 and 2022, the increase in total greenhouse gas emissions was driven largely by an increase in CO_2 emissions from fossil fuel combustion in power industries and across most end-use sectors – residential, transportation, industrial emissions.

Figure 2-1 illustrates the overall trend in total emissions and sinks since 1990.

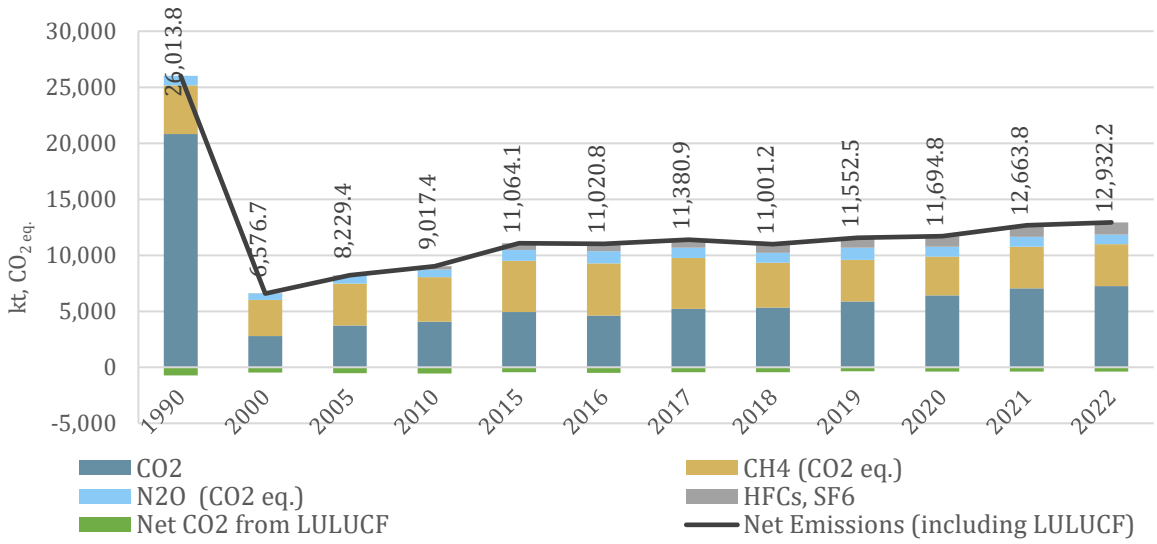

Figure 2-1. The overall trend in total emissions and sinks since 1990, kt CO_{2eq}.

Figure 2-2 illustrates the relative contribution of each gas to Armenia's net greenhouse gas emissions in 2022, in CO_2 equivalents.

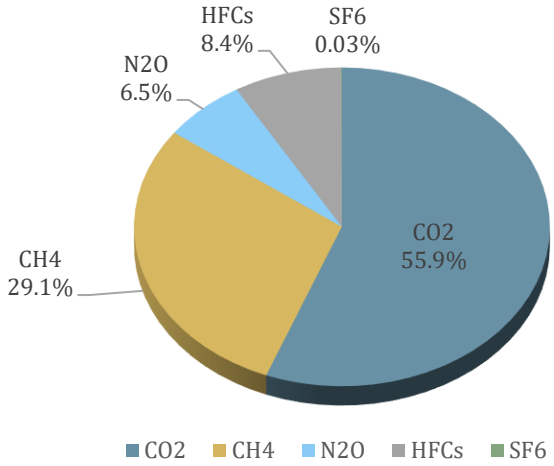

Figure 2-2. 2022 Armenia's net Greenhouse Gas Emissions by Gas (percentages based on kt $CO_{2eq.}$)

The primary greenhouse gas emitted in Armenia is CO_2, which accounts for 55.9 per cent of total net greenhouse gas emissions. The largest source of CO_2 and of overall greenhouse gas emissions is fossil fuel combustion - primarily from power generation, residential sector and transportation.

Methane (CH_4) emissions account for 29.1 per cent of total net emissions. The major sources of methane include natural gas system, enteric fermentation associated with domestic livestock, and decomposition of waste in landfills.

Nitrous oxide (N_2O) emissions account for 6.5 per cent of total net emissions. Agricultural soil management is the major sources of N_2O emissions, with smaller emissions coming from wastewater treatment and manure management.

Emissions of substitutes for ozone-depleting substances (ODS) were the source of hydrofluorocarbon (HFC) emissions, accounting for the 8.4 per cent of total net emissions. Electrical equipment was the source of sulphur hexafluoride (SF_6) emissions, the share of which is negligible.

From 1990 to 2022, total CO_2 emissions with LULUCF decreased by 65.27 per cent (13,592.32 kt $CO_{2\ eq.}$), total emissions of methane (CH_4) decreased by 13.2 per cent (573 kt $CO_{2\ eq.}$), and total emissions of nitrous oxide (N_2O) decreased by 1.2 per cent (10.6 kt $CO_{2\ eq.}$).

Since 2000, when Armenia started importing products and equipment containing HFCs, emissions of fluorinated gases HFCs have steadily increased, accounting for 8.4 per cent of total emissions in 2022, while the share of SF_6 is negligible (4.15 kt $CO_{2\ eq.}$). Despite being emitted in smaller quantities relative to the other greenhouse gases, emissions of HFCs, are significant because many of them have extremely high global warming potentials (GWPs).

2.3 Trends of Emissions and Removals by IPCC Sector

Overall, Armenia's gross GHG emissions in 2022 have decreased by over 50 per cent compared to 1990, mainly due to decreased emissions from the Energy sector. These resulted from structural changes in the economy, namely - a decreased share of energy-intensive industries, an increased share of the service sector, the widespread use of eco-friendly fuel (natural gas) for energy production (replacing heavy fuel oil-mazut) and transportation, the recommissioning of Armenia's Nuclear Power Plant, and strong growth in renewable energy.

The Energy sector is the most significant source of greenhouse gas emissions in Armenia and is therefore the key driver behind the overall trend. Energy-related emissions in Armenia vary considerably, primarily depending on economic conditions, the structure of the energy supply, the volume of electricity exports, and climatic conditions.

Figure 2-3 and Table 2-1 illustrate that for the entire time period of 1990 to 2022, total emissions from the Energy sector decreased by 62.1 per cent (14,510 kt $CO_{2\ eq.}$), Agriculture sector decreased by nearly 10 per cent (220.2 kt $CO_{2\ eq.}$) and Waste sectors increased by 56.1 per cent (310.8 kt $CO_{2\ eq.}$). Emissions from Industrial Processes and Product Use grew by 155 per cent (977.8 kt $CO_{2\ eq.}$). Over the same period, removals from the LULUCF sector decreased by 48.6 per cent (360.5 kt $CO_{2\ eq.}$).

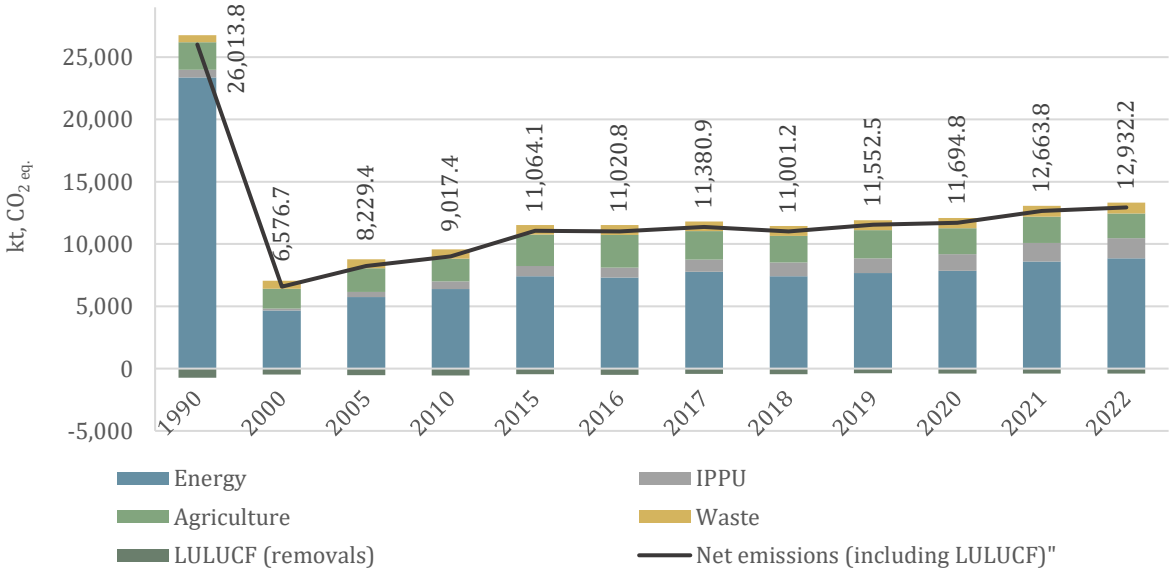

Figure 2-3. Greenhouse Gas Emissions and Sinks by IPCC Sectors, kt $CO_{2\ eq.}$

Table 2-1. Recent Trends in Armenia's Greenhouse Gas Emissions and Sinks by IPCC Sector (kt $CO_{2\ eq.}$) [9]

Sector	1990	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021	2022	Percentage change since 1990
Energy	23,360.92	4,653.94	5,748.18	6,398.59	7,415.44	7,298.27	7,784.54	7,401.82	7,677.11	7,842.65	8,603.70	8,850.55	-62.1
Industrial processes and product use[10]	631.16	152.33	397.39	609.86	815.79	821.86	956.74	1,114.16	1,179.26	1,347.05	1,477.71	1,609.00	155
Agriculture	2,210.14	1,600.89	1,906.16	1,816.16	2,506.56	2,611.90	2,280.86	2,142.76	2,260.89	2,084.64	2,102.02	1,989.89	-10.0
Waste	553.87	657.53	717.63	735.22	778.41	784.09	789.38	791.24	780.55	810.75	864.07	864.63	56.1
Total (without LULUCF)	**26,756.09**	**7,064.69**	**8,769.36**	**9,559.83**	**11,516.20**	**11,516.13**	**11,811.52**	**11,449.98**	**11,897.81**	**12,085.09**	**13,047.50**	**13,314.08**	**-50.2**
LULUCF	-742.33	-488.01	-539.95	-542.46	-452.14	-495.28	-430.65	-448.73	-345.28	-390.33	-383.69	-381.87	-48.6
Net emissions	**26,013.8**	**6,576.7**	**8,229.4**	**9,017.4**	**11,064.1**	**11,020.8**	**11,380.9**	**11,001.2**	**11,552.5**	**11,694.8**	**12,663.8**	**12,932.2**	**-50.3**

[9] The reasons for the discrepancy between Armenia's total $CO_{2eq.}$ emissions (without LULUCF) and the values reported in the CRTs are explained in the NID.
[10] Including F gases

Figure 2-4 illustrates the share of each sector to Armenia's total gross greenhouse gas emissions in 2022, in CO_2 equivalents.

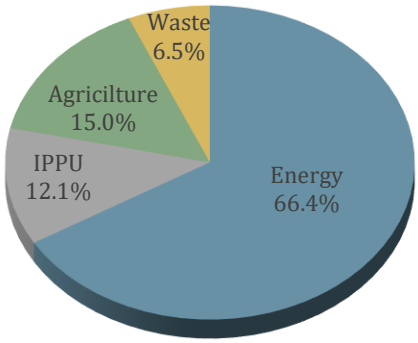

Figure 2-4. 2022 Gross Total Armenia's Greenhouse Gas Emissions by Sector (percentages based on kt $CO_{2\ eq.}$) (LULUCF sector excluded)

Energy

Emissions from energy-related activities come from two categories: 1) emissions associated with fossil fuel combustion and 2) fugitive emissions from natural gas. Energy-related activities, primarily fossil fuel combustion, accounted for the majority of Armenia's CO_2 emissions from 1990 through 2022. Fossil fuel combustion is the largest source of energy-related emissions, with CO_2 being the primary gas emitted.

Greenhouse gas emissions from the Energy sector in 2022 decreased by 62.1 per cent compared to 1990 due to the reasons mentioned above (Trends in Greenhouse Gas Emissions and Removals by Sector), while since 2000 (excluding the years 2009–2010) emissions from the Energy sector have increased by about 90 per cent, driven by the following factors:

- Economic growth, leading to the growth in traffic volume, which resulted in road transport emissions' growth - during 2000-2022 road transport emissions have increased by about 236 per cent.
- Improved household living conditions resulted in the wide use of natural gas for space heating. It became possible because of the unprecedented level of natural gas deliverability reached in the country. During 2005-2022, emissions attributable to energy used by households increased over fivefold.
- Increased generation of electricity by natural gas fired thermal power plants for export to Iran under the gas for electricity swap agreement.

Industrial Processes and Product Use

Emission sources in the Industrial Processes and Product Use (IPPU) accounted for 12.1 per cent of total gross greenhouse gas emissions in carbon dioxide (CO_2) equivalent in 2022. The GHG emissions from this sector in 2022 have increased 2.5-fold since 1990, as there were no HFC emissions in 1990, and by 36.4 per cent since 2019, driven predominantly by the growth of emissions from HFCs and cement production.

The use of HFCs as substitutes for ODS is the largest source of emissions in this sector, contributing 67.8 per cent of IPPU emissions in 2022 and driving growth since 2002, when Armenia started importing products and equipment containing HFCs.

The largest source of CO_2 emissions in IPPU sector is cement production, which accounts for 91.8 per cent of CO_2 emissions from the IPPU sector in 2022. Compared to 1990, the emission reduction from cement production for 2022 is 25.2 per cent. The shares of CO_2 emissions from other categories are significantly smaller.

HFCs emissions from refrigeration and air conditioning predominate in the overall HFCs emissions with the share of 94.2 per cent in 2022. The share of emissions from the other applications is much smaller.

SF_6 emissions from the use of electrical equipment are incomparably small: 4.15 kt $CO_{2eq.}$, making 0.3 per cent of sectoral emissions.

From 2020 to 2022, total emissions from IPPU increased by 19.4 per cent driven by the growth of the emissions from cement production and HFCs emissions. The impact of variations in emissions from the other categories is negligible.

Agriculture

Methane (CH_4) and nitrous oxide (N_2O) are the main greenhouse gases emitted because of agricultural activities, whereas CO_2 is emitted in relatively small quantities.

Methane emissions from enteric fermentation are the largest source of emissions in the Agriculture sector, consistently maintaining an absolute dominance in the sector's emissions, and, therefore, are the key driver behind the emissions trend in the Agriculture sector.

Agricultural emissions decreased by nearly 10 per cent over the period 1990 to 2022. The key driver behind the decreasing trend since 1990 has been the overall change in the economy of agriculture, which has resulted in a decrease in the number of animals which consequently led to a continuous reduction in methane emissions from enteric fermentation emissions until the year 2000. In the following years, due to economic recovery and favourable socio-economic conditions in the country, an increase in the number of agricultural animals, particularly cattle were recorded, which consequently led to a rise in methane emissions from enteric fermentation.

Since 2018, a Programme for Cattle Breeding Development has been implemented in Armenia, which has significantly increased the number of high-productivity cattle breeds in the country in recent years. In parallel, a decline in the number of local cattle breeds has been observed.

Methane emissions from enteric fermentation were the largest contributors to agriculture-related emissions making 61.3 per cent in 2022, with cattle accounting for the predominant share (85.3 per cent).

Compared to 1990, methane emissions from enteric fermentation decreased by 14 per cent, primarily driven by reductions in emissions from the "Other Cattle," sheep, and swine categories, due to declining livestock populations. In contrast, emissions from the Dairy Cows category increased by 13.8 per cent.

Agricultural soils are the largest source of agriculture-related emissions of N_2O, accounting for 77.6 per cent of N_2O emissions and 4.9 per cent of total net emissions of Armenia in 2022.

Manure management is the source of CH_4 and N_2O emissions and accounted for 5.8 per cent of Agriculture sector emissions in 2022. Emissions from manure management decreased by 24.7 per cent between 1990 and 2022 driven by changes in the animals' population.

Land Use, Land-Use Change, and Forestry

Net LULUCF sector removals amounted to 381.88 kt $CO_{2\ eq.}$ in 2022.The LULUCF sector has been a sink during the whole time series from 1990 to 2022. The main factor behind this trend was the *Forest Land*.

Predominating greenhouse gas in this sector is carbon dioxide (CO_2) - the LULUCF sector is a considerable net sink for this greenhouse gas.

Variations in carbon dioxide removals in the sector are driven primarily by changes in the annual volumes of fuelwood harvested.

Waste

Waste management and treatment activities are sources of CH_4 and N_2O emissions. Overall, emission sources in the Waste sector generated 864.63 kt $CO_{2\ eq.}$, or 6.7 per cent of Armenia's total net emissions in 2022. The prevailing part of emissions from the Waste sector are the landfill emissions, accounting for 67.3 per cent of waste-related emissions and 4.5 per cent of the country's total net emissions in 2022. Landfills are also the largest source of anthropogenic CH_4 emissions, generating 581.8 CO_{2eq}. and accounting for 15.4 per cent of total CH_4 emissions in 2022.

Additionally, wastewater treatment generated emissions of 225.55 kt $CO_{2\ eq.}$ and accounted for 26.1 per cent of waste emissions, 4.1 per cent of Armenia's CH_4 emissions, and 8.3 per cent of Armenia's N_2O emissions in 2022.

For the entire period of 1990 to 2022, total emissions from the Waste sectors increased by 56.1 per cent (310.8 kt $CO_{2\ eq.}$) due to economic development and higher standards of living.

2.4 Methodological Framework

Greenhouse gas emissions and removals from various source and sink categories have been estimated using methodologies consistent with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006) and 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetland. In general, this report uses published official statistics for activity data, emission factors and other key parameters as inputs to the methods applied, as well as the unpublished data required for emissions/ removals estimate, provided by various organizations in response to a request from the Ministry of the Environment.

The IPCC Inventory Software version 2.930.8992 was used for data entry, emissions estimation, results analysis and conclusions.

The vast majority of GHG emissions in Armenia originate from the Energy sector. Therefore, the Energy Balances of Armenia, officially published by the Statistics

Committee, are the most important data source for estimating GHG emissions from this sector. The GHG Inventory working group cooperates with the experts compiling the Energy Balance to ensure accuracy, reliability and comparability of the data.

The main source of data for the assessment of emissions from other sectors was the Statistics Committee of the RA. Data were also provided by the Ministry of Territorial Administration and Infrastructure, the Ministry of Economy, the Ministry of Environment, the Public Services Regulatory Commission, the State Revenue Committee, the Cadastre Committee, and private industrial/manufacturing enterprises.

Methods and emission factors by category are presented in Table 2-2.

Table 2-2. Summary report for methods and emission factors used in Armenia's inventory in 2022 (CS - country-specific, D- default, PS- plant-specific)

Categories of emissions and removals	**CO_2**		**CH_4**		**N_2O**		**HFCs**		**SF_6**	
	Method	EF	Method	EF	Method	EF	Method	EF	Method	EF
1. Energy	T1,T2,T3	PS,CS,D	T1,T2	D,CS	T1	D				
A. Fuel combustion	T1,T2,T3	PS,CS,D	T1	D	T1	D				
1. Energy industries	T3	PS	T1	D	T1	D				
2.Manufacturing industries and construction	T1,T2	D,CS	T1	D	T1	D				
3. Transport	T1,T2	D,CS	T1	D	T1	D				
4. Other sectors	T1,T2	D,CS	T1	D	T1	D				
5. Other	NO	NO	NO	NO	NO	NO				
B. Fugitive emissions from fuels	T1	D	T2	CS	NA	NA				
1. Solid fuels	NO	NO	NO	NO	NO	NO				
2. Oil and natural gas	T1	D	T2	CS	NA	NA				
C. CO_2 transport and storage	NO	NO								
2. Industrial processes	T1,T3	D, PS	NA	NA	NA	NA	T1,T2	D	T1	D
A. Mineral industry	T1,T3	D, PS	NA	NA	NA	NA				
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	T1	D	NA	NA	NA	NA	NA	NA	NA	NA
D. Non-energy products from fuels and solvent use	T1	D	NA	NA	NA	NA				
E. Electronic Industry					NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes							T1,T2a	D		
G. Other product manufacture and use	NA	NA	NA	NA	NA	NA			T1	D
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	T1	D	T1,T2	D,CS	T1,T2	D,CS				
A. Enteric fermentation			T1,T2	D,CS						
.B. Manure management			T1,T2	D,CS	T1,T2	D,CS				
C. Rice cultivation			NO	NO						
D. Agricultural soils			NA	NA	T1	D				
E. Prescribed burning of savannahs			NO	NO	NO	NO				
F. Field burning of agricultural residues			T1	D	T1	D				
G. Liming	NO	NO								
H. Urea application	T1	D								
3.I. Other carbon-containing fertilizers	NO	NO								
3.J. Other	NO	NO	NO	NO	NO	NO				
4. Land use, land-use change and forestry	T1,T2	D,CS	T1	D	T1	D				
A. Forest land	T2	CS	NA	NA	NA	NA				
B. Cropland	T1	D	NA	NA	NA	NA				
C. Grassland	T1	D	NA	NA	NA	NA				
D. Wetlands	T1	D	T1	D	T1	D				
E. Settlements	T1	D	NA	NA	NA	NA				
F. Other land	T1	D	NA	NA	NA	NA				

G. Harvested wood products	T1	D								
H. Other	NO	NO	NO	NO	NO	NO				
5. Waste	T1	D	T1, T2	D	T1	D				
A. Solid waste disposal			T2	D						
B. Biological treatment of solid waste			NO	NO	NO	NO				
C. Incineration and open burning of waste	T1, T2	D	T1	D	T1	D				
D. Waste water treatment and discharge			T1	D	T1	D				
E. Other	NO	NO	NO	NO	NO	NO				
6. Other (as specified in summary 1)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

2.5 Key Category Analysis

IPCC Approach 1 was used for selecting the key categories for Armenia's GHG inventory.

Key Category Analysis has been performed for absolute values of emissions and removals (level assessment) based on 2022 inventory, as well as for the trends - based on 2000 and 2022 inventories, as Armenia has undergone significant administrative and economic transition since 1990. Hence, 2000 has been used as a base year for trend assessment.

Key categories of Armenia's 2022 GHG inventory according to Level and Trend assessment are presented in Table 2 -3.

Table 2-3. Summary of 2022 key categories analysis

Code	GHG source and sink key categories	GHG	Criteria used for identification	Tier level
1.A.1	Energy Industries - Gaseous Fuels	CO_2	Level, Trend	T3
1.B.2.b	Fugitive emissions from Natural Gas transportation and distribution	CH_4	Level, Trend	T2
1.A.4.b	Residential- Gaseous Fuels	CO_2	Level, Trend	T2
1.A.3.b	Road Transportation - Liquid Fuels	CO_2	Level, Trend	T1
3.A.1.a	Enteric Fermentation - Cattle	CH_4	Level, Trend	T2
2.F.1	Refrigeration and Air Conditioning	HFCs	Level, Trend	T2a
1.A.3.b	Road Transportation - Gaseous Fuels	CO_2	Level, Trend	T2
5.A	Solid Waste Disposal	CH_4	Level, Trend	T2
1.A.2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	Level, Trend	T2
3.D.1	Direct N2O Emissions from managed soils	N_2O	Level, Trend	T1
1.A.4.a	Commercial/institutional - Gaseous Fuels	CO_2	Level, Trend	T2
2.A.1	Cement production	CO_2	Level, Trend	T3
4.A.1	Forest land Remaining Forest land	CO_2	Level, Trend	T2
3.A.4.	Enteric Fermentation – Other	CH_4	Level, Trend	T2, T1
1.A.4.C	Agriculture/Forestry/Fishing/Fish Farms - Gaseous Fuels	CO_2	Level, Trend	T2
5.D	Wastewater Treatment and Discharge	CH_4	Level, Trend	T1
3.D.2	Indirect N2O Emissions from managed soils	N_2O	Level	T1
1.A.4	Other Sectors - Liquid Fuels	CO_2	Level	T1
5.D	Wastewater Treatment and Discharge	N_2O	Level	T1
1.A.2	Manufacturing Industries and Construction - Liquid Fuels	CO_2	Trend	T1
2.F.2	Foam Blowing Agents	HFCs	Trend	T1
1.A.4	Other Sectors - Solid Fuels	CO_2	Trend	T1

There are 22 key categories in Armenia's GHG inventory - 16 of which have been identified with both level and trend assessments, 3 - with only level assessment and 3 more - with trend assessment.

In 2022, emissions from the key categories amounted to 12,276.4 kt $CO_{2\ eq.}$, which accounted for 95.1 per cent of the country's net emissions.

Out of the 22 key categories, 13 are assessed using higher tier (Tier 2 and Tier 3) methodologies, including emissions from the top 8 categories identified through key source level and trend assessments — except for emissions from liquid fuel combustion in *Road Transportation* (1.A.3.b).

Overall, emissions assessed using higher-tier methodologies for these 13 key sources accounted for 84.1 per cent of the net national emissions in 2022.

2.6 Uncertainty assessment

Uncertainty analysis of Armenia's inventory covers all source categories and all direct greenhouse gases.

The uncertainty has been assessed based on the level in 2022 GHG inventory data, as well as trend, where the base year was selected to be 2000.

The calculations' results revealed that the level of emissions uncertainty is within 10.3 per cent, and the uncertainty of trend is 17 per cent.

The highest contribution to variance by category in 2022 has Direct N_2O Emissions from managed soils (3.C.4), CH_4 and N_2O emissions for the use of natural gas in Road Transportation (1.A.3.b), N_2O emissions from Wastewater Treatment and Discharge (5.D) and CH_4 emissions from Solid Waste Disposal (5.A).

The highest contributors in the uncertainty of trend have CH_4 and N_2O emissions for the use of natural gas in Road Transportation (1.A.3.b), CH_4 emissions from Solid Waste Disposal (5.A), Direct N_2O Emissions from managed soils (3.C.4) and HFC emissions from Refrigeration and Air conditioning (2.F.1).

As it can be seen, in all cases the highest uncertainties are related to non-CO_2 emissions. For CO_2 emissions, the categories with highest uncertainty contribution both in level and trend are the liquid fuel use in Road Transportation (1.A.3.b) and Forest Land Remaining Forest Land (4.A.1). Consequently, the main efforts for reducing uncertainty should be directed towards these categories in future inventory processes.

2.7 QA/QC procedures

The ultimate goal of the QA/QC process is to ensure quality, transparency and credibility of the inventory and to contribute to the improvement of inventory across all sectors.

The quality of GHG emissions source categories is assured through application of the Armenia's Inventory QA/QC plan and are carried out within the framework of the Armenia Quality Management Plan for Greenhouse Gas Inventory, approved *by* the Ministry of Environment (QA/QC plan was outlined in the Annex 7 of NID).

Two types of checks were performed using this plan: (1) general (Tier 1) procedures consistent with the 2006 IPCC Guidelines that focus on procedures and checks to be used when gathering, maintaining, handling, documenting, checking, and archiving data,

supporting documents, and files; and (2) source category-specific (Tier 2) procedures that focus on checks and comparisons of the emission factors, activity data, and methodologies used for estimating emissions from the relevant emissions sources. These procedures include: checks to ensure that activity data and emission estimates are consistent with historical trends; that consistent, complete and data sources are used and documented; that interpolation or extrapolation techniques are consistent across sources; and that common units and conversion factors are used where applicable.

Consistent with the 2006 IPCC Guidelines, additional category-specific QC procedures were performed for more significant emission categories or sources where significant methodological and data updates have taken place. Any significant findings and errors identified are documented and corrected.

2.8 Greenhouse Gas Emissions by Sectors

2.8.1 Energy

Energy-related activities were the primary sources of Armenia's greenhouse gas emissions, accounting for 66.4 per cent of total gross greenhouse gas emissions in carbon dioxide (CO_2) equivalent in 2022. This included 97.8, 46.0 and 5.4 percent of the country's CO_2, methane (CH_4), and nitrous oxide (N_2O) emissions, respectively. Energy-related CO_2 emissions alone constituted 54.7 per cent of total net Armenia's greenhouse gas emissions from all sources on a CO_2-equivalent basis, while the non-CO_2 emissions from energy-related activities represented a significantly lower share of total net national emissions (13.7 per cent together).

Emissions from fossil fuel combustion contribute the vast majority of energy-related emissions, accounting for 81.6 per cent in 2022 with CO_2 being the primary gas emitted (79.9 per cent).

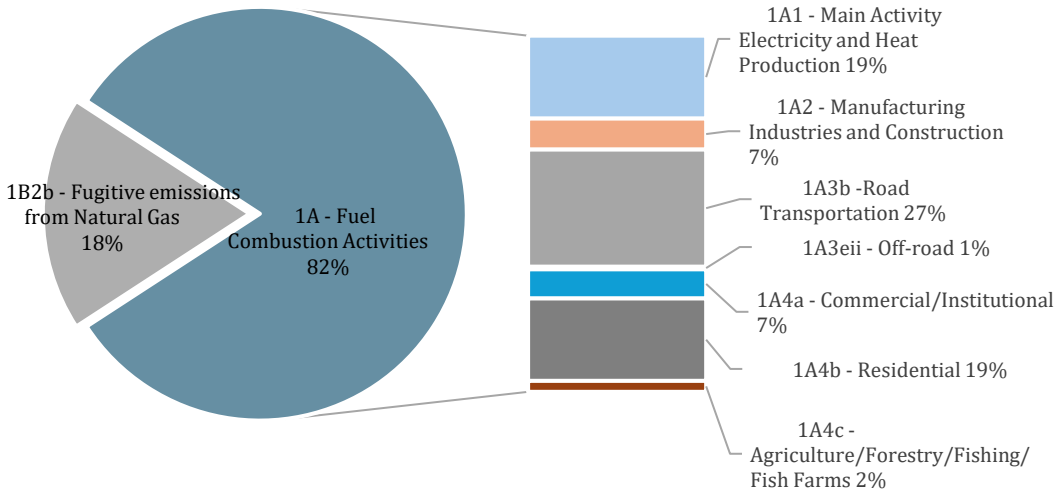

Figure 2-5. Greenhouse gas emissions in Energy sector by sources in 2022, (per cent, $CO_{2\ eq.}$)

The Energy sector is mainly responsible for carbon dioxide emissions because of high emissions volume from thermal power plants, road transportation and residential sector.

Road transport, fugitive emissions, energy production and residential sector are the leading sources of GHG emissions within the sector.

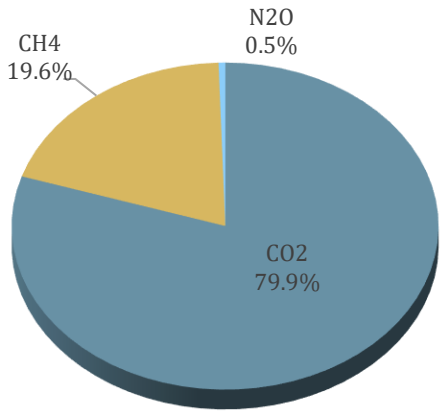

Figure 2-6. Greenhouse gas emissions by gases in Energy sector in 2022, CO_{2eq}.

As of 2022, road transport contributed the largest share of total emissions in the Energy sector (26.9 per cent), followed by electricity generation (19.0 per cent), residential sector (18.9 per cent), and fugitive emissions from natural gas (18.4 per cent).

Overview of greenhouse gas emissions in Energy sector (kt CO_{2eq}.) is presented in Figure 2-7.

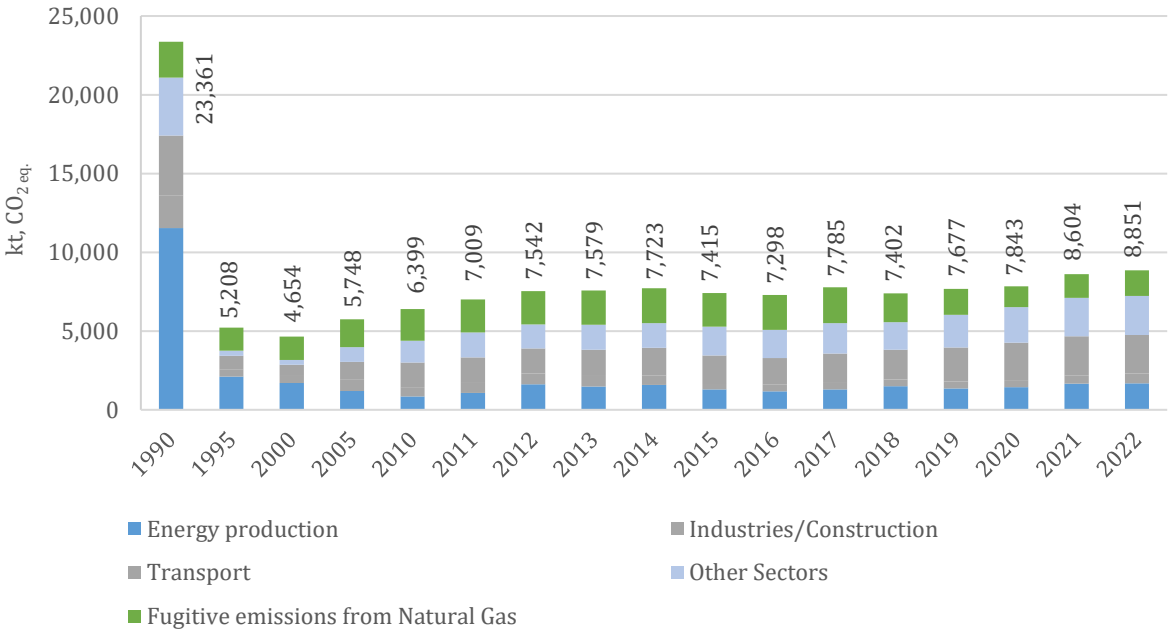

Figure 2-7. Overview of greenhouse gas emissions in Energy sector, (kt CO_{2eq}.)

About 75.8 per cent of Armenia's total primary energy supply (TPES) comes from fossil fuels, mainly natural gas. The rest comes from other energy sources, such as nuclear, hydro, biomass, wind and solar. Electricity exports amounted to -3.1 per cent from TPES.

Natural gas is the main fuel consumed in the country. In particular, natural gas has accounted for the largest share of domestic energy demand, making up 56.3 per cent of Armenia's final energy consumption in 2022. It has been consumed both in the electricity

generation sector and widely across all end-use sectors of final consumption, including transport, industry, commercial, and residential sectors.

As of 2022, natural gas accounted for about 60.6 per cent of the TPES, 78.5 per cent of fossil fuel consumption (including jet fuel) and more than 77.7 per cent of CO_2 emissions from fossil fuel combustion (excluding international bunkers). This can be explained by the high level of gasification in the country, which stands at 96.3 per cent, and the fact that 1 kWh of useful thermal energy produced from natural gas remains significantly cheaper (about 2.5 times) than 1 kWh of electricity.

The main power generation capacities in Armenia are nuclear power plant, large hydro power plants and thermal power plants operating on natural gas (including small combined heat and power plants), as well as at small renewable energy plants [small hydro, wind and solar PV plants (including autonomous PVs)], which provided 31.0 per cent, 12.3 per cent, 42.2 per cent and 14.5 per cent, of total electricity generation in 2022, respectively.

Armenia lacks its own industrial-grade fossil fuel and energy resources - all fuel is imported from Russia and Iran. Under these conditions, in terms of energy security, large-scale use of renewable energy sources and the implementation of energy saving measures become a priority, and is consistent with the country's commitment to address climate change challenges.

Although, as of 2022, renewable energy was mainly represented by hydro power plants (both small and large), in recent years, solar energy has developed rapidly. Solar energy production in 2019 was 36.6 GWh, which increased to 523.5 GWh in 2022, and reached 772.2 GWh in 2023. The share of non-fossil energy in total production in 2023 was around 58 per cent (including solar - 8.3per cent). This highlights the shift towards solar energy growth over the past few years.

2.8.2 Industrial Processes and Product Use

Greenhouse gas emissions from the Industrial Processes and Product Use sector accounted for 12.1 per cent of total gross greenhouse gas emissions in carbon dioxide (CO_2) equivalent in 2022.

CO_2 emissions from the IPPU sector in 2022 amounted to 513.81 kt, which accounts for 31.9 per cent of emissions from the Industrial Processes and Product Use sector and 4.0 per cent of the country's total net emissions. The largest source of CO_2 emissions in 2022 was cement production – 471.6 kt CO_2, which accounts for 91.8 per cent of CO_2 emissions from the IPPU sector. The shares of CO_2 emissions from other categories are much smaller.

HFC emissions in 2022 amounted to 1091.04 kt $CO_{2\,eq.}$, which accounts for 67.8 per cent of emissions from the Industrial Processes and Product Use sector and 8.4 per cent of the country's total net emissions. HFCs emissions from refrigeration and air conditioning predominate in the overall HFCs emissions with the share of 94.2 per cent in 2022. The share of emissions from the other applications is much smaller.

SF_6 emissions from the use of electrical equipment are incomparably small: 4.15 kt $CO_{2eq.}$, making 0.3 per cent of sectoral emissions.

GHG emissions from this sector in 2022 have increased 2.5 times since 1990, as there were no HFC emissions in 1990, and by 36.4 per cent since 2019, driven predominantly

by the growth of emissions from HFCs and cement production. The Figure 2-8 presents the trend of GHG emissions in the IPPU sector.

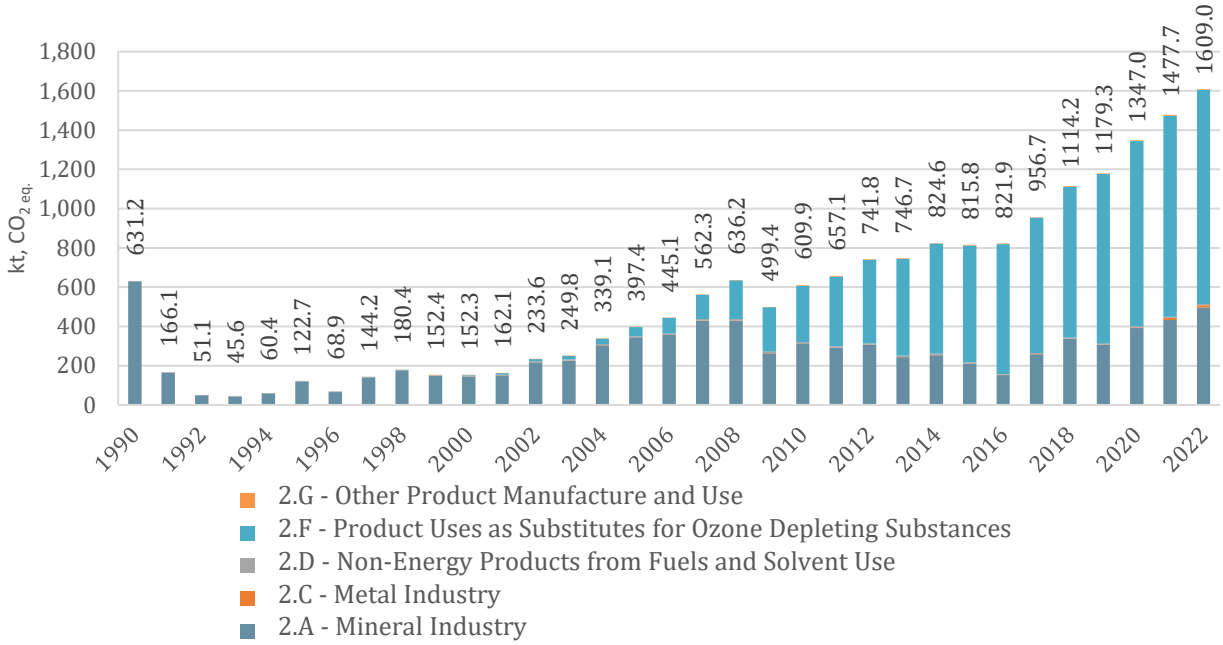

Figure 2-8. Trend of IPPU sector emissions in 1990-2022, kt CO2eq.

The Figure 2-9 presents emissions from IPPU sector by sources in 2022.

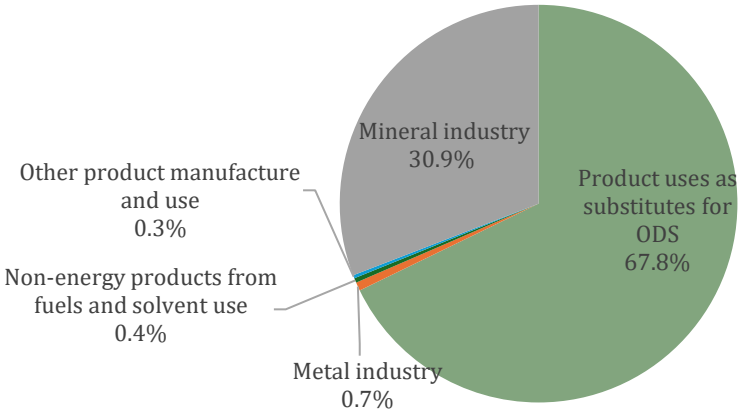

Figure 2-9. Emissions from Industrial processes and product use by sources, 2022 (per cent, CO2eq.)

Armenia has never had domestic production of HFCs. The country imports them as chemicals from UAE, occasionally from Iran and Türkiye, while they are contained in products or equipment (sub-applications) imported from many other countries.

Armenia started importing products and equipment containing HFCs after 2005, when the country launched its first country program for the phase-out of CFCs, although such imports had begun in small quantities since 2000. In particular: Armenia adopted the Law on Substances that Deplete the Ozone Layer and sub-legislative acts for ensuring enforcement of the Law; later, Armenia limited CFC import and completely banned it in 2010. In parallel, the country has launched HCFCs phase-out program. All these measures resulted in a sharp increase of the import of equipment with HFCs since 2010.

From all HFCs, HFC-134a has the widest application, due to its multifunctional character: it is widely used both as an individual chemical and a blend (R-404A, R-410A, R-407C) component in all sub-applications of RAC which is the country's HFC key application area, and is also contained in aerosols as a propellant and in foam blowing as a foam blowing agent.

Figures 2-10 and 2-11 illustrate the time series of HFC emissions by application and the HFC emissions by application for 2022, respectively.

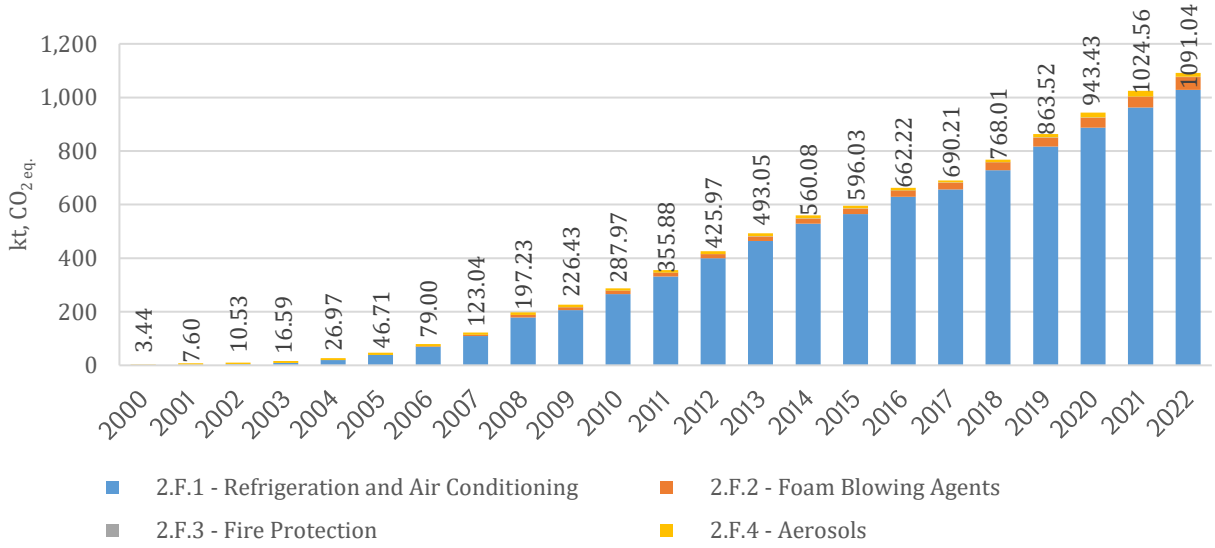

Figure 2-10. HFCs emissions time series by applications for 2000-2022, kt $CO_{2\ eq}$.

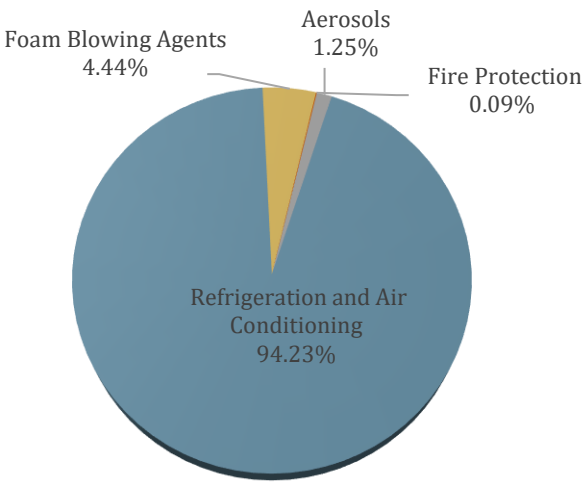

Figure 2-11. HFCs emissions by application for 2022

SF_6 emissions from closed pressure electrical equipment have grown continuously due to the ongoing reconstruction of the existing substations and the construction of new facilities with SF_6 containing gas circuit breakers (GCB), while the emissions of SF_6 from Sealed Pressure distribution equipment are negligible.

2.8.3 Agriculture

The agriculture sector emissions amounted to 2,084.65 kt $CO_{2\ eq.}$ in 2020, 2,102.02 kt $CO_{2\ eq.}$ in 2021 and 1,989.89 kt $CO_{2\ eq.}$ in 2022, or 17.8 per cent, 16.6 per cent and 15.4 per cent of Armenia's total net emissions in 2020, 2021 and 2022, correspondingly.

CO_2 emissions from agriculture in 2022 amounted to 3.79 kt, totally occurring *from Urea application (3.H)*.

CH_4 emissions in 2022 amounted to 1,270.2 kt CO_{2eq} which accounts for 61.8 per cent of emissions from the agriculture sector and 9.8 per cent of the country's total net emissions. The largest source of CH_4 emissions in 2022 was *Enteric Fermentation from Cattle (3.A.1)* – 1,042.5 kt $CO_{2\ eq.}$, which accounts for 81.2 per cent of CH_4 emissions from the agriculture.

N_2O emissions in 2022 amounted to 715.94 kt $CO_{2\ eq.}$, which accounts for 36.0 per cent of emissions from the agriculture and 5.5 per cent of the country's total net emissions. *Direct N_2O emissions from managed soils (3.D.1)* predominate in the overall N_2O emissions from the Agriculture Sector with a share of 72.1 per cent in 2022.

Figure 2-12 provides an overview of the development of greenhouse gas emissions in Agriculture sector since 1990.

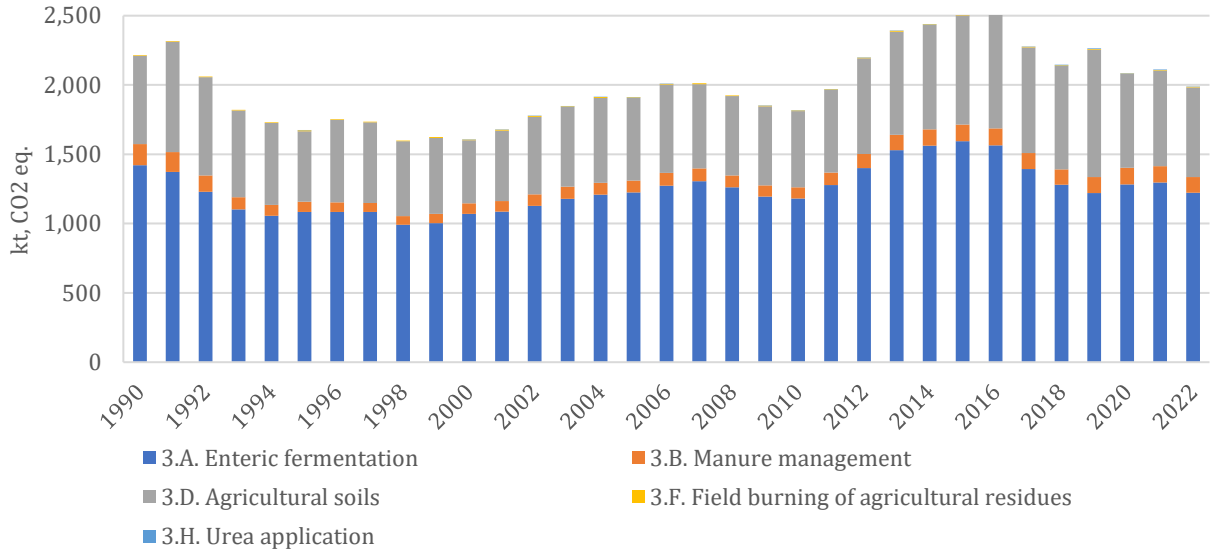

Figure 2-12. Overview of GHG emissions in Agriculture sector (kt $CO_{2\ eq.}$)

In 1990s the structural changes in agriculture resulted in a sharp decline in the livestock population which consequently led to a continuous reduction in emissions until the year 2000.

The significant increase in agricultural emissions since 2000 was due primarily to the increase in livestock population and increase in emissions from managed soils due to use of fertilizers.

Since 2018, a Programme for Cattle Breeding Development has been implemented in Armenia, which has significantly increased the number of high-productivity cattle breeds in the country in recent years. In parallel, a decline in the number of local cattle breeds has been observed.

Agriculture Sector Greenhouse Gas Emission Sources are presented in Figure 2-13.

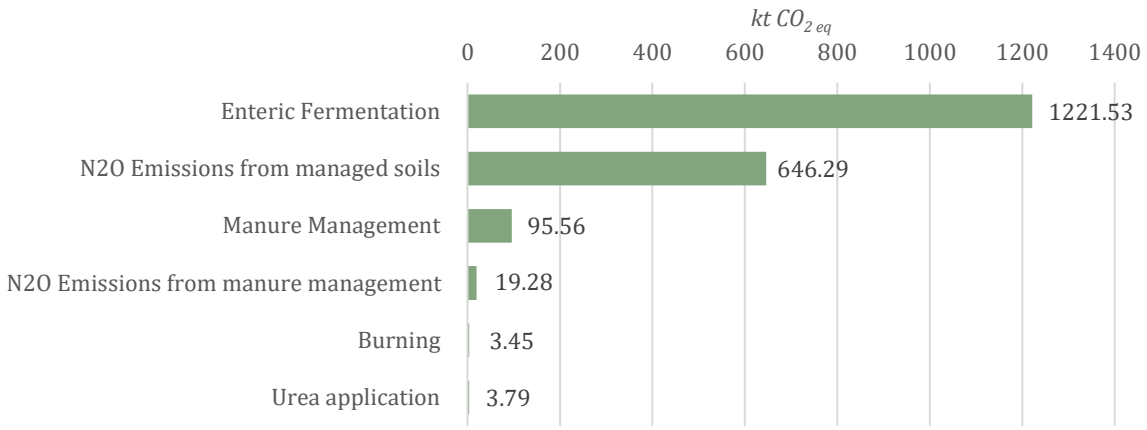

Figure 2-13.Agriculture Sector Greenhouse Gas Emission Sources, 2022(LULUCF excluded), kt $CO_{2\ eq.}$

2.8.4 Land use, land-use change and forestry

Approach 2 was used to quantify areas of land-use change between categories and to generate the land-use change matrix that feeds into the GHG emission and removal calculations for each land-use type and conversion.

Net LULUCF sector removals amounted to 390.33 kt $CO_{2\ eq.}$ in 2020, 383.7 kt $CO_{2\ eq.}$ in 2021 and 381.88 kt $CO_{2\ eq.}$ in 2022.

Figure 2-14 provides time series for GHG emissions and removals (sum of CO_2, CH_4 and N_2O) (kt CO2eq.) in the LULUCF sector since 1990, by sub-categories.

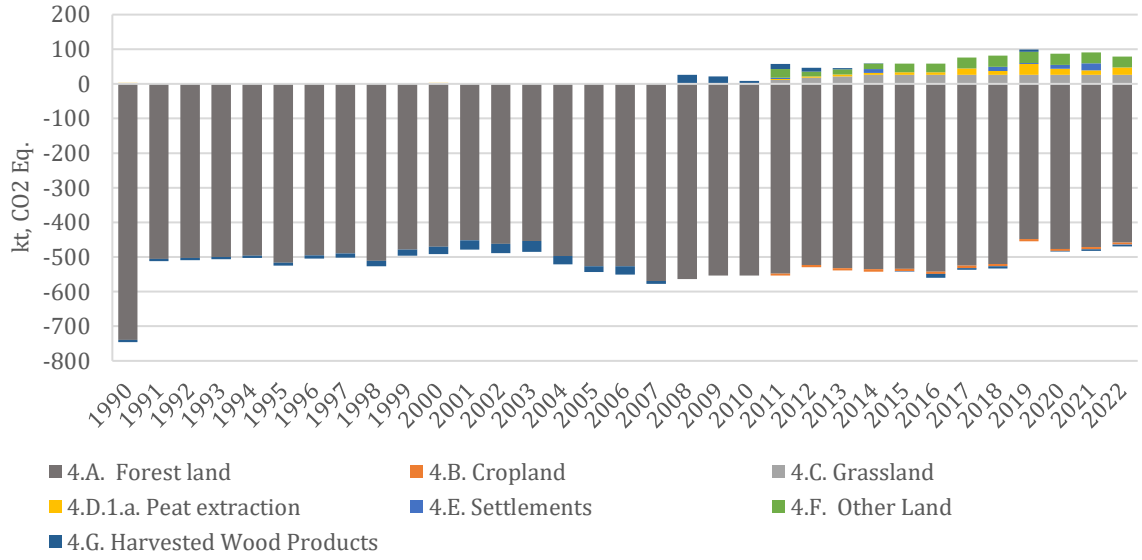

Figure 2-14. Time series for GHG emissions and removals (kt CO2 eq.) in the LULUCF sector since 1990, by sub-categories

The LULUCF sector has been a sink during the whole time series from 1990 to 2022. The main factor behind this trend was the Forest Land. The fluctuation in net biomass

removals in the Forest Land category is driven primarily by changes in the annual volumes of fuelwood harvested and illegal logging.

The predominating greenhouse gas in this sector is carbon dioxide (CO_2) - the LULUCF sector is a considerable net sink for this greenhouse gas.

Even though the LULUCF has clearly been a net carbon sink, it also produces some emissions. The largest emissions come from Other Land (32 kt CO_2), as well as from Grassland and Wetlands categories (25.65 kt CO_2 and 21.34 kt CO_2 from each category, respectively).

2.8.5 Waste

CH_4 emissions from landfills; CO_2, CH_4 and N_2O emissions from the combustion of waste and CH_4 and N_2O emissions from wastewater treatment and discharge are reported under the Waste sector.

The Waste Sector emissions amounted to 810.75 kt $CO_{2\ eq.}$ in 2020, 864.07 kt $CO_{2\ eq.}$ in 2021 and 864.63 kt $CO_{2\ eq.}$ in 2022, or 6.9 per cent, 6.8 per cent and 6.7 per cent of Armenia's total net emissions in 2020, 2021 and 2022, respectively.

The prevailing part of emissions from the Waste sector are the landfill emissions, which accounted for 67.2 per cent of Waste sector emissions and 4.7 per cent f the country's total net emissions in 2020, 68.5 per cent of Waste sector emissions and 4. 7 per cent of the country's total net emissions in 2021 and 67.3 per cent of Waste sector emissions and 4.5 per cent of the country's total net emissions in 2022. The emissions from the wastewater treatment accounted for 26.1 per cent of the sector emissions in 2022, while the emissions from the waste incineration and open burning accounted for remaining 6.6 per cent in 2022.

Figure 2-15 illustrates the trend of GHG emissions in Waste sector. The GHG emissions from this sector have increased by 56 per cent in 2022 since 1990, driven predominantly by the growth of emissions from solid waste disposal sites.

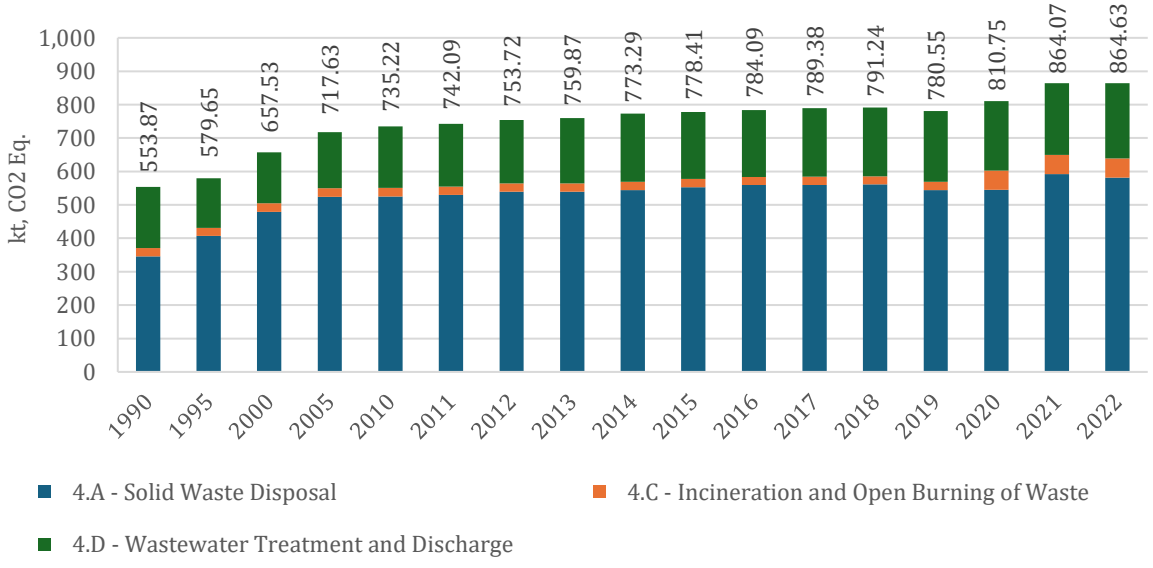

Figure 2-15. Overview of greenhouse-gas emissions in Waste Sector, kt CO2 eq.

2.9 Recalculations and Improvements to Armenia's 1990-2022 GHG Inventory

GHG emissions and removals were reviewed and recalculated as part of the continuous process of improving the quality of the national GHG inventory. This included using updated activity data and methodological approaches, considering new source categories, updating country-specific emission factor values, as well as applying the 100-year time-horizon global warming potential (GWP) values from the IPCC Fifth Assessment Report (AR5) instead of the GWP values from the IPCC Second Assessment Report (AR2) used in the previous National GHG Inventory.

The main improvements introduced to 1990–2022 National GHG Inventory are presented below per IPCC sectors, according to the principles of transparency, accuracy, completeness, consistency and comparability (TACCC). These improvements are based on the National GHG Inventory Improvement Plan, which incorporates the recommendations from the team of technical experts who conducted the technical analysis of Armenia's Third Biennial Update Report, as presented in the Technical Analysis Summary Report (TASR), along with additional recommendations proposed by the GHG Inventory experts.

Energy

- A new sub-category (1A4ci*) Stationary* was considered.
- To ensure the consistency of time series and to calculate GHG emissions from the (1A4ci) Stationary subcategory, the time series in the (1A4a) Commercial/Institutional and (1A4c) Agriculture/Forestry/Fishing/Fish Farms subcategories of the (1A4) Other Sectors category have been recalculated.
- The methodology for estimating country-specific emission factors for fugitive emissions from the natural gas transmission (including storage) and distribution systems of Armenia has been updated to reflect recent changes in the country's gas supply systems.
- GHG emissions from the Energy sector have been assessed for the periods 1991–1994 and 1996–1999, based on data from scientific and technical literature, as well as accompanying research data.

IPPU

- A new sub-category (2C1) *Iron and Steel Production* was considered.
- CO_2 emissions from (2D2) *Paraffin Wax Use* have been recalculated for the entire time period due to the adjustment of activity data.
- Emissions of NMVOCs from (2D3) *Solvent Use* have been recalculated for the entire period due to the change in the emission factor.
- The time series of NMVOC emissions from (2D4) Bitumen/Asphalt Production and Use has been recalculated for the entire period due to the adjustment for the bitumen content in the asphalt mixture.
- The time series of NMVOC emissions from (2H2) *Food and Beverages* has been recalculated for the entire period due to the change in the methodology applied - EMEP/EEA Manual Tier 2 methodology has been applied.

- The time series of HFC emissions from RAC applications has been recalculated for the entire period – emissions were calculated for each sub-application using the appropriate factors provided in the 2006 IPCC Guidelines.
- Emissions from closed pressure electrical equipment from 1999 to 2022 have been recalculated based on adjusted activity data from utilities.

Agriculture

- For calculation of emissions from animal husbandry, animal stocks for cattle (both dairy cows and other cattle) and sheep have been divided into sub-division used for purposes of Armenia's emissions reporting.
- Time series has been recalculated, and consistent time series for 1990-2022 has been developed due to the adjustment of data required for assessing emissions from enteric fermentation.
- Time series on methane and nitrous oxide emissions from manure management has been recalculated for the 1990-2022 period with adjusted activity data.
- Based on the data from the "External Trade of the Republic of Armenia (according to the 8- and 10-digit classification of the Commodity Nomenclature of External Economic Activity)" of the RA SC, the time series of direct and indirect nitrous oxide emissions from managed soils has been recalculated for the entire period.

  Due to data gaps with respect to years 1990-1995, emissions for 1990-1995 were estimated by linear interpolation, assuming a constant annual decrease in emissions throughout the period of 1990-1995.

LULUCF

- The recalculation has been performed for the entire time series for *Cropland Remaining Cropland* subcategory due to the adjusted activity data.
- The recalculation of the time series for *Land converted to settlements* subcategory has been performed for the years 2011-2022 due to the updated data on land-use conversion to Settlements and corrections to it. Data on land-use conversion to Settlements are not available before 2011.
- The recalculation of the time series for the years 2011-2022 has been performed due to the updated data on land-use conversion to *Other land* and corrections to it. Data on land-use conversion are not available before 2011.
- The recalculation of the time series for the entire period for *Harvested Wood Products* category has been performed due to the adjusted activity data.

Waste

- 2020-2022 emissions from 5.A. *Solid Waste Disposal* category have been calculated using waste composition data, while for 1990-2019 emissions were calculated using bulk waste.
- The methodology for calculating total waste has been updated with the new approach, considering the total population of Armenia (both urban and rural), whereas in the previous submissions only urban population was considered.

Therefore, methane emissions for 1990-2019 need to be recalculated. This will require additional data collection for previous years, identification of any data gaps and consideration of various splicing techniques from the 2006 IPCC Guidelines to identify the most suitable for recalculating this category. This improvement is planned for the next inventory cycle.

- Emissions from (5.C.1.) *Waste incineration* category has been assessed.
- The recalculation has been performed for the entire time series of methane emissions from *(5D1.) Domestic Wastewater* category, using the new data published by the RA Statistics Committee, while in the previous inventories the values of the population's access to the sewerage system were based on expert judgment.
- The time series for nitrogen oxide emissions from *(5D1.) Domestic Wastewater* category has been recalculated using updated data for Armenia published by the UN FAO on the amount of protein consumed per person per day.
- The recalculation has been performed for the entire time series for (5.D2) *Industrial wastewater treatment and discharge* category (methane emissions), using the updated data from RA SC publications, as well as data from the RA SC databases.

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

3.1 Introduction

National circumstances, institutional arrangements and legal frameworks

To fulfil the ambitions in emission reduction, Armenia is in the process of following key mitigation steps. These initiatives mainly focus on Energy, Waste, Industry, Agriculture and Forestry sectors. Achieving a clean, diversified, energy-efficient, sustainable, inclusive, and competitive Energy sector in the country; growth and diversification of the manufacturing sector; developing a sustainable, innovative, agriculture sector; sustainable forest and land management; waste management including reduction and prevention of waste generation, reusing waste, recycling, recovering energy, and safely disposing of waste are some of the main key concepts of the government to progressing towards GHG emission reductions. The Government of Armenia reaffirms its commitment to reduce GHG emissions to 2.07 tCO_2eq equivalent per capita by 2050 through the adoption of Long-term Low Greenhouse Gas Emission Development Strategy.[11] The MoE, and the IACCC are playing the role of climate change policymaking and coordination bodies.

To track the progress on the actions taken by the country towards reducing emissions, and to enable consideration of the country's efforts in the global perspective, the Government is committed to implementing an MRV system in line with Decision 18/CMA.1 on the MPGs for the Transparency Framework for Action and Support under Article 13 of the Paris Agreement and European standards and principles.

Description of nationally determined contribution of Armenia under Article 4 of the Paris Agreement, including updates

Updated NDC of Armenia (2021–2030)- approved by the Government decision in April 2021, commits to reducing GHG emissions by 40 per cent below 1990 levels by 2030 through an economy-wide approach covering Energy, Industry, Agriculture, Waste and Forestry sectors based on 2017 inventory assessment of the country. The country also plans to engage in Article 6 cooperative mechanisms to enhance mitigation efforts.

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

BTR assessment of Armenia tracks progress towards its NDC (2021–2030) using net GHG emissions and removals as the key indicator, consistent with Decision 18/CMA.1, with year 1990 as the reference year. The original analysis relied on the 1990–2017 inventory, which reported total emissions of 25,855 $ktCO_2eq$ in 1990 (excluding Forestry and Other Land-Use) and net emissions of 25,118 $ktCO_2eq$. In the latest NID, the baseline has been recalculated based on updated requirements, incorporating revised activity data and methods, new source categories, updated country-specific emission factors, and IPCC AR5's 100-year GWP values in place of the previously used AR2 values, with estimates extended to 2022. According to these revised data, 1990 emissions are now reported as

[11] UNDP LEDS, 2023

26,756.1 $ktCO_2eq$ for total emissions and 26,013.8 $ktCO_2eq$ for net emissions. MAs were evaluated for years 2021 and 2022 using methodologies consistent with IPCC guidelines, CDM and Guidelines for Estimating Greenhouse Gas Emissions of Asian Development Bank Projects, based on national data and expert input. Emission estimates were done using ClimateSI's Smart ETF tool. NDC implementation of Armenia draws on national strategies across energy, transport, agriculture, waste and forestry sectors, targeting a 40 per cent GHG reduction by 2030. As of 2022, net GHG emissions (including LULUCF) stood at 12,932.2 $ktCO_2eq$ representing a 50.3 per cent decrease from 1990 levels, indicating that Armenia is on track towards achieving its 2030 target.

Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement

Armenian mitigation policies and measures are based on documents, such as the "NDC 2021–2030 of the Republic of Armenia" (2021), the "Implementation Plan for the Nationally Determined Contributions of the Republic of Armenia for 2021–2030 under the Paris Agreement" (developed and discussed with the national stakeholders) and the "Report on Methodological Approaches and Data-Collection Instructions for Reporting the Information Necessary to Track Progress Made in Implementing and Achieving NDCs" (2024). These draw from major sectoral strategies such as the Government Programme (2021–2026), the Energy Sector Development Strategy to 2040, the Clean and Energy-Efficient Transport Strategy, the 2020-2030 Strategy of the Main Directions Ensuring the Economic Development of the Agricultural Sector, the Municipal Solid Waste Management Strategy (2017–2036), and the National Forestry Management Programme. Based on these frameworks, BTR assessment of Armenia identified and evaluated 16 active mitigation measures: 13 in the Energy sector, two in the AFOLU sector, and one in the Waste sector, to quantify their individual emissions reduction impacts for the years 2021 and 2022 to track progress towards the NDC target.

Projections for greenhouse gas (GHG) emissions and removals

NDC 2.0 of Armenia commits to a 40 per cent reduction in GHG emissions by 2030 compared to 1990 levels (approximately 15,500 $ktCO_2eq$). Under a BAU scenario, emissions would reach approximately 20,000 $ktCO_2eq$ by 2030, creating a mitigation gap of 4,500 $ktCO_2eq$ requiring substantial policy interventions.

Under the WAM scenario, Armenia projects achieving a 42 per cent reduction compared to 1990 levels, demonstrating commitment to enhanced climate action.

Energy Sector: Despite continued growth through 2030, the Energy sector emission– which contributes the largest share of total emissions– is projected to remain 56 per cent below 1990 levels.

Industrial Processes and Product Use (IPPU): The IPPU sector is projected to reach 197 per cent of 1990 levels by 2030 (nearly doubled), which is mainly attributed to the exponential increase of F-gases from 2000 due to the expansion of the manufacturing sector.

Agriculture: The agricultural sector is expected to demonstrate relative stability, with 2030 emissions projected at approximately 5 per cent above 1990 levels.

Land-Use, Land-Use Change and Forestry (LULUCF): Despite modest projected improvements, 2030 removal levels are expected to remain 40 per cent below 1990 baseline, indicating substantial loss of carbon sink capacity.

Waste Sector: Emissions are projected to continue rising, reaching approximately 81 per cent above 1990 levels by 2030.

Common tabular formats for the electronic reporting of the information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement

Chapter 3 contains 12 common tabular formats (CTFs) for tracking progress in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement. These tables were generated separately from the main BTR document using ClimateSI's Smart ETF tool.

3.2 National circumstances, institutional arrangements and legal frameworks

3.2.1 Economic profile

Economic growth dynamics and the GDP

Since 2017, Armenia has been classified as an upper-middle-income country according to the world classification of countries by income groups. In 2024, the GDP of Armenia reached 26.0 billion USD, and the GDP per capita was 8,556.0 USD.[12] The 2024 GDP exceeded the level of 1990 by 2.8 times, and the level of 2000 by 4.1 times[13].

The past 34 years have been marked by three significant economic downturns followed by periods of dynamic recovery. The first recovery after gaining independence began in 1994 and lasted until 2008, with an average annual GDP growth rate of 8.9 per cent. Already in 2004, the GDP level of 1990 was exceeded. Initially, the economic growth was mostly due to Agriculture, and afterwards it was mainly provided by the growth in the construction and services sectors.

Until the 2008-2009 world financial crisis, the economic growth was mostly based on non-tradable sectors, the consequence of which was one of the deepest economic downfalls in the world: in 2009, the GDP shrank by 14.1 per cent. However, the recovery phase began relatively quickly, starting in 2010, mainly through the expansion of the external debt. In 2010-2019, the average GDP growth was 4.5 per cent. During the post-crisis period, the services sector was the main driver of economic growth.

The third economic downturn occurred in 2020, primarily due to the COVID-19 pandemic, resulting in a 7.2 per cent decline in GDP. Starting in 2021, GPD growth was restored, and during the 2021-2024 period, average economic growth was 8.15 per cent. The primary contributor to economic growth during that time was the services sector.[14]

Table 3-1 below lists the major macroeconomic indicators for the period 1990-2024.

[12] Statistical Committee https://armstat.am/am/?nid=202
[13] Calculation based on data from Statistical Yearbooks of Armenia
[14] i Calculation based on data from Statistical Yearbooks of Armenia

Table 3-1. Main macroeconomic indicators

	1990	2000	2010	2015	2020	2021	2022	2023	2024
GDP (current prices), billion AMD	10.1[15]	1031.3	3460.2	5043.6	6181.9	6991.8	8501.4	9492.5	10193.4
GDP growth, %	…	5.9	2.2	3.2	-7.2	5.8	12.6	8.3	5.9
GDP (constant 2015 million US$)	5839.8	3959.4	8513.5	10553.3	11941.0	12633.6	14225.5	15406.2	16315.1
GDP, ppp (constant 2021 international million $)	21801.5	14781.7	31783.3	39398.6	44579.3	47164.9	53107.6	57515.6	60909.0
GDP per capita, ppp (constant 2021 international $)	6137.6	4589.0	10438.6	13112.8	15052.9	15921.7	17886.2	19402.8	20078.8
Consumer price index, %	107.8	99.2	108.2	103.7	101.2	107.2	108.6	102.0	100.3

Source: 1,2,6 lines from the SC database, 3,4,5 lines from the World Bank database

Figure 3-1 below illustrates the changes in the GDP structure and the shifts in the prominence of different economic sectors in the period 1990 – 2024.

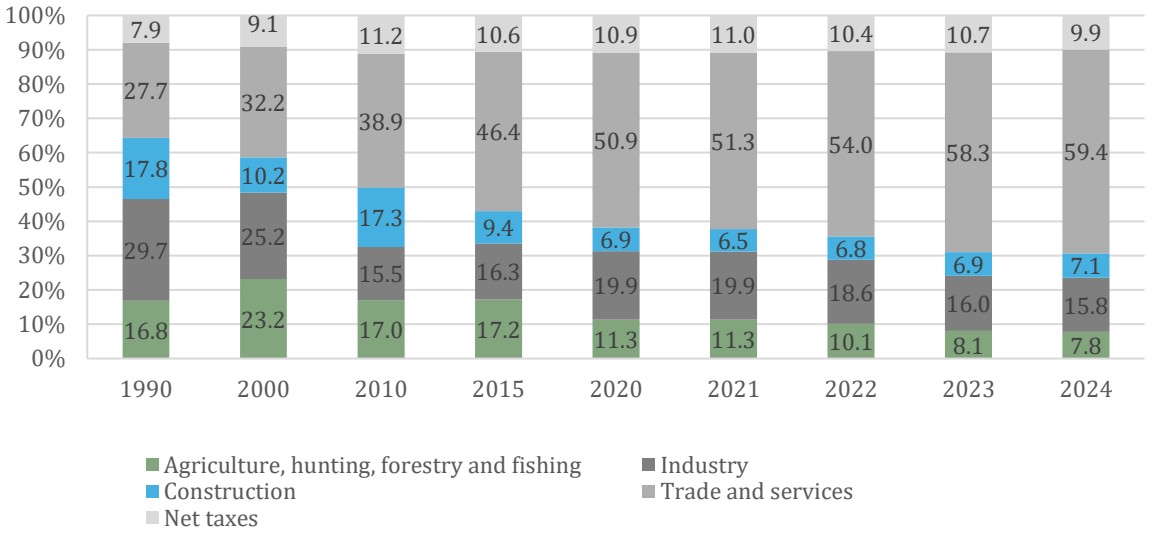

Figure 3-1. Sector-wise share of GDP

Source: SC of the RA, https://statbank.armstat.am/, Statistical Yearbooks of Armenia

[15] 1990 GDP is calculated and presented in billions of USSR rubles, https://armstat.am/am/?nid=12&id=01001

Labour-market

The labour-force participation rate was 59.1 per cent in 2024. The employment rate was 51.2 per cent and the unemployment rate was 13.4 per cent. The average monthly wage was 287.2 thousand Armenian Dram (AMD) (approximately 730 USD).

Women dominate in the structure of the labour resources, while men represent a greater share of the labour force, as well as among the employed and unemployed populations.

The gender gap in the labour-force participation rate in 2024 was 30.6 per cent, and the averages nominal monthly wage gender gap was 39 per cent.

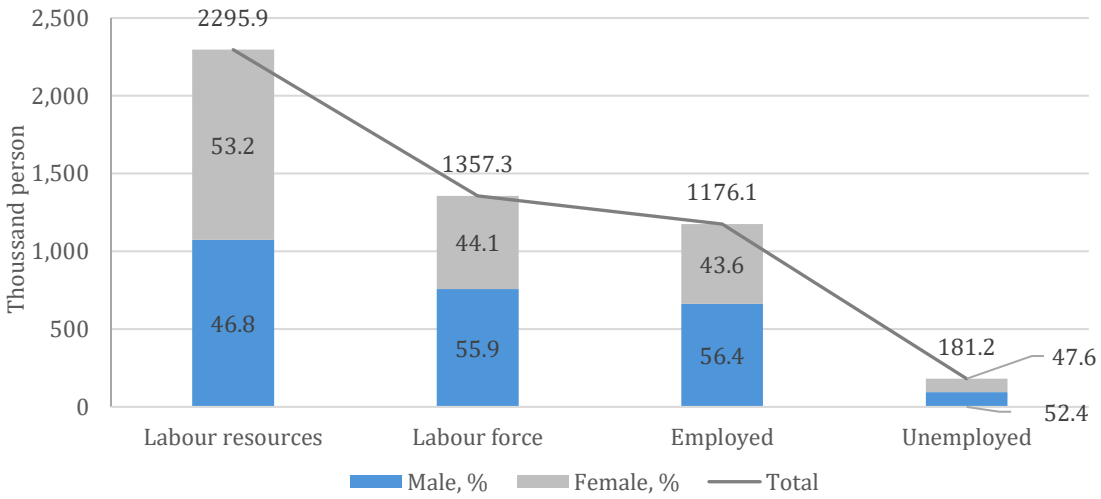

Figure 3-2. Labour resources in 2024

Source: SC of the Republic of Armenia, Statistical Yearbook of Armenia, https://statbank.armstat.am/

The sectoral composition of employment has changed in line with the shift of economic focus as shown in Figure 13 below. Most prominent changes in the sectoral share of employment between 1990 and 2024 are the rise in Trade and Services from 40.6 per cent to 59.7 per cent, and the fall in industry from 30.4 per cent to 12.9 per cent.

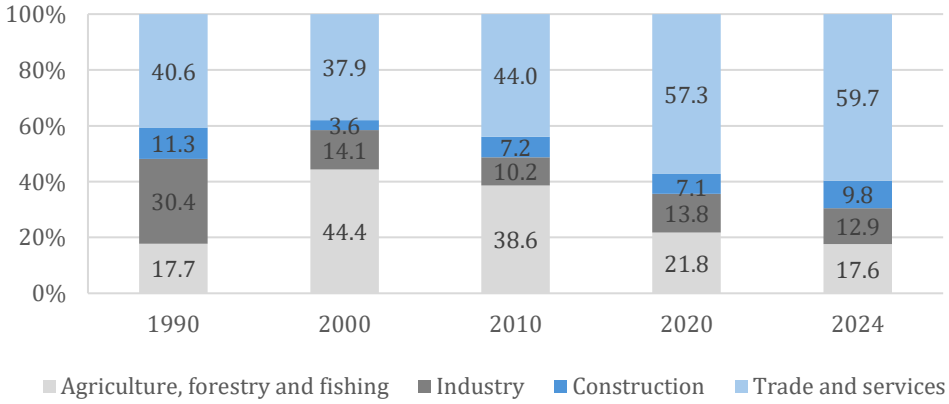

Figure 3-3. Share of employment by groups of economic activity

Source: SC of the RA, Statistical Yearbook of Armenia

Compared to men, women's employment is relatively high in non-market services (40.5 per cent versus 20.5 per cent), especially in education (19.6 per cent versus 3.7per cent),

health and social services (7.7 per cent versus 0.7 per cent), and much lower in construction (0.7 per cent versus 16.8 per cent). 76 per cent of employed women are employees, and only 1.1 per cent[16] are employers. In legislative, executive, judicial, and local governments, women hold half as many leadership positions as men. [17].

Gender equality and poverty.

The gender equality situation in the country has essentially improved in the last years. In 2023-2024 the position of Armenia in the world was 64 out of 146 countries by the Global Gender Gap Index (GGGI), and 49 out of 193 countries by the Gender Inequality Index (GII). For comparison, in 2020-2021, the position of Armenia was 114 out of 156 countries by GGGI[18] and 54 out of 162 countries by GII.[19]

In 2024, the poverty rate was 21.7 per cent, with poverty rate among women being lower (19.4 per cent) than among men (22.5 per cent). At the same time, the extreme poverty rate is twice as high (1 per cent) as for men (0.4 per cent). Every third household in Armenia (32.5 per cent) is headed by women. The highest poverty rate was recorded in households headed by woman with child(ren) under six years old (27.6 per cent).[20]

GDP energy intensity and emissions

In 2022, the energy intensity of GDP decreased by about five times compared to 1990 and by two times compared to 2000. This reduction can mainly be attributed to structural changes in the economy and the adoption of energy-saving technologies. The most significant factor contributing to the decrease in energy intensity was the decline in the share of industrial production and growth in the share of the services sector.

In 2022, GHG emissions decreased by about 2 times compared to 1990, but increased by about 2 times relative to 2000 (the lowest point in the time series). GHG emissions per unit of GDP showed a significant declining trend, decreasing by about 5 times compared to 1990 and by 1.7 times compared to 2000.

Following figure indicates the trends in GDP energy intensity and net GHG emissions per unit GDP for the period 1990–2022.

[16] Statistical Committee, Labour Market, 2025
[17] gender_statistics_arm_18.12_2_interactive.pdf
[18] Gender Gap Report 2025 | World Economic Forum
[19] Gender Inequality Index | Human Development Reports
[20] Social Snapshot and Poverty in Armenia, 2025 / Statistical Committee of the Republic of Armenia

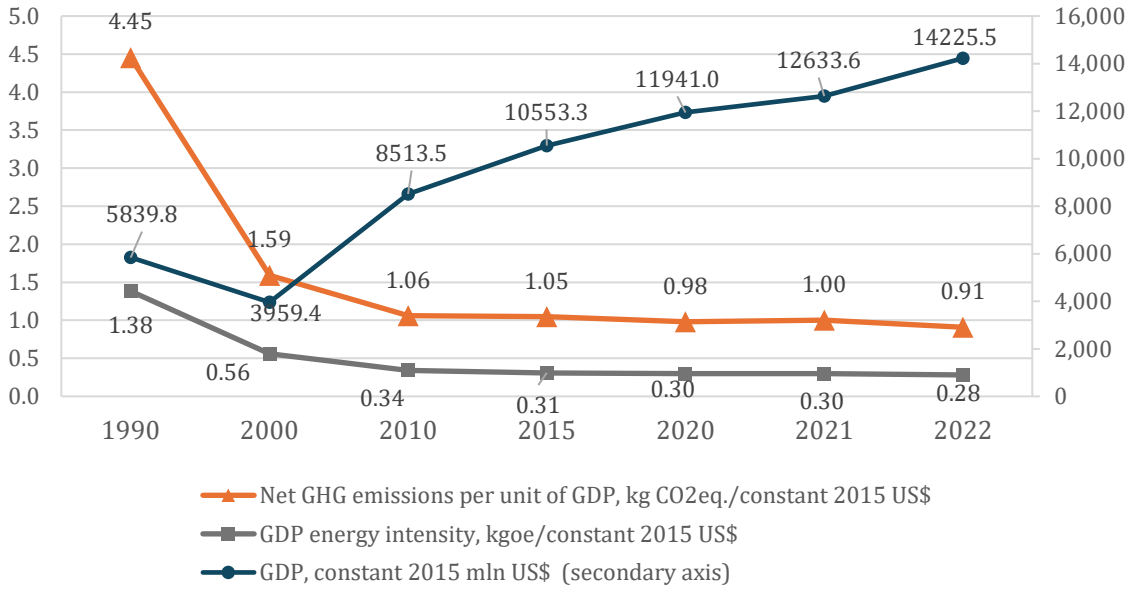

Figure 3-4. GDP, GDP energy intensity and net GHG emissions per unit GDP

Source: GDP: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/ GHG emissions per unit GDP, GDP energy intensity; Energy balance and GHG inventory data

3.2.2 Climate profile

The annual temperature in Armenia ranges from -5°C to 15°C, with an average of 5.5°C. The average annual precipitation ranges between 200 mm and 1000 mm, with an average of 592 mm.

Ten distinct climatic zones that span from strictly continental to cold mountainous climates have resulted due to the mountainous terrain.

Armenia has climatic conditions favourable for solar energy use, with 2,500 annual average sunshine hours and an annual average GHI of 1,720 kWh/m^2.

Effects of global climate change on temperature

Armenia has experienced a significant increase in the average annual surface air temperature (AASAT).

AASAT for the period 1990-2024, exceeded the value for the period 1961-1990 by 1.1°C, and the AASAT of 2024 reached 7.2°C, with a record deviation of 1.7°C from the AASAT for the period 1961-1990.[21]

The second warmest winter since 1935 occurred in 2023-2024 winter when the average seasonal temperature dropped to -1.5°C, which is 4.0°C above 1961-1990 baseline average, while some communities of Shirak region experienced a temperature of -29° C.

Year 2024 experienced a "hot" summer, with an average temperature of 17.4°C, which was 1.6 °C above 1961-1990 baseline average. Yerevan, and some communities of

[21] Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/

Aragatsotn, Ararat, Armavir and Vayots Dzor marzes have recorded temperatures of 40°C. [22]

Figure 3-5 below shows the deviation of the average annual air temperature from the baseline average of 1961-1990.

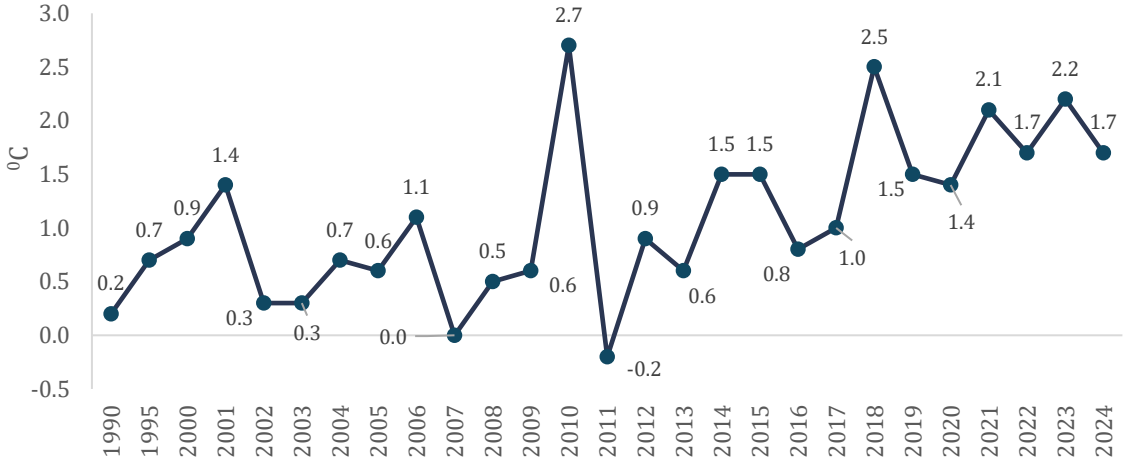

Figure 3-5. Deviation of the average annual air temperature from the baseline average of 1961-1990

Source: Statistical Committee of the Republic of Armenia, Environment and Natural Resources in the Republic of Armenia for 2024

Effects of global climate change on precipitation

With an increase in the temperature, Armenia has experienced a decrease in precipitation compared to the period 1961-1990. As evident from Figure 3-6 below, there is a high variance in the annual precipitation values. However, it is evident that the mean value is considerably lower than the 1961-1990 average.

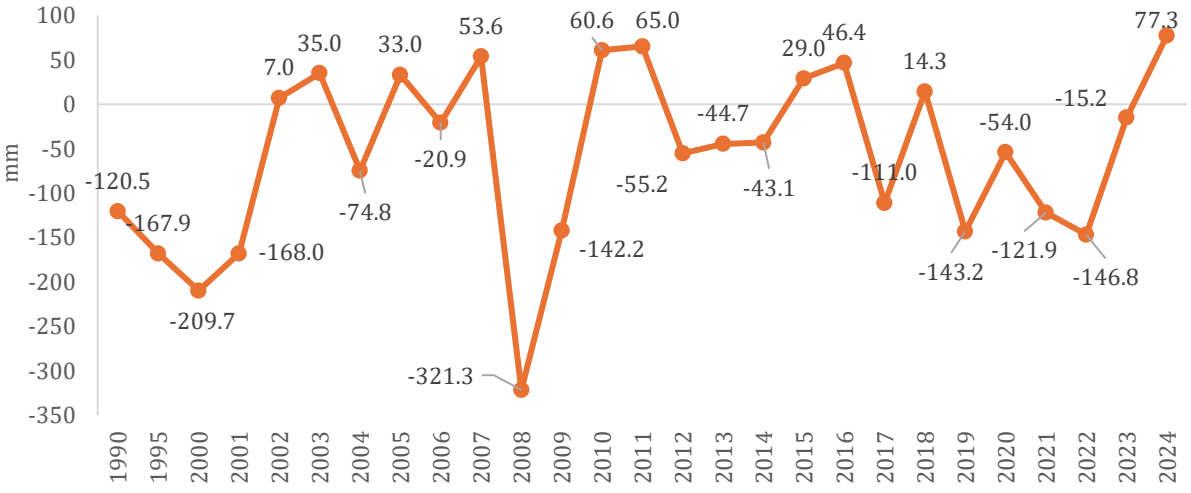

Figure 3-6. Deviation of the average annual precipitation from the baseline average of 1961-1990

Source: Statistical Committee of the Republic of Armenia, Environment and Natural Resources in the Republic of Armenia for 2024

[22] Source: Armhydromet of MoE of RA, https://meteomonitoring.am/

3.2.3 Sector details

Energy

a) Total supply of primary energy

A clean, energy-efficient, sustainable, inclusive, diversified and competitive Energy sector is a main priority for the Armenian government.

In 2023, the total supply of primary energy was 3,854.7 ktoe, reflecting a 3.7 per cent decline compared to the previous year. Since Armenia does not have its own fossil fuel resources, the demand for oil and natural gas is met through imports.

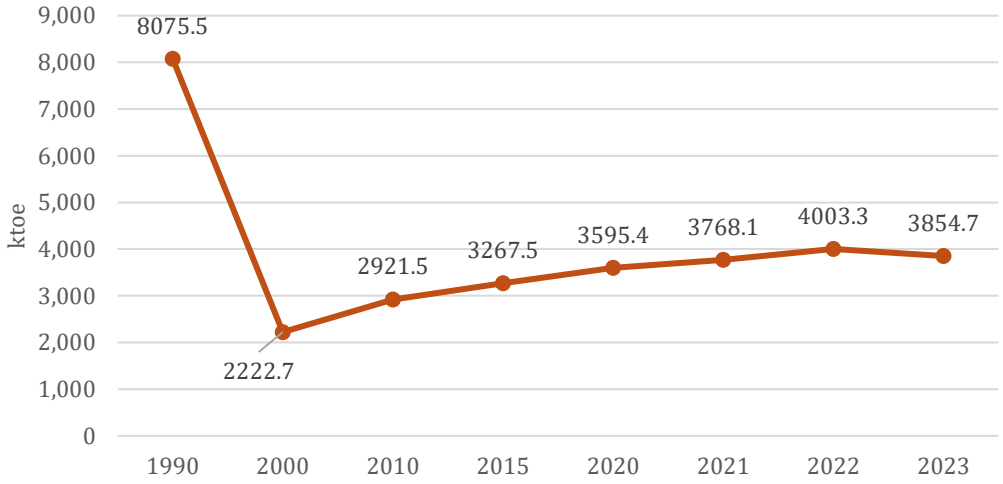

Figure 3-7. Total primary energy supply

Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/, Energy balance

The supply of primary energy experienced a significant decline from 1991 to 1993 due to economic downturn and energy crisis. In 1995, the primary energy supply decreased by 4.3 times relative to 1990. Following this period, there was stable growth in primary energy supply until 2015. Although there were decreases in 2016 and 2018, the supply saw an average increase of 6.2 per cent from 2019 to 2022. As a result, in 2023, the primary energy supply and energy supply per capita decreased by 52.3 per cent and 42.9 per cent respectively, from 1990 levels. Compared to the year 2000, the primary energy supply and the per capita level increased by 73.4 per cent and 88.4 per cent respectively, in 2023.

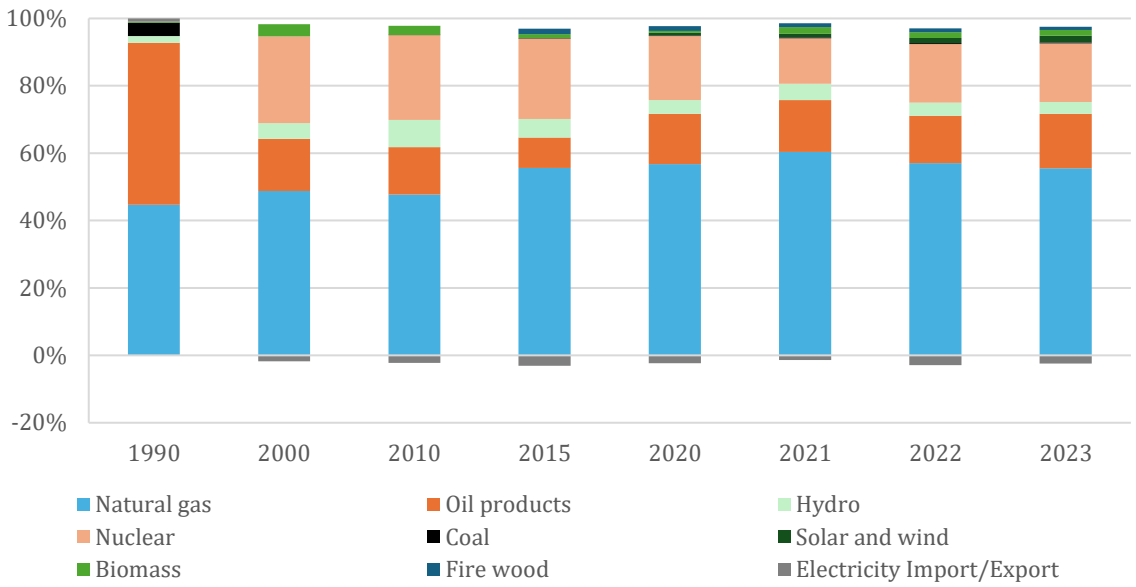

Figure 3-8. Share of the total primary energy supply by source

Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/, Energy balance

The structure of the total primary energy supply shows positive trends. Compared to 1990, the share of oil products decreased significantly by 31.2 percentage points, dropping to 16.9 per cent in 2023. Coal, which held a 4 per cent share in 1990, is now almost non-existent, accounting for just 0.4 per cent in 2023. In contrast, the share of natural gas increased by 13.7 percentage points, reaching 58.4 per cent. Additionally, since the reopening of the Armenian Nuclear Power Plant in 1995, nuclear energy has been generated, with its share reaching 18.3 per cent by 2023. Solar energy has also seen a consistent rise since 2015, reaching 2 per cent in 2023, while the share of wind energy remains low at just 0.1 per cent.

The reduction in primary energy supply and structural changes have a significant impact on emissions from the Energy sector. In 2022, GHG emissions from this sector decreased by approximately 62 per cent compared to 1990 levels, totalling 8,850.6 $ktCO_2eq$ Consequently, their share of total emissions dropped by 20.8 percentage points.

b) Final energy consumption

After the energy crisis in the early 1990s, final energy consumption saw a significant decline. By 1995, final energy consumption had decreased by 4.3 times compared to 1990 levels. Since then, a steady growth trend has been observed, with exceptions in 2016, 2018 and 2023, where there was a decrease of 2.7 per cent. As a result, by 2023, final energy consumption had increased by 2.3 times compared to 1995, reaching a total of 2,858.9 ktoe.

In 2023, final energy consumption and per capita consumption decreased by 46.7 per cent and 36.3 per cent, respectively, compared to 1990.

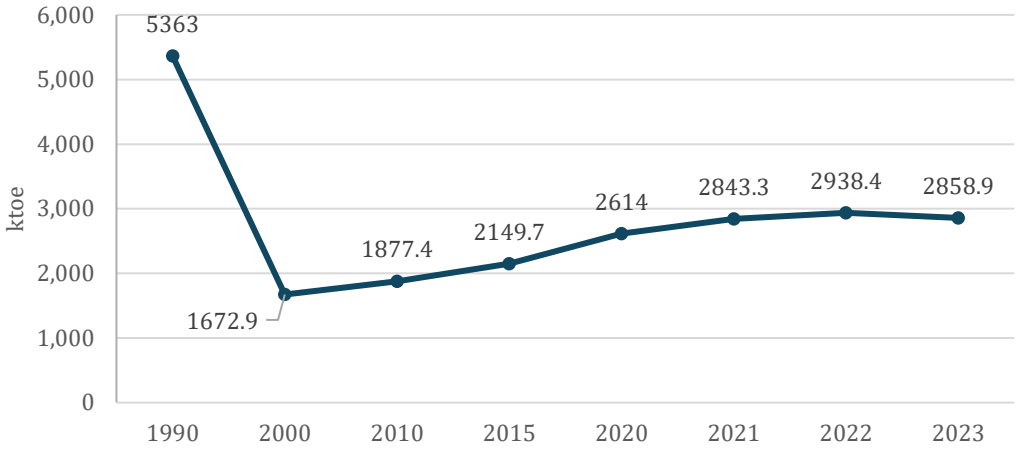

Figure 3-9. Final energy consumption

Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/, Energy balance

Natural gas accounts for the largest portion of energy consumption at approximately 52.1 per cent. This is largely attributed to the country's high level of gasification, which is around 96 per cent. Natural gas is also widely utilized in road transport. Households are the leading consumers of energy, making up 34.6 per cent of total consumption, followed closely by the transport sector at 30.7 per cent.

Following figure shows the share of final energy consumption by fuel type and by consumer type in 2023.

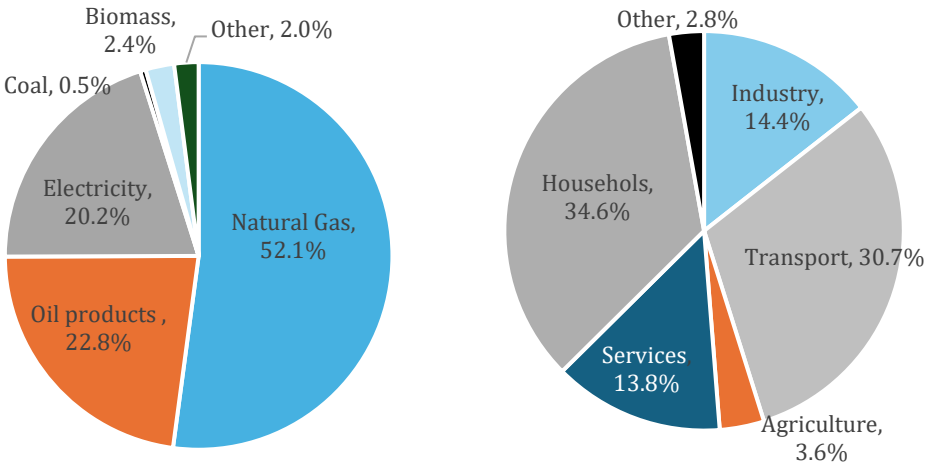

Figure 3-10. Structure of final energy consumption by fuel type (left) and by consumer type (right) in 2023

Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/, Energy balance

c) Electricity generation

In Armenia, electricity is primarily generated through thermal, nuclear and hydropower plants. Since 1990, the composition of power generation has changed significantly. Back

in 1990, thermal power stations accounted for 85 per cent of electricity generation, while hydropower plants contributed 15 per cent.

Since 1995, the Armenian Nuclear Power Plant has been reopened. Since 2010, power has also been generated from wind power plants, and solar power plants have been added since 2017. However, the share of wind plants has not yet exceeded 0.1 per cent of the total power generation. Over the past eight years, the installed capacity of solar power plants has increased by 485.4 MW in 2023.

In 2023, the total electricity generation came from thermal, nuclear, hydropower and solar power plants, with respective shares of 42.2 per cent, 30.8 per cent, 18.7 per cent, and 8.3 per cent.[23] Approximately 43 per cent (703.9 million MWh[24]) of the electricity generated by hydropower plants came from small HPPs. As a result of state incentive policies, the installed capacity of small HPPs has increased significantly from 31.7 MW in 1999 to 395 MW in 2023.[25] In 2023, renewable energy sources included small hydropower plants, solar energy and wind power plants, making up approximately 17 per cent of the total electricity generated.

As a result of the improvement of the electricity generation structure and the continuous development of renewable energy, GHG emissions from energy industries in 2022 decreased by 6.8 times compared to 1990, totalling 1,682.3 $ktCO_2eq$, while electricity generation decreased only by 14.7 per cent.

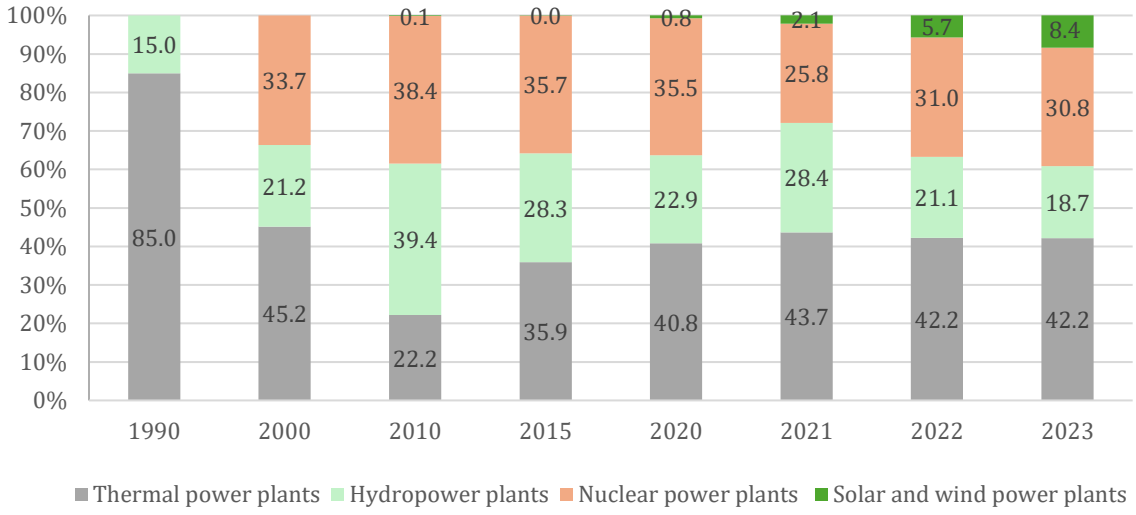

Figure 3-11. Share of electricity generation by source

Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/, Electricity balance

d) Sector regulation

The principal bodies involved in Energy sector governance in Armenia include the Ministry of Territorial Administration and Infrastructure, which is responsible for overall energy policymaking; the Public Services Regulatory Commission (PSRC); and the

[23] Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/, Electricity balance
[24] Public Services Regulatory Commission, ttps://www.psrc.am
[25] Ibid.

Committee on Nuclear Safety Regulation. The Public Services Regulatory Commission's main competencies are activity licensing, setting of regulated tariffs, adoption of market rules and regulations, etc.

Gazprom Armenia CJSC owned by Russia's Gazprom imports natural gas from Russia and Iran as well as owns and operates the gas transmission and distribution networks in Armenia.

In 2018, amended were done in the Law on Energy to drive greater liberalization of the electricity market. With the changes in the law, consumers are now able to purchase electricity from other suppliers. On February 1, 2022, the gradual liberalization of the Armenian electricity market started. The ultimate goal of liberalization is to shift the electricity market from a single supplier model to multiple suppliers, an open market model. The new market conditions do not necessarily apply to households, and they continue to purchase electricity from the only guaranteed supplier, the Electric Network of Armenia (ENA). Meanwhile, both households and other consumers have the right to choose their own supplier, and the deadlines for the mandatory entry of different groups of consumers into the market are set by paragraph 107 of the Rules of the Retail Electricity Market, approved by the Commission's Decision No.517 as of 25.12.2019.

Transport

The geopolitical restrictions, geographical location, climate, level of urbanization, and the absence of direct access to the sea from Armenia shape the features of the transport sector. These factors contribute to high transportation costs and pose challenges for the maintenance and development of road infrastructure, ultimately affecting the country's economic competitiveness.

Effective communication and connectivity in transportation are strategically important for the country. Given the outlined restrictions, further development of motor vehicle transport and the expansion of the transport network and channels are especially critical.

Communication routes include rail, motor vehicle, pipeline and air transport.

In 2024, the total length of general-purpose railway lines was 725.6 km, the length of general-purpose motor roads measured 7533.2 km, and the gas pipeline extended for 1580.3 km. The density of general-purpose railroad and motor vehicle transportation routes per 1000 km^2 is 24.4 km and 253.3 km, respectively.[26]

The country's road infrastructure is highly vulnerable to climate change, particularly to climate-induced hazards, such as landslides, floods and extreme temperatures.

Since the 1990s, the transport sector has experienced significant challenges due to structural shifts in the economy, changes in industrial supply chains, and a reduction in transit traffic. The lowest volume of freight transportation was recorded in 2000, at 4.5 million tons, which was about 25 times lower than the volume in 1990.

By 2024, the total volume of freight transportation reached 16.8 million tons, which is 3.7 times higher than the level recorded in 2000.

Similar trends have been observed in passenger transportation; however, the decline was much less severe, at 3.6 times lower in 2000 compared to 1990. The lowest level of

[26] Statistical Committee of the Republic of Armenia, Statistical Yearbook of Armenia 2025

passenger transportation occurred in 2020, with only 69.9 million passengers, due to the COVID-19 pandemic. In 2024, the number of passenger transportation rose to 246.8 million, representing 1.8-fold increase compared to 2000.

Road (motor vehicle) transport dominates in both passenger and freight transportation due to obstacles in developing alternative transport routes, such as the absence of sea access, physical obstructions for river transportation, and limited interstate railway connectivity. In 2024, motor vehicle transport accounted for 79.6per cent of freight transport and 83.3 per cent of passenger transport. Railroad transportation represented a much smaller share, with 8.6per cent for freight and only 0.2 per cent for passengers. Additionally, electric transport, including metro and trolleybus services, made up 14.3 per cent of passenger transport.

In the Transport sector, energy consumption reached 878.4 ktoe in 2023, reflecting a growth of 35.3 per cent since 2015. A substantial part (99.2 per cent) of this consumption occurred in road transport. Over the past decade, the structure of fuel consumption in road transport has seen significant changes. In 2023, natural gas continued to be the most widely used fuel, accounting for 39.1 per cent of consumption; however, its share has decreased by 1.6 times compared to 2015. Conversely, the percentage of liquefied petroleum gases (LPG) rose dramatically, increasing 18 times over the same period, and now represents 16.7 per cent of the fuel mix. The shares of gasoline and diesel fuel remained relatively stable, at 26.7 per cent and 17.5 per cent, respectively.

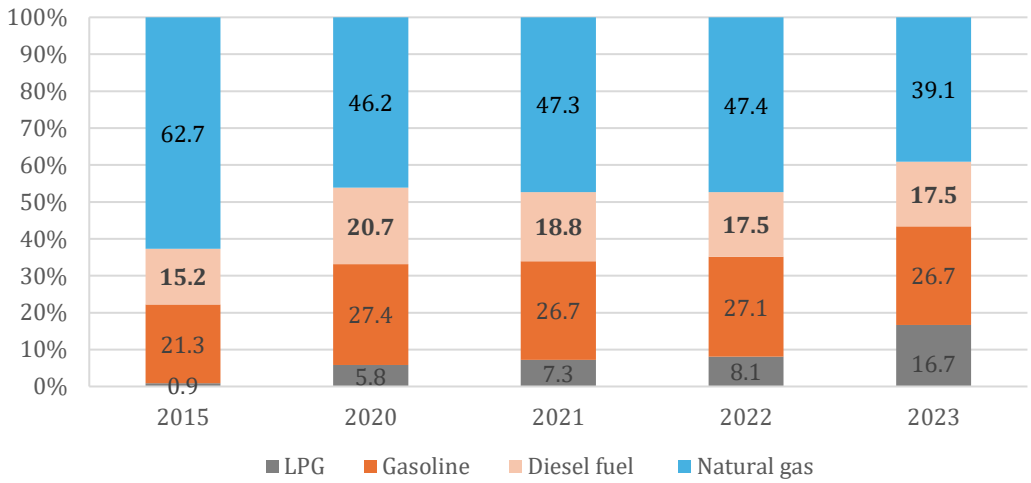

Figure 3-12. Fuel consumption structure in road transport

Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/, Energy balance

In the context of decarbonizing the transport sector, the government prioritizes the development of electric transportation, which includes both public transportation and personal vehicles. Between 2017 and 2023, Armenia imported a total of 24,692 electric-powered vehicles. This figure includes 11,688 electric passenger vehicles, 70 electric freight vehicles, 55 electric minibuses, and 12,879 units of mopeds, motorcycles and bicycles. This data reflects a significant shift towards electric mobility, especially in passenger vehicles, which are the largest GHG emitters in this sector.

In 2022, GHG emissions from the transport sector decreased by 36.3 per cent compared to 1990 levels, reaching a total of 2430.55 $ktCO_2eq$ This reduction is primarily attributed

to a decline in both freight and passenger turnovers since 1990. The transport sector accounted for 27.5 per cent of GHG emissions in the Energy sector and 18.3 per cent of total GHG emissions.

Industry

The collapse of the common economic area and challenges in transitioning to a new economic system led to a significant decline in the industrial sector from 1991 to 1993. By 1994, industrial production had fallen to just 45 per cent of the 1990 level. However, from 1995 to 2024, the sector experienced an average growth rate of 5.3 per cent. By 2012, the volume of industrial production had returned to the 1990 level, and by 2024, it had doubled that amount.[27]

Industrial sector contributed to 15.8 per cent, of GDP and employed 151.8 thousand (12.9 per cent of the total employed people) in 2024.

The structure of the industry has seen notable changes. In 1990, most of the industrial production consisted of the manufacturing of machinery and metal products (32.8 per cent), and light industry (24.6 per cent), followed by the manufacturing of food products, construction materials, chemical, and mining industries.

In 2024, the manufacturing sector accounted for 72.9 per cent of the industry. The primary branches within this sector included the manufacturing of food products, the production of basic metals, beverages, and tobacco products.

The mining and quarrying sector represented 14.9 per cent of the industry, with approximately 93 per cent of this sector related to the mining of metal ores.

Electricity, gas, steam, air conditioning supply, and water supply, sewerage, and waste management accounted for 11.2 per cent and 1.0 per cent of the industry, respectively. Figure 23 below shows the share of subsectors in industry.

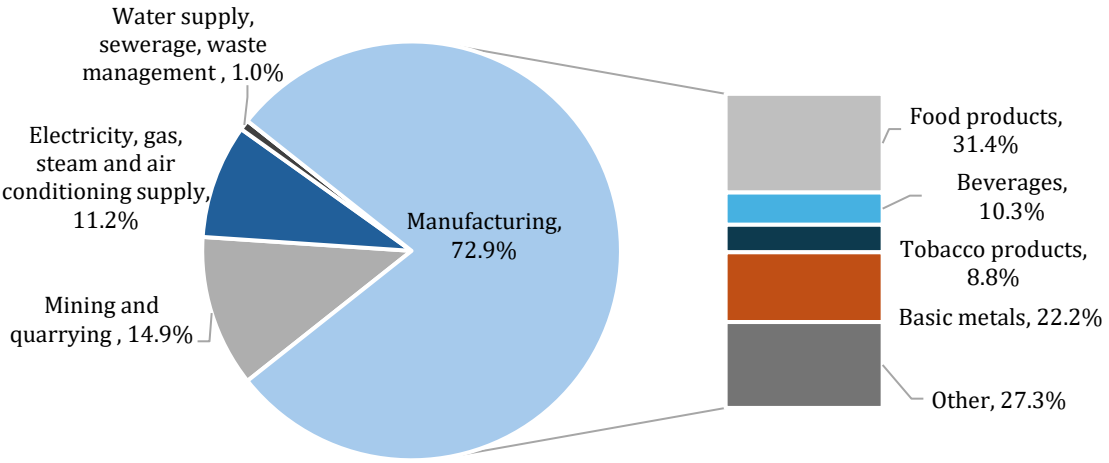

Figure 3-13. Structure of industry by sectors, 2024

Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/

[27] Calculation based on data from Statistical Yearbooks of Armenia

RA Government focuses on maintaining growth and diversification of the manufacturing sector, by pursuing goals like increasing international competitiveness, extending the production chain and promoting the development of more complex and valuable products.

In 2022, GHG emissions from the Industrial Processes and Product Use (IPPU) sector increased by approximately 55 per cent compared to 1990 levels, reaching a total of 1609 Gg of CO_2 equivalent. This rise occurred alongside a doubling of the industrial sector's production volume since 1990. As a result, the share of total emissions attributed to these sectors grew by 9.7 percentage points within the overall GHG emissions.

The main source of emissions in industrial processes is the carbon emissions generated during cement production. Small amounts of emissions are also generated from lime and glass production, as well as from the use of lubricants and solid paraffins. However, the increased emissions in the sector in the last decade are mainly attributable to the steady increase in F-gases (Hydrofluorocarbons or HFCs) emissions, which, for the most part, is a result of the widespread use of F-gases in refrigeration and air conditioning systems.

In 2019, Armenia ratified the Kigali amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer of the Vienna Convention on the Protection of the Ozone Layer, by which Armenia committed to gradually reducing the use of HFAs starting from 2024 and to ensure their reduction by 80 per cent to 85 per cent by 2045.

Agriculture

Agriculture is vital to ensure food security; promote agrifood processing industries such as foodstuff, beverages and tobacco; expand export opportunities; and provide employment in rural communities, which constitute 36 per cent of the population.

In 1993, after land reforms and the introduction of market economy rules in the sector, the share of Agriculture in the GDP reached 50.6 per cent. As a result of structural shifts in the economy and economic development, the share of Agriculture in GDP decreased. By 2024, Agriculture accounted for only 7.8 per cent of GDP. Agriculture receives 17.6 per cent or 206.8 thousand people of the total employment.

Over the past decade, the sector shifted from plant growing, towards animal husbandry. By 2024, animal husbandry already comprised 52.5 per cent of gross agricultural production, while plant growing accounted for 47.5 per cent.[28]

Only about two-thirds of arable land is cultivated, while only 32 per cent is irrigated. Many land plots are small and significantly limit land-use efficiency, and the adoption of innovative agricultural technologies, thus reducing the sector's overall productivity and effectiveness.

Armenian Agriculture sector frequently faces considerable natural and climatic risks, which are exacerbated by climate change and lead to substantial damage to agricultural production. These risks mainly include decreased precipitation, droughts, hail, and frost.

The Government's vision for the next decade is developing a sustainable, innovative, Agriculture sector that adds high value. It emphasizes the importance of caring for natural

[28] Source: Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/

resources and ensuring harmony with the environment and aims to produce ecologically clean products while guaranteeing the well-being of individuals living in rural areas.

In 2022, GHG emissions from the Agriculture sector declined by about 10 per cent compared to 1990 levels, totalling 1,986. $ktCO_2eq$, but share increased by 6.7 per cent of total GHG emissions. The share of total emissions from these sectors increased by 6.7 percentage points of total GHG emissions. 65.5 per cent of emissions in the Agriculture sector come from enteric fermentation, while 32.5 per cent originate from agricultural soils.

Forestry

The MoE administers sustainable forest management through the Forest Policy Department and the "ArmForest" SNCO.

As of 2024, Armenia had 333,9ha (approximately 12.7 per cent of the territory) of forest lands, out of which 86.6 per cent was covered by forests[29]

Armenian forests are crucial in protecting water sources and land, while serving as reserves, sanctuaries, and national parks. Though tree felling is permitted only for sanitary and care purposes, excessive and illegal logging has created a continuous decline in forest cover, causing soil degradation, erosion and negative impacts on biodiversity.

The long-term goal of the RA forest policy is to balance the ecological, social and economic significance of forest ecosystems and their components. The policy aims to enhance forest protection, restore forest ecosystems and landscapes, conserve forest biodiversity, and manage forest lands sustainably, and introduce a modern registry system to gain a comprehensive understanding of the forestry sector.

In 2022, the land-use and forestry sector removed only 386.0 $ktCO_2eq$ of emissions, compared to 738.2 $ktCO_2eq$ in 1990.

Waste

In 2024, in the territory of the republic, 62,497 thousand tons of waste were generated, of which 636.8 thousand tons, or 1 per cent of the total, was municipal waste, while 61,860.9 thousand tons, or 99 per cent, was industrial waste.[30]

Since 2000, the volume of municipal waste has risen by 66.9 per cent, and the per capita waste volume has increased by 77.2 per cent.

In 2022, GHG emissions from the Waste sector rose by approximately 56 per cent compared to 1990 levels, reaching a total of 864.6 $ktCO_2eq$. This sector accounted for 6.5 per cent of total emissions. Solid waste disposal accounts for 67.3 per cent of emissions of the Waste sector, while wastewater treatment and open burning of waste account for 26.1 per cent and 6.6 per cent, respectively.

The Ministry of Territorial Administration and Infrastructure is the main authority responsible for Waste sector policy, regulations for waste collection and the establishment of norms and procedures for the design, construction and operation of

[29] Source: Statistical Committee of the Republic of Armenia, Environment and Natural Resources in the Republic of Armenia for 2024, https://armstat.am/file/article/eco_book_2024_5.pdf
[30] Statistical Committee of the Republic of Armenia, ArmStatBank, https://statbank.armstat.am/

landfills. The MoE is responsible for waste registration, classification by hazard level, approval of placement limits, as well as monitoring of waste disposal sites. Within the framework of the government's current policy, the landfill gas capture system will be introduced based on the Strategy and the plans for the construction of new sanitary landfills in Yerevan and Hrazdan, which have been initiated and are currently underway.[31]

The Government's policy in the sector will be aimed at coordinating technologies and management systems of waste collection, transportation, storage, processing and utilization processes on a streamlined and sustainable institutional basis. Higher priority is set for effective garbage collection, as well as the implementation of mechanisms aimed at reducing the amount of garbage, its reuse and recycling.

3.2.4 National climate change and emissions reporting legislation

Currently, climate legislation in the RA is based on the Environment Laws, such as, international treaties of the Republic of Armenia, "Law on Energy Saving and Renewable Energy", "Law on the Protection of Atmospheric Air", other relevant legal acts.

In addition, the law of the Republic of Armenia "On Climate" has already passed the first reading by the National Assembly in 2025. This law will provide a legal basis for the development and implementation of effective climate policies in the country, mobilization of financial resources for them, integration of climate considerations into sectoral policies, integration of climate finance into the public finance management system, formation and development of institutional systems for the coordination, and control and accountability of these processes, while providing guidance for necessary legal developments for the sector.

3.2.5 Monitoring and reporting on the implementation progress

In the context of addressing climate change, MRV is a crucial mechanism that includes all efforts made to gather data on GHG emissions, mitigation actions, adaptation measures, and support received.

To track the progress on the actions taken by the country towards reducing emissions, and enable consideration of the country's efforts in the global perspective, the Government is committed to implementing an MRV system in line with European standards and principles.

Armenia has established the fundamental component of the GHG Inventory: National GHG Inventory System, in accordance with the transparency framework under the UNFCCC. This regulation was enacted in accordance with the "Atmospheric Air Protection" Law, as per the RA Government Decree N54-N dated January 11, 2024.

The Inter-Agency Coordinating Council operates within the authorized body of the Government, as a horizontal coordination and verification mechanism in terms of environmental protection. The Government has undertaken and is consistently implementing the required legal, organizational, and capacity-building processes to achieve an institutionalized level of horizontal and vertical interactions between different

[31] In 2016, the Government of the Republic of Armenia approved the "2017-2036 Solid Waste Management System Development Strategy" and in 2017 - the "2017-2036 Solid Waste Management System Development Strategy Implementation Plan."

institutions and stakeholders in terms of effective communication, collection, storage and exchange of climate-related data.

In this context, the Government pursues compliance commitments under the Republic of Armenia-European Union Comprehensive and Enhanced Partnership Agreement (RA-EU CEPA), according to which the establishment of the national MRV system is planned to be accomplished by 2026.

3.2.6 Climate change policymaking responsibility in Armenia

Ministry of Environment

MoE is the central public authority in charge of climate policy development and implementation, ensuring the compliance of Armenia with its international obligations, and responsible for submitting reports to the UNFCCC.

The Climate Policy Department of MoE is responsible for the development and implementation of institutional, legal and procedural arrangements for mitigation and adaptation. The Armhydromet of MoE is responsible for monitoring air quality, emissions and the climatic process. The Centre observes factors affecting the components of the environment and generates, assesses, records, analyses, disseminates and stores data on such assessments. It is designated as an executive body for the GHG Inventory creation as well.

The Inter-agency Coordinating Council for the implementation of the requirements and provisions of the UNFCCC and the Paris Agreement

The Council was established in 2012 and revised in 2021 by Prime Minister's Decree N719-A. It is chaired by the Deputy Prime Minister and includes representatives from ministries, state agencies and independent bodies.

Its responsible for overseeing the execution of the commitments made by the Republic of Armenia under the Convention and the Paris Agreement, providing high level institutional and political coordination for climate change reporting, and providing verification and validation procedures before submission of reports to the UNFCCC.

MoE and the Council build the basic institutional framework for MRV activities in Armenia.

Women's involvement in climate change policymaking

In 2024, women held 37% of leadership positions in the Ministry of Environment and 40% in structures subordinate to the ministry. 53% of the members of the IACCC and the three professional working groups under the council were women.[32]

Stakeholder engagement

Public consultation in the process of NDC updating and tracking has been carried out in line with the government procedures, including involvement of civil society.

The implementation of the NDC is supported on the subnational level by involving local communities and encouraging all stakeholders to take action, including private sector non-governmental organizations (NGOs), taking into account the needs of youth, vulnerable groups, in a gender-responsive manner.

[32] gender_statistics_arm_18.12_2_interactive.pdf

3.3 Description of Nationally Determined Contribution of Armenia under Article 4 of the Paris Agreement, including updates

The NDC of the Republic of Armenia for 2021–2030 (RA, 2021)represents the country's updated climate commitments under the Paris Agreement, following its INDC submission in 2015. This update was prepared in line with decisions 4/CMA.1, 9/CMA.1, and 18/CMA.1, and was approved by Government Decision No. 610-L on 22 April 2021. The NDC 3.0 development and stakeholder consultations were started in 2024 and the approval of NDC 3.0 is planned by the end of 2025.

Mitigation target

Under NDC for 2021-2030 Armenia commits to reducing GHG emissions by 40 per cent below 1990 levels by 2030. It maintains its 2050 mitigation goal of limiting per capita net emissions to 2.07 tCO_2eq as outlined in its Long-Term Low Emissions Development Strategy (LT-LEDS).

Table 3-2. Summary of the updated NDC of Armenia

Description of the Updated NDC of Armenia	
Target(s), including a description and the target type(s)	40 per cent reduction from 1990 emission levels by 2030. (The absolute GHG emissions reduction in 2030, based on the updated 1990 emissions using the latest GWP values (AR5), is 15,608.3 $ktCO_2e$)
Target year(s) or period(s), and whether they are single-year or multi-year target(s)	2030 (Single year)
Reference point(s), level(s), baseline(s), base year(s), or starting point(s), and their respective value(s)	Reference year: 1990
Time frame(s) or periods for implementation	1st January 2021 – 31st December 2030
Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases	Economy-wide target Sectors included in the mitigation contribution: a. Energy b. IPPU c. AFOLU d. Waste GHGs covered: CO_2, CH_4, N_2O and F-gases HFCs, SF_6
Intention to use cooperative approaches that involve the use of internationally transferred mitigation outcomes (ITMOs) under Article 6 towards NDCs	Armenia plans to participate in both market and non-market mechanisms under Article 6 of the Paris Agreement to enhance mitigation efforts beyond its domestic actions. This includes cooperation through ITMOs (Article 6.2), project mechanisms (Article 6.4), and non-market approaches (Article 6.8). The country is already working with the European Union and its Member States to advance such climate actions at domestic, regional and international levels.

Any updates or clarifications of previously reported information (e.g. recalculation of previously reported inventory data or greater detail on methodologies or use of cooperative approaches)	The National GHG Inventory of Armenia underwent comprehensive recalculations across all IPCC sectors from 1990-2022 to improve data quality. This included updated activity data, methodological approaches, new source categories, revised country-specific emission factors, and applying 100-year GWP values from IPCC AR5 instead of AR2 used previously. The Energy sector estimated missing data for 1991-1994 and 1996-1999 based on data from scientific and technical literature, while Industrial Processes recalculated emissions from steel production, solvents and refrigeration systems using updated activity data. Agriculture recalculated enteric fermentation and manure management emissions for the entire 1990-2022 period and revised N_2O emissions from managed lands for 2000-2019. The Waste sector recalculated solid waste disposal emissions for 1990-2019 using improved composition data and updated wastewater management emissions for the entire period, with further improvements planned for future cycles.

3.4 Information necessary to track progress made in implementing and achieving Nationally Determined Contribution under Article 4 of the Paris Agreement

A. Description of selected indicators

Pursuant to Decision 18/CMA.1 on the MPGs for the Transparency Framework for Action and Support under Article 13 of the Paris Agreement, Armenia has identified the indicator/s to track progress towards the implementation and achievement of its NDC under Article 4. In accordance with paragraph 66 of Decision 18/CMA.1, net greenhouse gas (GHG) emissions and removals have been selected as the primary indicator to track progress in the implementation and achievement of Armenian NDC, with a target year of 2030.

As the NDC of Armenia encompasses adaptation actions and economic diversification plans that generate mitigation co-benefits, relevant information necessary to track progress in addressing the social and economic consequences of such policies and measures has been incorporated according to the Common Tabular Format (CTF) as shown in the table below.

Table 3-3. CTF Table 1 structured summary: description of selected indicators

Indicator(s) selected to track progress	Description
Net GHG emissions	The economy-wide annual total net GHG emissions and removals consistent with the second NDC in the country, taking into account the ITMOs consistent with Article 6 of the Paris Agreement

Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s)	Net GHG emissions 1990 (Reference year): 25,118.1 $ktCO_2eq$
Updates in accordance with any recalculation of the GHG inventory	Net GHG emissions 1990 (Reference year): 26,013.8 $ktCO_2eq$
Relation to NDC	The indicator is defined in the same unit and metric as the NDC target, and Armenian NDC sets an economy-wide net emission reduction target, making it the most appropriate indicator to measure and assess progress towards the 2030 mitigation goal

B. Methodologies and accounting approaches for tracking progress towards implementing and achieving the NDC

<u>BAU and target setting in the updated NDC</u>

Historical data used to set the 2030 target of Armenia under its Second NDC were originally drawn from the National GHGI Report of the Republic of Armenia for 1990–2017. These data were based on IPCC 2006 Guidelines for National Greenhouse Gas Inventories, and GWP values were taken from the IPCC Second Assessment Report (AR2). Subsequently, the data have been recalculated in line with both the IPCC 2006 Guidelines and their 2019 Refinement, as well as using GWP values from the IPCC Fifth Assessment Report (AR5).

In the NDC 2.0 of Armenia, the mitigation potential and targets were developed based on the country's national and sectoral strategies, which collectively guide low-carbon development across key sectors. These include:

- Strategic Programme of Perspective Development (2014–2025): Promotes the expansion of renewable energy and the enhancement of energy efficiency
- Government Programme (2019): Prioritizes nuclear and renewable energy development, energy efficiency, green economy transition and climate resilience
- EU–Armenia Comprehensive and Enhanced Partnership Road map: Incorporates 12 actions on climate change and 34 actions on energy efficiency, renewable energy and energy security
- Energy Sector Development Strategy (to 2040): Strengthens energy security through nuclear energy, modern gas-fired plants and renewable energy – particularly solar– with a goal to install 1,000 MW of solar capacity by 2030, reaching at least 15 per cent of total power generation
- National Energy Efficiency and Renewable Energy Programme (2021–2030): Establishes new sectoral targets to accelerate clean energy transition
- Transport Strategy: Aims to improve public transport efficiency, promote renewable energy use and encourage the adoption of EVs
- Agriculture Strategy (2020–2030): Focuses on sustainable agriculture through improved fertilizer management, efficient irrigation and the promotion of digital and organic farming
- Solid Waste Management Strategy (2017–2036): Seeks to modernize and improve the national waste management system

- National Forestry Programme (2021): Targets an increase in forest cover to 12.9 per cent of Armenian territory by 2030

BAU scenario and the mitigation scenario of the BTR assessment

For the BTR assessment, the BAU scenario was updated using the GWP values from the IPCC AR5. This revision was aligned with the emissions levels outlined in NDC 2.0 and reflected ongoing updates under the preparation of NDC 3.0. Accordingly, for the assessment, both the 1990 emissions baseline established in NDC 2.0 and the BAU scenario developed under the updated NDC were taken into account to track progress in national emissions reduction efforts.

The assessment of actual GHG emission reduction progress for each sectoral mitigation measure in 2021 and 2022 was carried out for actions that demonstrated measurable progress during the reporting period. This assessment was based on the Implementation Plan for the NDCs of the Republic of Armenia for 2021–2030 under the Paris Agreement, the "Report on Methodological Approaches and Data-Collection Instructions for Reporting the Information Necessary to Track Progress Made in Implementing and Achieving NDCs" (2024), and inputs from national and international experts.

The "Report on Methodological Approaches and Data-Collection Instructions for Reporting the Information Necessary to Track Progress Made in Implementing and Achieving NDCs" was developed in 2024 under the UNDP-GEF Project / 00110252, Building the National Transparency Framework of Armenia under the Paris Agreement. The report defines the methodological approach and data requirements for assessing sector-specific Policies and Measures (PaMs) for Armenia, based on the reporting requirements outlined in the MPGs. Additionally, it provides guidance on developing projections, addressing data gaps, and completing CTF tables 1–4 in accordance with 2021 NDC of Armenia.

Mitigation assessments for the identified actions were conducted using ClimateSI's Smart ETF tool, which incorporates the latest versions of UNFCCC CDM methodologies, methodologies consistent with IPCC guidelines, Asian Development Bank guidelines for estimating project-level GHG emissions and more. The methodologies used for each action are summarized in Table 10. All assessments applied the GWP values from IPCC AR5 and utilized activity data and EFs applicable to the 2021–2022 period, or the most recent available data for that time frame.

Further details on the methodologies and accounting approaches, consistent with the Paris Agreement's accounting guidance, are presented in CTF Table 3 ("Methodologies and Accounting Approaches"), which is submitted electronically as part of this BTR.

C. Progress towards the updated NDC of Armenia

In 2022, net GHG emissions excluding LULUCF were approximately 13,314.1 $ktCO_2eq$ representing a 50.2 per cent reduction compared to the reference year 1990 and an 11.3 per cent increase relative to the year 2017. When accounting for LULUCF activities (approximately –381.9 $ktCO_2eq$), total net GHG emissions amounted to 12,932.2 $ktCO_2eq$ in 2022. This corresponds to a 50.3 per cent decrease from 1990 levels and a 12 per cent increase compared to 2017.

Considering the 1990 reference year, Armenia is making progress towards its 2030 emission reduction target outlined in its Second NDC.

Table 10 lists a summary of progress towards implementing and achieving the NDC.

Table 3-4. Summary of progress towards implementing and achieving the NDC

Indicator: Total net GHG emissions, $ktCO_2eq$		
Target level: 40 per cent reduction from 1990 emission levels		
Reference year: 1990		
Implementation period: 2021 - 2030		
Target year: 2030		
	Year	Net GHG emissions ($ktCO_2eq$)
	1990	26,013.8
	2021	12,663.8
	2022	12,932.2
	2030	N/A
Progress made towards the NDC: The most recent level (2022) of the indicator is 50.3 per cent below the reference year level		

Note 1: N/A Not applicable

Note 2: More detailed information is provided in CTF Table 4 ("Structured Summary: Tracking Progress Made in Implementing and Achieving the NDC under Article 4 of the Paris Agreement").

3.5 Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving a nationally determined contribution under Article 4 of the Paris Agreement

This section provides an overview of key mitigation PaMs of Armenia, drawing on information from the "NDC 2021–2030 of the Republic of Armenia" (2021), the "Implementation Plan for the Nationally Determined Contributions of the Republic of Armenia for 2021–2030 under the Paris Agreement", the "Report on Methodological Approaches and Data-Collection Instructions for Reporting the Information Necessary to Track Progress Made in Implementing and Achieving NDCs" (2024), as well as inputs from national and international experts.

An overview of the key programmes and strategies included in the NDC together with information on their implementation progress and monitoring outcomes is presented in the following table.

Table 3-5. Key programmes and strategies in Armenia

Programmes, strategy, document, etc.	Assessment outcomes
Government Programme (2021-2026)	The assessment highlights structured approaches of Armenia on climate action through renewable energy expansion, infrastructure modernization, Waste Management and climate finance. • Key outcomes include progress in green taxonomy development, a Green and Sustainable Economic Development Strategy, the enactment of a Climate Law to align policies with global commitments and Long-term Low Greenhouse Gas Emission Development Strategy of the Republic of Armenia (LT-LEDS). • Completed measures include the deployment of solar energy technologies, modernization of hydrometeorological monitoring system, and the introduction of energy efficiency incentives. Ongoing initiatives focus on electric mobility, expansion of renewable energy, the adoption of the NDC 2026-2035, and forest and water resource management strategies. • Armenian electric mobility initiatives are designed to accelerate the nationwide adoption of electric vehicles (EVs) and the development of supporting charging infrastructure. These efforts are reinforced through strategic procurement, targeted government actions, and fiscal incentives, including VAT and Customs duty exemptions for EVs. By 2030, Armenia aims to deploy 50,000 EVs, install 300 ultrafast charging stations, establish EV service and assembly facilities, promote local manufacturing of chargers, transition 50 per cent of public-sector vehicle fleets to electric models, and develop at least one dedicated battery recycling facility. • Many measures remain in development, requiring accelerated implementation, financing mechanisms, and strengthened governance to meet climate commitments of Armenia. One such commitment is the Global Methane Pledge (2021), under which Armenia, along with 155 other countries, has agreed to collectively reduce human-caused methane emissions by at least 30 per cent below 2020 levels by 2030.
NDC draft Implementation Plan Package	Armenia has made strides in expanding renewable energy use, energy efficiency, climate finance and sustainable transportation, though key transformations remain ongoing. • The retrofit of 221 buildings has benefited 280,000 people, cutting 1.4 million tons of GHG emissions. The Yerevan Energy Efficiency Project Phase I involved the renovation and seismic strengthening of 50 kindergartens across Yerevan, resulting in total annual energy savings of 5,394 MWh. The Yerevan Energy Efficiency Phase II project will rehabilitate 38 municipal buildings, saving 19.65 GWh/year and reducing emissions by 3.9 $ktCO_2eq$/year. • Completed urban projects include 9,700+ LED streetlights in Yerevan and Gyumri and 87 Compressed Natural Gas (CNG) buses improving public transport. • Climate finance instruments such as the Debt-for-Climate Swap are currently under development, complemented by ongoing assessments of carbon pricing options and methane reduction planning. Additionally, the Climate Budget Tagging tool has been applied in Armenia.

	• HFC phase-down efforts continue, with Armenia targeting a 10 per cent reduction by 2029 under the Kigali Amendment. • Challenges persist in infrastructure modernization, carbon pricing and financing, requiring accelerated action and policy refinement.
Strategic Programme for the Development of the Energy sector until 2040	Armenia has made significant progress in modernizing its Energy sector, with 21 completed actions, 20 ongoing measures and 17 planned initiatives. • The country is actively pursuing nuclear energy longevity, renewable energy expansion, electricity market reforms and infrastructure modernization to enhance energy security and sustainability. The Armenian Nuclear Power Plant (ANPP) has undergone life-extension efforts until 2026, with feasibility studies exploring safe operation until 2036. • Renewable energy deployment in Armenia is progressing steadily, with the 55 MW Masrik-1 solar power plant completed and the Ayg-1 and Ayg-2 projects currently in pre-construction. Additional development includes the construction of solar PV stations of up to 5 MW capacity, totalling 255 MW. The sector is further supported by a net-metering policy applicable to all renewable energy sources (including solar PV systems up to 150 kW) and the use of autonomous power generators of up to 500 kW. However, some PV projects were cancelled in 2023 due to financial and regulatory constraints. • Grid modernization efforts include 85 per cent completion of the Armenia-Islamic Republic of Iran 400 kV line and the ongoing Armenia-Georgia transmission network upgrade, which will strengthen regional electricity trade. • Energy efficiency and regulatory reforms are being implemented, with EU-aligned energy efficiency standards, modernized electricity metering and the transition to a competitive wholesale electricity market. • Despite notable progress, financial limitations, shifting public demand, and infrastructure gaps remain key challenges requiring policy adjustments and investment strategies to accelerate Armenian energy transition and market integration.
Developing Clean and Energy-Efficient Transport Sector in Armenia	Nine measures were identified in electro-mobility, public transport, charging infrastructure, energy savings and policy improvements. • Two are completed, including tax and Customs incentives and parking fee exemptions for EVs in Yerevan. • Six measures are currently ongoing, focusing on promoting EVs, charging infrastructure, public transport efficiency, awareness and policy integration. • Broader adoption of electric mobility and energy-efficient transport solutions is still developing.
Strategy of the Main Directions Ensuring Economic Development in the Agricultural Sector of the Republic of	A total of 100 measures were identified across land consolidation, improved irrigation, credit and risk management, food safety, market development, institutional capacity-building, rural development and digital agriculture. • 9 measures have been completed. Armenia has made progress in agricultural modernization, with key achievements in land management, food safety, veterinary services, market development and digital agriculture. Completed measures include the Hazard Analysis and Critical Control Point (HACCP) standard, a national digital agriculture strategy, a geographical map of the area, and a

Armenia for 2020-2030	livestock registry, alongside the legal framework for agricultural equipment leasing. • Ongoing efforts focus on land consolidation, irrigation optimization, agricultural insurance and precision farming technologies. • Many initiatives, particularly in financing, infrastructure and digitalization, remain in progress or at the planning stage.
2017-2036 Municipal Solid Waste Management System Development Strategy[33]	Waste management reforms of Armenia include 13 measures focused on legislation, policy and infrastructure. • Eight measures have been completed, including the Waste Law, amendments to Government Decision No. 258-N (2016), and regional waste management plans for Lori, Shirak and Syunik. • A legal analysis and regulations on waste site design are also finalized. • One measure is ongoing, with two regional landfill projects in progress. • Four are planned, targeting 95 per cent waste collection, 20 per cent waste sorting, and landfill closures, though lack of monitoring data limits progress assessment. While major policy reforms are in place, infrastructure development is still under way. • The RA Government's Decree No. 464-L of 01.04.2021 approved the strategy of the waste collection system and the programs of measures ensuring the implementation of the strategy.
Sustainable Forest Management	• Armenia's sustainable forest management efforts are focused on forest conservation, protection, afforestation, forest restoration, forest utilization, national forest inventory, biodiversity conservation, and monitoring. Key achievements include planting 1,500 hectares of forest seedlings, establishing nurseries in Hrazdan and Sisian, and shifting to biological pest control over 4,120 hectares in 2023. • Ongoing measures include the national forest inventory (completion by 2028), wildfire prevention and afforestation expansion. • Planned actions target forest restoration in Lake Sevan Basin, reducing firewood reliance by 30 per cent, and expanding forest cover. • Due to lack of substantial interventions in the forest sector, many measures are either postponed or cancelled.

Source: Draft Report 1: Assessment of Armenia's NDC 2021-2030 implementation by CIVITTA AM and Cibola Partners

Based on the progress achieved during 2021 and 2022 in the implementation of national policies, programmes, and strategies and contributions from national and international actors, the following key MAs demonstrating measurable progress have been identified for inclusion in the BTR assessment.

[33] Declared invalid by the decision of the Government of the Republic of Armenia dated 21.11.2021 N1728-N

A. Energy sector mitigation measures

As the leading contributor to GHG emissions in the national inventory, the Energy sector holds the highest potential for emission mitigation. Several MAs have been implemented in this sector, with notable progress observed during the assessment period, as outlined below.

i. Construction of solar PV stations with up to 5 MW capacity (total 315 MW)

This measure, launched in 2018, aimed to install a total of 315 MW of solar PV power plants with an installed capacity of up to 5 MW each by 2030. Significant progress was made towards this goal. As of October 1, 2020, licences for the production of electricity had been granted to 49 solar PV plants with a combined installed capacity of 200 MW. By December 1, 2020, two solar PV plants with a total capacity of 10 MW had already been connected to the national grid, marking an important step in the expansion of renewable energy capacity.

The Solar Energy sector of Armenia has experienced remarkable growth across conventional solar PV plants from 2020 to 2023. Conventional solar power plants (excluding autonomous systems) grew from 15 facilities with 16.8 MW capacity in 2020 to 61 facilities with 205.4 MW capacity in 2023, generating 382.3 million kWh of electricity.[34]

ii. Net-metering policy for all RE (solar PV up to 150 kW)

The Republic of Armenia offers a net-metering scheme for distributed (self-consumption) renewable energy producers. Under the net metering scheme, the electricity produced in excess of self-consumption can be exported to the grid, and additional electricity exported to the grid can be used to offset future electricity consumption. This net-metering regime is designed to support the uptake of distributed renewable generation, encourage self-consumption and enable households and businesses to obtain value from excess generation. It also complements broader Armenian objectives of increasing renewable energy capacity, improving energy security and reducing emissions. Solar PV systems up to 150 kW (and in early transitional period up to 500 kW for legal entities) qualify for the simplified net-metering scheme without needing full licensing. The host-consumer is thereby treated as both consumer and producer (autonomous producer) under the legal framework of Armenia. [35]

Autonomous solar PV plants, which operate under contract agreements, expanded dramatically from 4,114 units with 77 MW capacity in 2020 to 17,112 units with 268 MW capacity by 2023, supplying 186.4 GWh of net electricity to the grid[36].

- *Social and economic consequences of the measure*

In Armenia, 96 per cent of women spend 5–6 hours daily on household management and family care, while only 53 per cent of men engage in such activities, averaging around 2 hours per day (NSS, 2009).[37] Given this disparity, women should be considered primary beneficiaries of clean energy initiatives, such as the net-metering policy. Access to clean and affordable electricity, particularly from solar energy, enables women to use

[34] Public services regulatory commission reports
[35] https://icbss.org/wp-content/uploads/2020/10/2_SARGSYAN-Vahan.pdf
[36] Public services regulatory commission reports
[37] Time Use Survey covering 512 households was conducted in 2008 by Armstat with support of the Statistics Sweden (SCB) and Swedish International Development Cooperation Agency. Microsoft Word - Time_Use_Eng_Fin.doc

household appliances more efficiently, reducing both time and financial burdens. This, in turn, creates opportunities for women to participate in income-generating activities and enhance their economic empowerment.

In 2023-2025, the Armenia Renewable Resources and Energy Efficiency (R2E2) Fund implemented the "Energy Efficiency and Renewable Energy measures and demonstration pilots with high impact on a large proportion of the local population" project, which is intended for the socially disadvantaged, low-income, vulnerable, rural or small urban, forest-adjacent and energy-poor settlements of five regions of Armenia. Priority was given to public infrastructures with special importance for women and youth like kindergartens, health stations, cultural and sports centres, among others.[38]

iii. Construction of small hydropower plants, to achieve total installed capacity of 430 MW

The small hydropower plant development programme of Armenia aims to create favourable conditions for small hydropower plants (SHPP) expansion through collaborative financing involving private investors, with loans EBRD, and KfW Bank (via the "German-Armenian Fund" RE Programme) channelled through Armenian commercial banks as of April 1, 2020, total SHPP capacity reached 374.4 MW, with an additional 60 MW (203.4 GWh annual generation) under construction. By the end of 2022, the total capacity of SHPPs had reached 389.2 MW, ensuring 253 $ktCO_{2eq}$ annual emission reduction, contributing significantly to the renewable energy transition of Armenia and climate mitigation goals.

iv. Government-supported energy efficiency programme of buildings under state subvention programme under policy priority: "Improving Energy Performance of Buildings"

In Armenia, a number of government-supported energy efficiency initiatives have been implemented within the buildings sector to reduce energy consumption and associated GHG emissions. Key MAs include the "De-risking and Scaling up Investment in Energy-Efficient Building Retrofits in Armenia" programme, the "Yerevan Energy Efficiency in Public Buildings" project, and various municipal investments targeting energy-efficient repair works and lighting upgrades in public buildings.

Among these initiatives, the "De-risking and Scaling up Investment in Energy-Efficient Building Retrofits in Armenia" project has demonstrated notable progress in recent years. Implemented with the support of the MoE, the Ministry of Territorial Administration and Infrastructure, the Yerevan Municipality, UNDP, the GCF, and the European Investment Bank (EIB), the project aims to scale up investments in energy-efficient building retrofits, reduce the investment risk profile to attract private sector participation, and alleviate fuel poverty.

To date (end of 2024), the project has successfully retrofitted 157 multi-apartment buildings (MABs) and 70 public buildings, including 40 kindergartens and schools. In 2023 alone, 92 buildings were retrofitted, directly benefiting more than 230,000 people across the country. Among the project's beneficiaries, almost 147,000 or 64 per cent, were women and girls.

During the winter months, heating expenses constitute the largest portion of household (HH) expenditures in Armenia. To reduce these costs, many HHs are implementing EE

[38] R2E2 - Armenia Renewable Resources and Energy Efficiency Fund

measures in their apartments, such as installing heat-insulated doors and windows, LED lighting, wall insulation using mineral wool or foam materials, and upgrading to more efficient heating systems. However, such measures often require upfront investments that can be challenging for vulnerable HHs, particularly FHHs. While FHHs tend to be more energy-conscious, they often rely on non-investment measures, such as partially heating their homes or limiting heating hours, resulting in lower indoor temperatures. Thus, 41 per cent of FHHs (versus 13 per cent of MHHs) heat either only third of the apartment space or only 2-3 hours per day, and as a result, 56 per cent of FHHs, compared to 42 per cent of male-headed HHs fail to maintain the minimum standard temperature of 18°C.[39]

v. EIB Yerevan energy efficiency project

The Yerevan Energy Efficiency Programme has been implemented since 2018 through a partnership between the EIB, the Eastern Europe Energy Efficiency and Environment Partnership (E5P), the Yerevan Municipality, the GCF, and the UNDP under the "De-risking and Scaling up Investment in Energy-Efficient Building Retrofits" project.

The programme aims to support the Municipality of Yerevan in implementing a large-scale rehabilitation initiative focused on enhancing energy efficiency, integrating renewable energy measures and improving the safety and comfort of public buildings.

Implementation is divided into two phases:

- Phase One (2018–2025): Focuses on the reconstruction and EE retrofitting of kindergartens in Yerevan, ensuring seismic safety, energy efficiency and improved indoor comfort.
- Phase Two (2024–2028): Expands the programme's scope to include additional kindergartens and healthcare institutions, emphasizing improved public service quality and a greener, more resilient urban environment. (EU Neighbourseast, 2025)

In total, approximately 147 public buildings and kindergartens, will benefit from energy efficiency and seismic strengthening measures. Of these, about 48 kindergartens will undergo comprehensive EE retrofits including full building envelope refurbishment, while the remaining 99 buildings will implement targeted energy efficiency measures and on-site renewable energy solutions.

vi. State support for energy-efficient retrofitting of multi-apartment buildings

Habitat for Humanity Armenia (HFHA) has developed a financing model that provides loans to condominiums for implementing energy efficiency (EE) retrofits in MABs. The initiative aims to achieve annual energy savings of approximately 5,067 MWh, with implementation beginning in 2019.

vii. Modernization of distribution networks by "Electric Networks of Armenia"

The Government of Armenia privatized the national electric distribution networks in 2002, transferring ownership to the Electric Networks of Armenia CJSC (ENA). In 2017, the Asian Development Bank (ADB) Board of Directors approved an $80 million equivalent non-sovereign loan to ENA as part of a broader initiative to upgrade, rehabilitate, and modernize Armenia's electric distribution network. The project aimed to enhance electricity distribution nationwide by 2021, using 2016 as the baseline year.

[39] MABs' Survey in Gyumri, Stepanavan, Dilijan2023_Eng_Digital.pdf - Google Drive

According to the project's design and monitoring framework, distribution losses were expected to decrease from 9.7 per cent in 2016 to 8.0 per cent, while annual avoided CO_2 emissions were projected to increase from zero in 2016 to 11,400 tons of CO_2eq. To achieve these targets, the framework outlined several key outputs for the rehabilitation of the distribution network, including:

(i) upgrading 400 kilometres of distribution lines to 10/0.4 kV overhead lines,

(ii) upgrading 900 10/0.4 kV transformers,

(iii) upgrading 550 substations, and

(iv) installing 250,000 automatic metering devices for end consumers.

With the implementation of this project, distribution losses in Armenia decreased to approximately 6.7 per cent in 2021 and 2022, surpassing the expected target of 8.0 per cent.

viii. Public transport fleet renewal /Yerevan bus project

The Yerevan Bus Project is a key component of the city's broader public transport reform programme, designed to modernize the urban transport system through the renewal of the bus fleet and the restructuring of the bus network.

During the first phase of implementation, 100 new low-floor CNG buses (with more passenger capacity) were introduced across five major bus routes. This modernization effort resulted in the termination of 17 outdated routes, including five bus and 12 minibus routes and the removal of 50 old buses and 139 minibuses from operation. Under the project scenario, the annual mileage of the new bus fleet is 6,098,271 km, whereas under the baseline scenario, representing the routes operated by the replaced buses and minibuses the total mileage was 20,267,858 km, including 5,625,541 km for buses and 14,642,317 km for minibuses[40].

The newly procured buses comply with EURO V or higher emission standards and meet advanced noise, safety and comfort requirements, marking a significant step towards cleaner, safer and more energy-efficient urban transport in Yerevan. The project is supported by the EBRD and implemented by the Yerevan Municipality.

ix. Yerevan street lighting

The Yerevan Street Lighting Project represents a comprehensive modernization initiative focused on upgrading the lighting infrastructure across 28 streets in central Yerevan. The project involved the complete refurbishment of street lighting systems in several districts and major avenues throughout the city, replacing outdated high-pressure sodium lamps with energy-efficient LED luminaires.

By 2022, the project had delivered substantial improvements across the city's lighting infrastructure:

Coverage and Scale:

- 230 kilometers of streets benefited from enhanced illumination
- 9,836 LED luminaires were installed throughout the project area

[40] ATMS Solutions Ltd., 2020

- 28 central streets underwent complete lighting system upgrades

Energy Efficiency:

- Achieved approximately 74 per cent improvement in energy efficiency
- Reduced total electricity consumption by 7,792 MWh annually

The transition from traditional high-pressure sodium lamps to modern LED technology has not only improved visibility and safety on Yerevan's streets but has also significantly reduced the city's energy footprint and operational cost.

x. Gyumri city street lighting

The Gyumri Street Lighting Project, launched in 2020, focuses on the modernization of the public lighting system in the city of Gyumri. The project involves the replacement of existing high-pressure mercury-based luminaires with modern, energy-efficient LED luminaires, alongside upgrading electrical supply cabling, replacing lighting poles and installing safety equipment to protect and extend the operational lifetime of the new lighting system.

The project is expected to achieve up to 70 per cent energy savings in the city's public lighting system, equivalent to approximately 1,698 MWh of electricity saved per year. Implemented as a component of the Gyumri Urban Roads Project, it is co-financed by the EBRD and the E5P.

- *Social and Economic Impacts of the Street Lighting Projects*

Beyond its environmental benefits, the project generates important social and economic co-benefits. The initiative improves road safety, traffic management, and public security through enhanced lighting, while creating employment opportunities during both the construction and operational phases. Job creation in one of the poorest regions of Armenia contributes significantly to local economic development. The project incorporates a strong gender component, ensuring gender-sensitive public participation and consultation processes. Improved lighting and safety conditions particularly enhance the mobility and security of women, while the overall enhancement of street lighting conditions improves public safety and urban liveability for all residents.

xi. State subsidies to communities on upgrading street lighting (in other cities)

The Armenian government has introduced state subsidy programmes to support local communities in upgrading their street lighting systems with energy-efficient LED technology. These subsidies are part of broader regional infrastructure investment initiatives aimed at improving local economic and environmental performance. In 2022, approximately 1 billion AMD was allocated to regional administrations to finance community capital projects, including public lighting upgrades.

The programme operates on a co-financing model, covering a portion of the capital costs for municipal projects proposed by local authorities and approved by the Government of Armenia. Eligible measures include street lighting modernization and the installation of renewable energy systems, such as solar photovoltaic (PV) plants.

The main objective is to prioritize capital investments that enhance economic infrastructure, promote local development and advance EE and RE deployment in communities.

Progress indicators include:

- Number of co-financed projects implemented; and
- Energy and cost savings achieved through these projects.

xii. EV for private transport (private vehicles, cars, buses, etc., tax exemption)

The "Fuel Switching to Electricity in Transport" Project, coordinated by the Government of Armenia and UNEP, aims to promote the adoption and use of EVs by creating favourable policy and market conditions, including the introduction of a preferential tax regime for EV imports. The overarching objective of the initiative is to increase the share of EVs within the national transport sector, thereby reducing dependence on fossil fuels and contributing to emissions reduction targets.

Since the introduction of VAT and Customs duty exemptions for EVs in 2020, expand the use of charging infrastructure across the country, installing 300 ultrafast chargers, establishing service and assembly facilities, promoting local manufacturing of chargers, transitioning 50 per cent of public fleets to EVs, and creating at least one battery recycling facility, the adoption of electric mobility has accelerated significantly. In 2018, only 12 EVs were registered in Armenia. By 2019, this number had risen to 145 electric cars and 523 electric motorcycles and mopeds. The growth trend continued, with 2,663 electric cars and 2,823 electric bikes and mopeds imported in 2022. According to the Interior Ministry, by the end of August 2025, the number of EVs had soared past 22,650 – an increase of more than 85-fold compared to 2020.[41]

These figures demonstrate the rapid progress of Armenia towards transport electrification, driven by government incentives and increased consumer awareness of the economic and environmental benefits of electric mobility.

B. AFOLU sector mitigation measures

i. Purchase of highly productive breeding cattle through subsidized/backed loans

Livestock breeding is a major component of Armenian Agriculture, contributing over 50 per cent of the gross agricultural output, with cattle breeding accounting for more than AMD 280 billion in 2018. However, productivity remains low, with average milk yields around 2,000 kg per cow and pre-slaughter weights not exceeding 320 kg, mainly due to herd fragmentation and limited pedigree selection. Despite the potential to double yields and improve meat production using modern technologies and high-yield breeds, the sector faces efficiency challenges. To meet growing domestic and export demand for quality milk and meat, Armenia aims to intensify cattle breeding by improving herd quality and management practices. This includes promoting the import of pedigree large-horned cattle (e.g., Schwyz, Holstein) and developing pedigree farms in line with Government Decision No. 53 (2017), thereby enhancing genetic potential, productivity, and the effective use of pastures and hayfields (Decision of the Government on approving the 2019-2024 Programme for cattle breeding development in the RA).

The project focused on importing and breeding animals with high fodder digestibility and crossbreeding them with local cows to improve the Caucasian Grey breed and gradually reduce the number of local breeds. Through a dedicated loan programme, it became possible to import approximately 3,000 breeding animals annually. By 2020, around

[41] Armenia sees EV boom as state subsidies cut prices by a third - CIVILNET

24,000 breeding animals had been imported, marking steady progress towards herd improvement. The programme aimed to increase the number of new breeds to 180,000 by 2030, supporting enhanced livestock productivity and more efficient resource use in the agricultural sector.

ii. Forest cover increased by 43,945 ha in addition to 6,055 to achieve 50,000 ha

In Armenia, the forest sector is officially included as a main sector for the country's contribution to mitigation. With that, the country has set several critical targets in afforestation including, achieving 12.9 per cent of forest cover by 2030. The target for 2030 includes increasing the forest cover to 12.9 per cent by 2030, corresponding to an increase of 50,000 ha of forests, which is also a contribution to the Bonn Challenge. In 2023, under the Long-term Low Greenhouse Gas Emission Development Strategy of the Republic of Armenia (until 2050), Armenia aims to increase forest coverage and the carbon absorption capacity to 450,000 hectares by 2050, WAM expected to add over 90,000 hectares by the same year.

C. Waste sector mitigation measures

i. Nubarashen landfill gas capture and power generation CDM project

The Nubarashen Landfill Gas Capture and Power Generation Project, launched in 2007 with a 16-year project duration, aimed to reduce CH_4 emissions through gas capture and combustion at the Nubarashen landfill. The first crediting period ran from 2007 to 2014, followed by a second seven-year period starting in 2014 (UNFCCC CDM, 2014 to 2021).

A summary of mitigation policies, measures, actions and plans which aid the achievement of the NDC are presented in Table 12 below.

Table 3-6. Mitigation policies and measures, actions and plans

#	IPCC Sectors	Projects	Measure/ Additional measure	Implementation status as of 2021 and 2022	Methodology	Sector(s) affected	Gases affected	Start year of implementat...	Estimates of GHG emission reductions/ (removals by sink) ($ktCO_2eq$)	
									2021 achieved	2022 achieved
1	Energy	Construction of SHPP, to achieve total install capacity of 430 MW	Measure	Implemented	AMS-I.D.: Grid connected renewable electricity generation --- Version 18.0	Energy	CO_2	2017	306.5	308.2
2		Construction of solar PV stations with up to 5 MW capacity (total 315 MW)	Measure	Implemented	AMS-I.D.: Grid connected renewable electricity generation --- Version 18.0	Energy	CO_2	2018	63.4	141.0
3		Modernization of distribution networks by ENA company	Measure	Implemented	ADB: EE Projects (Improvement of Existing Electricity Transmission and Distribution System)	Energy	CO_2	2016	88.2	99.0
4		EV for private transport (individuals, cars, buses, etc, tax exemption)	Measure	Implemented	AMS-III.C.: Emission reductions by electric and hybrid vehicles --- Version 16.0	Energy	CO_2	2019	5.0	8.8
5		Government-supported energy efficiency programme of buildings under state subvention programme under policy priority: "Improving Energy Performance of Buildings"	Measure	Implemented	AMS-II.E.: EE and fuel switching measures for buildings --- Version 12.0	Energy	CO_2	2018	4.6	7.0

#	IPCC Sectors	Projects	Measure/ Additional measure	Implementation status as of 2021 and 2022	Methodology	Sector(s) affected	Gases affected	Start year of implementat...	Estimates of GHG emission reductions/ (removals by sink) ($ktCO_2eq$)	
									2021 achieved	2022 achieved
6		Public transport fleet renewal /Yerevan Bus project	Measure	Implemented	AMS-III.BC.: Emission reductions through improved efficiency of vehicle fleets --- Version 3.0	Energy	CO_2	2020	2.9	2.9
7		Yerevan street lighting	Measure	Implemented	AMS-II.L.: Demand-side activities for efficient outdoor and street lighting technologies --- Version 2.0	Energy	CO_2	2019	1.8	3.3
8		Gyumri city Street lighting	Measure	Implemented	AMS-II.L.: Demand-side activities for efficient outdoor and street lighting technologies --- Version 2.0	Energy	CO_2	2019	0.7	0.7
9		Net-metering policy for all RE (solar PV up to 150 kW)	Additional measures	Implemented	AMS-I.D.: Grid connected renewable electricity generation --- Version 18.0	Energy	CO_2	2020	NA	NA
10		State subsidies to communities on upgrading with LEDs (Street lighting in other cities)	Additional measure	Implemented	AMS-II.L.: Demand-side activities for efficient outdoor and street lighting technologies --- Version 2.1	Energy	CO_2	NA	NA	NA
11		State support for energy-efficient renovation of apartments and houses	Measure	Implemented	AMS-II.E: Energy efficiency and fuel switching measures for buildings --- Version 12.0	Energy	CO_2	NA	NA	NA

#	IPCC Sectors	Projects	Measure/ Additional measure	Implementation status as of 2021 and 2022	Methodology	Sector(s) affected	Gases affected	Start year of implementat	Estimates of GHG emission reductions/ (removals by sink) ($ktCO_2eq$)	
									2021 achieved	2022 achieved
12		EIB Yerevan energy efficiency project	Measure	Implemented	AMS-II.E: Energy efficiency and fuel switching measures for buildings --- Version 12.0	Energy	CO_2	NA	NA	NA
13	Agriculture	Purchase of highly productive breeding cattle through subsidized/backed loans	Additional measure	Implemented	IPCC 3A: Emissions from livestock and manure management	AFOLU	CH_4 and N_2O	2019	16.9	35.2
14	Land-Use, Land-Use Change and Forestry	Forest cover increased by 43,945 ha in addition to 6,055 to achieve 50,000 ha	Additional measure	Implemented	IPCC 3B – Emissions from Land	AFOLU	CO_2	2020	(3.0)	(6.2)
15	Waste	Nubarashen Landfill Gas Capture and Power Generation CDM project	Measure	Implemented	ACM0001: Flaring or use of landfill gas --- Version 19.0	Waste	CH_4	2007	0	3.6

3.6 Summary of greenhouse gas emissions and removals

Armenia submits its National GHGI Report as a stand-alone document titled "NID under the UNFCCC and Paris Agreement." A summary of the NID is presented in chapter 2 of this BTR. For a concise overview, please refer to chapter 2.

Information presented in a tabular format can be found in "CTF Table 6: Summary of GHG emissions and removals in accordance with the common reporting table 10 emission trends – summary".

For a more detailed assessment, please refer to the NID under the UNFCCC and Paris Agreement: "Greenhouse Gas Emissions in the Republic of Armenia, 1990–2022", published in 2025.

3.7 Projections of greenhouse gas emissions and removals, as applicable

BAU scenario and NDC target comparison

The updated NDC 2.0 of Armenia establishes a target of 40 per cent reduction in GHG emissions by 2030 relative to 1990 levels, which corresponds to approximately 15,500 $ktCO_2eq$.

However, under the BAU scenario which represents a baseline projection without additional climate mitigation interventions, GHG emissions of Armenia are projected to reach approximately 20,000 $ktCO_2eq$ by 2030, as illustrated in the figure below. This BAU trajectory, developed as a baseline reference through 2030, indicates a significant gap of approximately 4,500 $ktCO_2eq$ between projected emissions under current trends and the NDC target, highlighting the substantial mitigation efforts required to achieve climate commitments of Armenia.

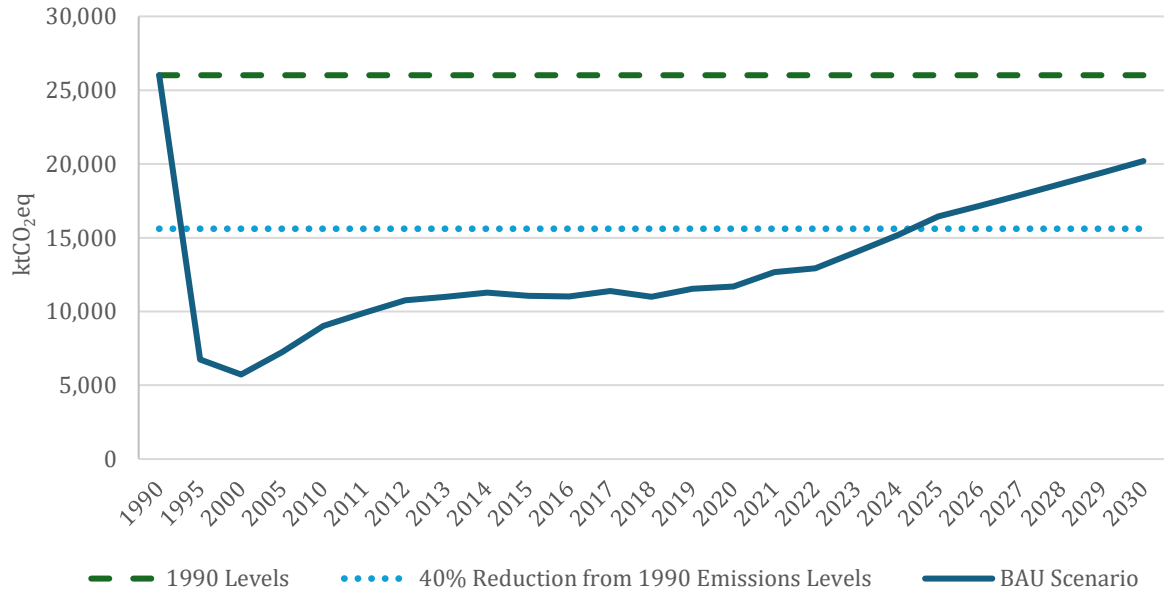

Figure 3-14. BAU scenario and GHG emission target levels

Sectoral breakdown of BAU the scenario of Armenia

The figure below illustrates the sectoral distribution of GHG emissions under the BAU scenario, providing insight into how national GHG emissions are allocated across different economic sectors. This sectoral analysis reveals that the Energy sector is the dominant contributor to the projected emissions of Armenia, accounting for the majority of the country's total GHG footprint under the BAU trajectory through 2030.

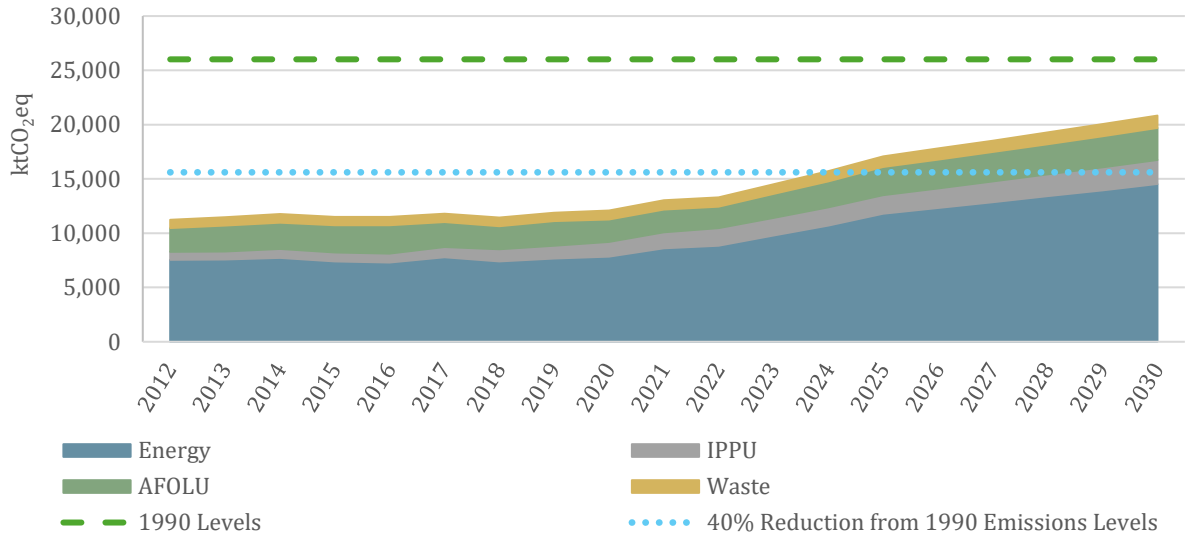

Figure 3-15. Sectoral BAU scenarios and target overall target level

Greenhouse gas emission trends and projections of Armenia

Armenia experienced a dramatic decline in total GHG emissions between 1990 and 2001. Following this significant decrease, emissions began to gradually increase through 2022.

To assess future emission pathways, three distinct scenarios have been defined:

a) Without Measures (WOM) Scenario: This scenario excludes all policies and measures (PAMs) that have been implemented, adopted or planned. It represents a BAU trajectory without any climate mitigation interventions.
b) WM Scenario: This scenario incorporates all PAMs included in the Revised NDC 2.0 of Armenia, reflecting the measures currently being implemented to achieve the country's NDC targets.
c) With Additional Measures (WAM) Scenario: This scenario goes beyond the current NDC commitments by incorporating additional PAMs that are planned for future implementation, representing a more ambitious mitigation pathway.

The projected emission trajectories under these three scenarios are illustrated in the figure below.

Total GHG emissions of Armenia are expected to achieve a 40 per cent reduction compared to 1990 baseline levels by 2030[42].

[42] NDC v2 Armenia

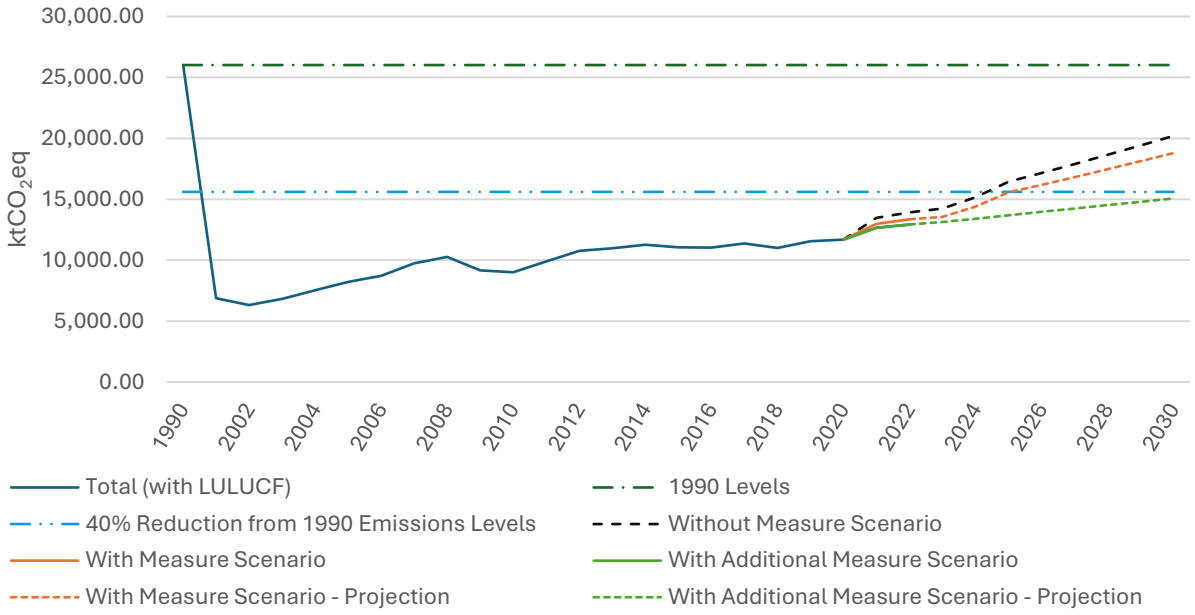

Figure 3-16. Total GHG emission and removal projections

Projections by sector

a) Energy sector greenhouse gas emission projections of Armenia

The Energy sector of Armenia has demonstrated an overall upward trend in GHG emissions through 2022, despite experiencing minor fluctuations during this period. The actual emissions data reveals a general pattern of increase as the sector expanded over time.

According to projections under the "WAM" scenario, the Energy sector's GHG emissions are expected to continue rising until 2030 as illustrated in the figure below. However, despite this continued growth trajectory, the projections indicate that by 2030, the Energy sector of Armenia will still achieve approximately 56 per cent lower emissions compared to the 1990 baseline levels. This substantial reduction relative to the historical reference year reflects the significant decline that occurred during the early transition period, which continues to position current and projected emission levels well below the 1990 benchmark.

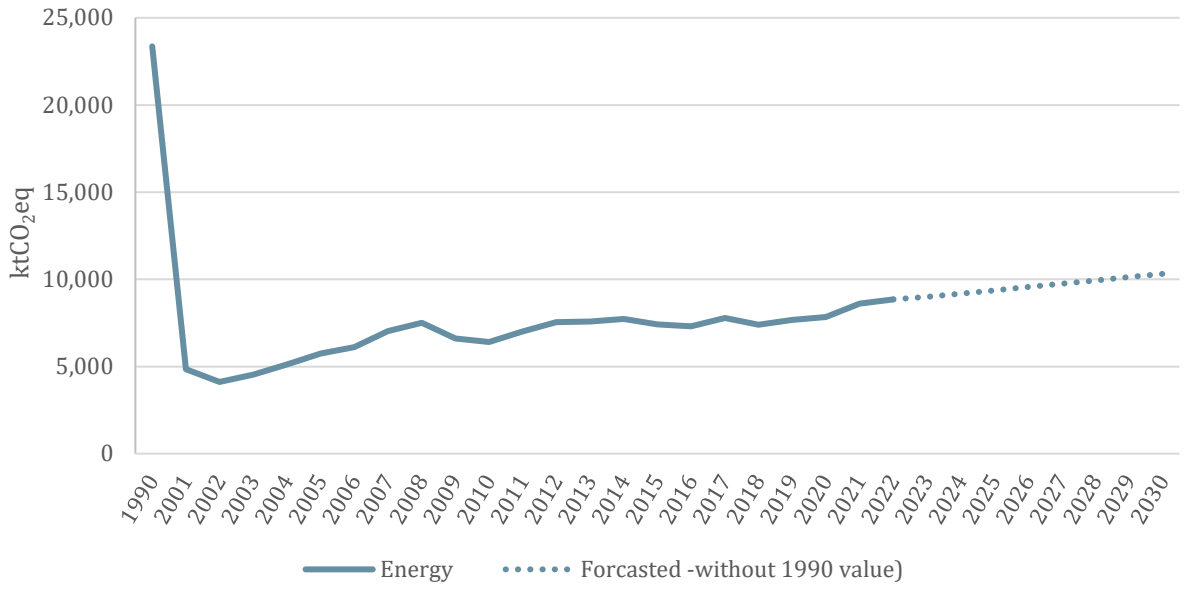

Figure 3-17. Greenhouse Gas Emission Projections for the Energy Sector of Armenia

b) IPPU sector of Armenia: GHG emission projections

GHG emission from the IPPU sector of Armenia experienced a dramatic decline by more than 50 per cent between 1990 and 2001, relative to 1990 baseline levels.

Following 2001, the IPPU sector demonstrated a consistent upward emissions trend through 2022.

Projections beyond 2022 indicate that IPPU sector emissions will continue to increase through 2030, albeit at a more moderate rate compared to the previous two decades. Overall, the sector is projected to reach approximately 197 per cent of its 1990 emission levels by 2030, which is nearly a threefold increase from the baseline year. This significant growth trajectory is illustrated in the figure below.

To address part of this challenge, particularly emissions from HFCs within the IPPU sector**,** Kigali Implementation Plan (KIP) of Armenia serves as the main tool for implementing the Kigali amendment to the Montreal Protocol, aiming to phase down HFC consumption in the country. The plan's overall objective is to reduce HFC consumption by 80 per cent between 2024 and 2045, thereby minimizing the contribution of Armenia to climate change from high GWP substances. Following the freeze in HFC consumption on January 1, 2024, the KIP establishes progressive reduction targets: 10 per cent by 2029, 30 per cent by 2035, 50 per cent by 2040, and 80 per cent by 2045. The implementation is divided into three stages spanning from July 2024 to December 2045. Stage I (July 2024 - December 2029) follows the successful cross-sectoral approach used in the HCFC phase-out management plan of Armenia, and focuses on four main strategies: training RAC technicians in proper servicing practices and recovery & recycling; strengthening national policies and regulations including import controls and safety standards; promoting low-GWP alternatives while preventing replacement with high GWP HFCs; and engaging stakeholders with particular emphasis on mainstreaming gender considerations throughout all KIP.[43]

[43] Kigali HFC Implementation Plan

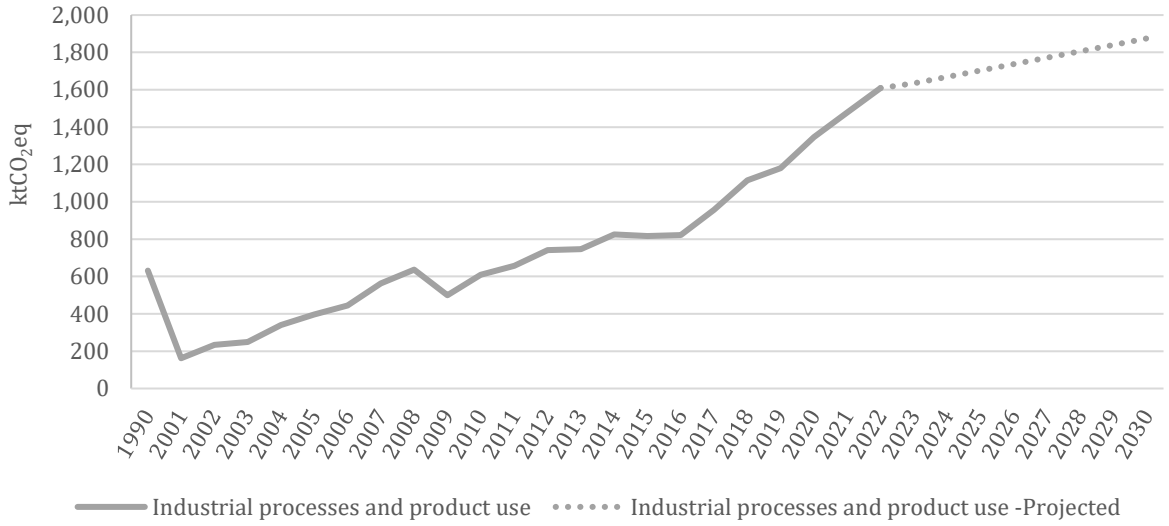

Figure 3-18. IPPU sector of Armenia: GHG emission projections

c) Agricultural sector of Armenia: GHG emission projections

Agricultural sector of Armenia exhibits a variable GHG emission pattern, characterized by notable fluctuations rather than a consistent linear trend. The sector's emission profile can be understood through several distinct phases.

In 1990, the agricultural sector recorded characteristically high GHG emissions, representing the baseline reference point. Following this peak, emissions declined through the early transition period.

Subsequently, emissions began a gradual recovery with a modest upward trend. This gradual increase continued until 2016, when emissions reached their peak level in the modern era. After 2016, the sector experienced a downward trajectory through 2022.

Based on projections under the "WAM" scenario from 2022 onward, the agricultural sector is expected to show a slight upward trend through 2030. However, this projected increase remains modest in scale. Overall, by 2030, Agricultural sector emissions of Armenia are anticipated to be approximately 5 per cent higher than 1990 baseline levels, indicating relative stability in this sector's emissions profile over the four-decade period.

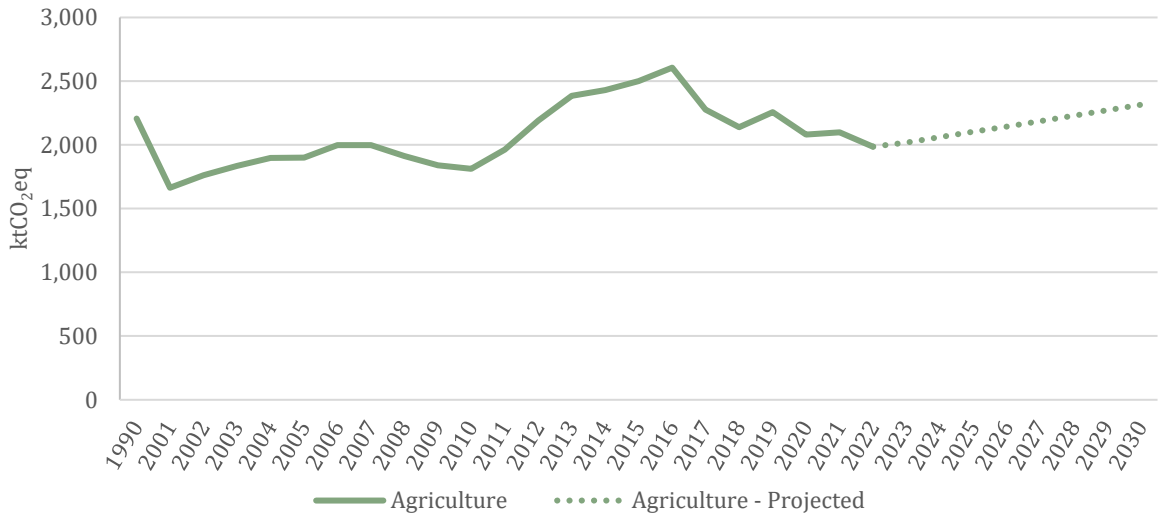

Figure 3-19. Agricultural sector of Armenia: GHG emission projections

d) Land-Use, Land-Use Change and Forestry (LULUCF) sector of Armenia: GHG removal projections

The LULUCF sector of Armenia has experienced a significant decline in its carbon sequestration capacity over the past three decades. In 1990, the sector demonstrated a high level of GHG removal, serving as a substantial carbon sink for the country.

However, this removal capacity decreased drastically between 1990 and 2001. This sharp decline has resulted from factors such as deforestation, land degradation, changes in forest management practices.

From 2001 through 2022, the overall downward trend persisted, with the LULUCF sector's GHG removal capability continuing to diminish, albeit at varying rates. This sustained decline indicates ongoing challenges in forest conservation, land management and ecosystem restoration efforts.

Looking ahead, projections under the "WAM" scenario suggest a modest reversal of this negative trend. The sector is expected to show a slow upward trajectory in carbon sequestration capacity through 2030. However, despite this projected improvement, the LULUCF sector's GHG removal levels in 2030 are anticipated to remain approximately 40 per cent lower than the 1990 baseline, indicating that significant ground has been lost in terms of natural carbon sink capacity over this four-decade period.

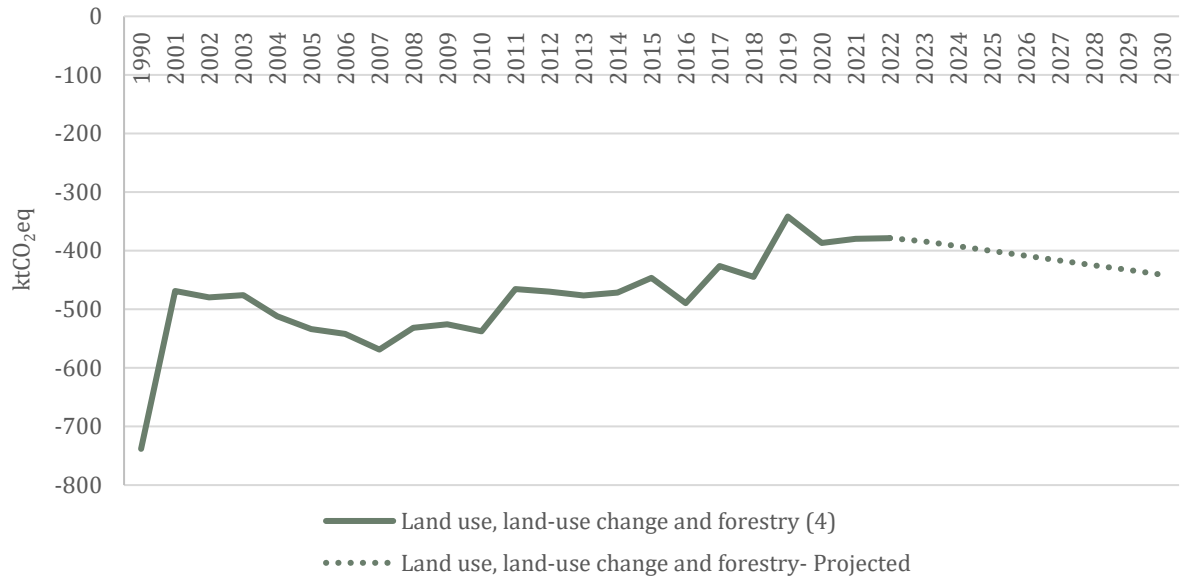

Figure 3-20. LULUCF sector of Armenia: GHG removal projections

e) Waste sector of Armenia: GHG emission projections

The Waste sector of Armenia has demonstrated a consistent upward trend in GHG emissions from 1990 through 2022, with emissions increasing steadily throughout this period. This gradual but persistent growth reflects expanding waste generation associated with urbanization, consumption patterns and potentially inadequate waste management infrastructure.

According to projections under the "WAM" scenario, the Waste sector's emissions are expected to continue their upward trajectory beyond 2022, with increases projected through 2030. Despite the implementation of additional mitigation measures, the sector will continue to be a growing source of GHG emissions.

By 2030, the Waste sector is projected to emit approximately 81 per cent more GHG compared to 1990 baseline levels.

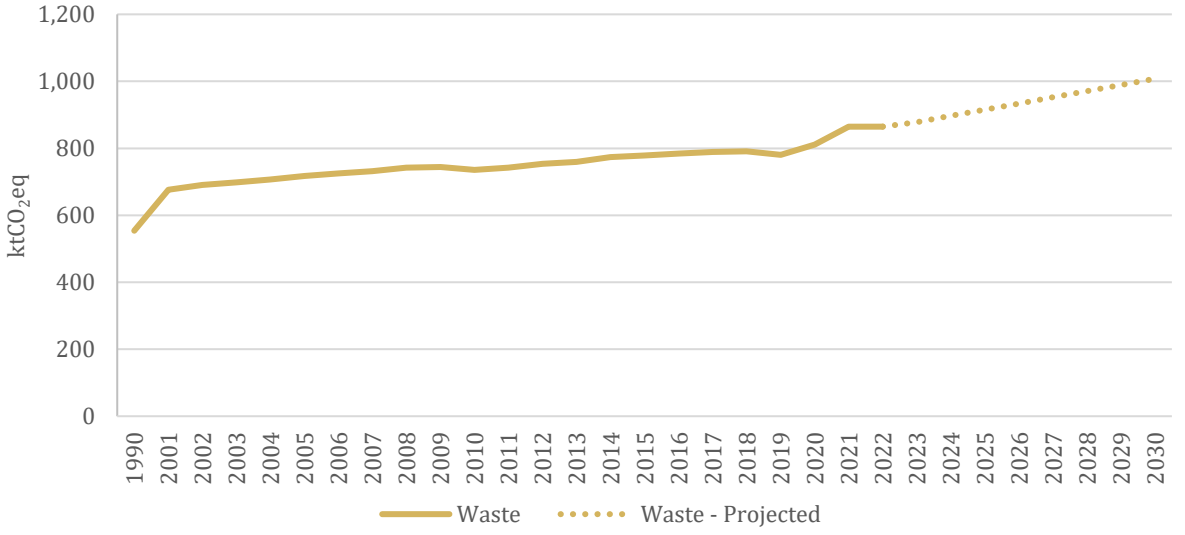

Figure 3-21. Waste sector of Armenia: GHG emission projections

Summary of the projected national GHG emissions and removals

The tables presented below provide detailed information on projected national GHG emissions and removals of Armenia under:

a) Without Measures (WOM) Scenario
b) With Measures (WM) Scenario
c) With Additional Measures (WAM) Scenario

These projections offer insights into the potential trajectory of the country's climate impact under different levels of mitigation effort and policy implementation.

Table 3-7. Projections of greenhouse gas emissions and removals under a 'without measures scenario'

	Inventory data		Projections	
	$ktCO_2eq$		$ktCO_2eq$	
Sector	2021	2022	2025	2030
Energy	9,179.8	9,490.3	11,174.3	13,695.7
IPPU	1,668.9	1,725.3	2,031.4	2,489.8
Agriculture	2,060.3	2,130.0	2,508.0	3,073.9
Land-use, land-use change and forestry	-341.9	-340.6	-360.5	-396.9
Waste	1,320.8	1,397.9	1,479.6	1,566.0
Gas				
CO_2 emissions without net CO_2 from LULUCF	7,904.7	8,172.1	9,622.2	11,793.4
CO_2 emissions with net CO_2 from LULUCF	7,562.8	7,831.5	9,261.7	11,396.5
CH_4 emissions without CH_4 from LULUCF	3,901.5	4,033.5	4,749.2	5,820.8
CH_4 emissions with CH_4 from LULUCF	3,901.5	4,033.5	4,749.2	5,820.8
N_2O emissions without N_2O from LULUCF	863.6	892.8	1,051.2	1,288.5
N_2O emissions with N_2O from LULUCF	863.6	892.8	1,051.2	1,288.5
HFCs	1,131.6	1,169.9	1,377.5	1,688.3
PFCs	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	NO	NO	NO	NO
SF_6	4.3	4.5	5.2	6.4
NF_3	NO	NO	NO	NO
Total (without LULUCF)	**13,805.7**	**14,272.8**	**16,805.4**	**20,597.4**
Total (with LULUCF)	**13,463.8**	**13,932.2**	**16,444.9**	**20,200.5**

Table 3-8. Projections of greenhouse gas emissions and removals under a 'with measure scenario'

	Inventory data		Projections	
	$ktCO_2eq$		$ktCO_2eq$	
Sector	**2021**	**2022**	**2025**	**2030**
Energy	8,877.4	9,123.3	10,604.4	12,774.2
IPPU	1,613.9	1,658.6	1,927.8	2,322.3
Agriculture	1,992.5	2,047.7	2,380.1	2,867.1
Land-use, land-use change and forestry	-360.9	-359.5	-380.5	-418.9
Waste	867.9	887.7	1,036.0	1,247.9
Gas				
CO_2 emissions without net CO_2 from LULUCF	7,644.3	7,856.1	9,131.5	10,999.9
CO_2 emissions with net CO_2 from LULUCF	7,283.4	7,496.5	8,751.0	10,580.9
CH_4 emissions without CH_4 from LULUCF	3,773.6	3,873.9	4,507.0	5,429.2
CH_4 emissions with CH_4 from LULUCF	3,773.6	3,873.9	4,507.0	5,429.2
N_2O emissions without N_2O from LULUCF	835.2	858.3	997.6	1,201.8
N_2O emissions with N_2O from LULUCF	835.2	858.3	997.6	1,201.8
HFCs	1,094.4	1,124.7	1,307.3	1,574.7
PFCs	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	NO	NO	NO	NO
SF_6	4.2	4.3	5.0	6.0
NF_3	NO	NO	NO	NO
Total (without LULUCF)	**13351.6**	**13717.2**	**15,948.3**	**19,211.5**
Total (with LULUCF)	**12990.6**	**13357.7**	**15,567.8**	**18,792.6**

Table 3-9. Projections of greenhouse gas emissions and removals under a 'with additional measures scenario'

	Inventory data			Projections
	$ktCO_2eq$			$ktCO_2eq$
Sector	**2021**	**2022**	**2025**	**2030**
Energy	8,603.7	8,850.6	9,367.4	10,313.6
IPPU	1,477.7	1,609.0	1,703.0	1,875.0
Agriculture	2,098.3	1,986.4	2,102.4	2,314.8
Land-use, land-use change and forestry	-379.9	-378.4	-400.5	-441.0
Waste	864.1	864.6	915.1	1,007.6

Gas				
CO_2 emissions without net CO_2 from LULUCF	7,431.2	7,621.2	8,066.3	8,881.0
CO_2 emissions with net CO_2 from LULUCF	7,039.7	7,231.1	7,665.7	8,440.0
CH_4 emissions without CH_4 from LULUCF	3,716.9	3,761.6	3,981.2	4,383.4
CH_4 emissions with CH_4 from LULUCF	3,721.5	3,766.1	3,981.2	4,383.4
N_2O emissions without N_2O from LULUCF	867.2	832.6	881.3	970.3
N_2O emissions with N_2O from LULUCF	874.3	839.8	881.3	970.3
HFCs	1,024.6	1,091.0	1,154.8	1,271.4
PFCs	NO	NO	NO	NO
Unspecified mix of HFCs and PFCs	NO	NO	NO	NO
SF_6	3.8	4.2	4.4	4.8
NF_3	NO	NO	NO	NO
Total (without LULUCF)	**13,043.7**	**13,310.6**	**14,087.9**	**15,510.9**
Total (with LULUCF)	**12,663.8**	**12,932.2**	**13,687.4**	**15,069.9**

3.8 Other information (if applicable)

Social and economic impact

Households' energy consumption

The largest consumer of energy in Armenia are the households, responsible for around 35 per cent of the final energy consumption in the last decade. While within 1990-2008 the first position in energy consumption was held by the industry, since 2008 the households came to the first place pushing back the industry to the third position (the transportation is in the second position).

The households consumed energy for different purposes, but the most demanding direction for the household energy consumption is space heating. In Armenia, the vast majority of households, 97.9 per cent, heat their apartments, using natural gas, firewood, electricity, and coal. Natural gas is the main option for heating in Yerevan and other cities (77 per cent of households), whereas rural communities still rely on wood as the main option for heating (45.6 per cent of households). Electricity is used for heating by 25.8 per cent of households living in urban area and by only 5 per cent of rural households[44].

Solar water heaters and PV panels for vulnerable households

The installation of solar water heaters and independent PV units by households certainly improves the living conditions for women and children, providing them with a healthier environment and contributes to more effective solutions for family care, provided by women.

[44] Statistical Committee of RA, Poverty and Social Snapshoot 2025

The gender and social impact of renewable energy activities have come to the forefront in various projects implemented by national and international organizations. The Armenia (R2E2) Fund with UNDP funding, has installed solar water heaters and PV panels for 400 families with three or more children living in non-gasified communities in Gegharkunik and Shirak regions. The "Strengthened Community Resilience through EE and Low-Emission Development" UNDP-Sida project donated 2 kW PV systems to 50 vulnerable, mainly rural, families in Alaverdi community.

Flexibility information

In accordance with paragraph 85 of the MPGs, Decision 18/CMA.1, Armenia has estimated the expected and achieved GHG emission reductions for actions, policies, and measures identified in the country's NDC implementation plan, and presented the progress in tabular format to the extent possible. However, due to data limitations and the absence of measurable progress for certain measures, the achieved GHG emission reductions could not be estimated. In such cases, consistent with the flexibility provisions under paragraph 85 of the MPGs, only other relevant qualitative information has been reported.

Furthermore, in line with paragraph 95 of the MPGs (18/CMA.1), Armenia developed emission projections from the most recent year included in the Armenia's latest NID up to the end point of the country's NDC implementation period (2030) without the 15-year extension period beyond the NDC time frame.

Improvement over time

In the next Biennial Transparency Reports (BTRs), the application of flexibility provisions is expected to be minimized through the strengthening of MRV systems across all sectors. This will enhance data collection and improve the accuracy of information related to mitigation measures.

Additionally, Armenia has already developed a Long-term Low Greenhouse Gas Emission Development Strategy of the Republic of Armenia (until 2050), which can serve as a basis for extending emission projections beyond the current NDC period. This strategy will support the estimation of emissions and reductions for individual measures over an additional 15-year time frame and is expected to be reflected in the country's next and subsequent BTRs.

4 Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

4.1 Introduction

This Chapter highlights substantial sectoral vulnerabilities, particularly in water resources, agriculture, health, energy, tourism and human settlements, as well as progress on implementation of adaptation at national and sub-national levels. Overall, climate impacts are already shaping the development pathway of Armenia, requiring enhanced coordination, improved data and risk assessment systems, scaled investments in resilient infrastructure and natural resource management, and strengthened institutional capacity at all levels.

Climate context

As a small, mountainous, landlocked country in the South Caucasus, Armenia is increasingly experiencing the effects of climate change, with serious implications for sustainable development, poverty reduction and social equity. The national climate is defined by a strong warming trend and growing aridity: since 1935, mean annual temperature has risen by approximately 1.7°C, while average annual precipitation has declined by around 18.9 per cent since 1935. Climate projections indicate a continued rise in temperature of up to 4.7°C by 2100 and further reductions in precipitation of up to 8.3 per cent under high-emissions scenarios. These climatic changes have already resulted in more frequent and damaging extreme events, including prolonged heatwaves, droughts, heavy rainfall leading to flash floods, hailstorms, late spring frosts, landslides, mudflows and wildfires. Such events disproportionately affect rural communities, which are more dependent on natural resources and less equipped to cope with climate shocks.

Key impacts across sectors

Water scarcity is intensifying as snowmelt-fed river flows decline and seasonal melt occurs earlier, reducing late-summer supply. Lake Sevan - the largest freshwater reserve of Armenia, which plays a central role for national water security, and is a critical source for drinking water, irrigation, fisheries, hydropower and ecological services, faces now lower inflows, increased evaporation and ecological pressure. Agriculture – core to rural livelihoods – suffers from reduced yields, degraded pasture and frequent production losses – estimated at tens of millions of dollars annually. Without adaptation, economic losses will rise and burden national development. Hydropower, which provides about one-third of the electricity in Armenia, is increasingly affected by declining river flows and seasonal variability, infrastructure faces landslide and flood risks. The health sector confronts intensifying heat stress, poorer air quality, disease risks and service disruptions. Tourism – an emerging growth area – faces impacts on natural and cultural assets. Human settlements and ageing infrastructure remain highly exposed to hazards.

Socioeconomic vulnerabilities

Socioeconomic challenges – including rural poverty, gender inequality, limited local institutional capacity and under-investment in infrastructure – compound climate risks. Rural female headed households (FHHs) are especially vulnerable due to limited access to finance, technology and decision-making.

Climate triggered losses and damages

Armenia continues to incur significant losses from flash floods, droughts, wildfires and landslides, among other natural hazards. Reducing impacts requires stronger early warning systems, hazard- and risk-informed spatial planning, resilient infrastructure and improved risk financing instruments to safeguard long-term development under climate change.

Adaptation governance

The NDC (2021–2030) and National Adaptation Plan (2021-2025) form the core of adaptation planning. Based on these, Water Sector Adaptation Plan for 2022-2026 has been developed and approved, agriculture and healthcare adaptation measures have been developed and integrated into sector strategies and action plans for 2022–2023. Energy and tourism resilience frameworks have been developed and are pending for integration into sector strategies, and settlements' adaptation planning is underway. Armenia is also establishing a national monitoring and evaluation (M&E) framework with indicators to strengthen data collection and track adaptation progress. Climate budget tagging has been introduced to improve resource allocation. National Climate Law has been developed and is in the final stage of approval to formalize climate governance and support integration of adaptation across sectors and regions.

Implementation progress

Adaptation implementation is advancing in priority areas. Basin-level water management and irrigation modernization are being strengthened; hydrometeorological networks and early warning systems are expanding. Climate risk considerations increasingly appear in regional planning, disaster risk management (DRM), and sectoral programmes. Pilot projects, mostly with international partners, support climate-smart agriculture, local water management and capacity-building on national and local levels. Civil society engagement has helped raise awareness and strengthen community resilience.

Remaining challenges

Despite progress, institutional and technical capacity in state institutions, ministries and local governments remains limited. Data and monitoring systems require improvement to support evidence-based planning. Domestic financing is insufficient, and implementation depends heavily on international support.

International cooperation

International partners are key to building institutional capacity, supporting technical studies, piloting adaptation measures and mobilizing climate finance. Good practices include improved hydrometeorological services, integrated climate risk and disaster risk planning, and community-based adaptation. Lessons learned highlight the importance and need for sustained cross-sector coordination, better data, scaling successful pilots and continued capacity-building.

Future priorities

Enhancing long-term resilience requires sustainable investments in water and energy systems, climate-resilient infrastructure, safer and more adaptive settlements**,** particularly in hazard-prone and rural areas, modernizing agriculture and rural services, protecting ecosystems and upgrading health services. Strengthening social protection and integrating inclusive and gender-responsive approaches is essential for equitable outcomes.

National commitment

Armenia remains committed to strengthening transparency, raising adaptation ambition and expanding engagement. Continued domestic reforms – supported by international finance and capacity-building – will be critical to protecting people, the economy and ecosystems in a rapidly changing climate.

4.2 National circumstances, institutional arrangements and legal frameworks

4.2.1 National circumstances relevant to its adaptation actions, including biogeophysical characteristics, demographics, economy, infrastructure and information on adaptive capacity

Biogeophysical characteristics

Armenia is a small, landlocked, mountainous country in the South Caucasus. Around three-quarters of its territory lies between 1,000 and 2,500 metres above sea level, with the average elevation exceeding 1,800 metres. This rugged topography creates diverse climatic zones, ranging from dry continental to alpine. Armenian climate is strongly influenced by its complex topography, resulting in considerable spatial and temporal variability. Average annual air temperatures range from −8°C in high-altitude mountainous areas (above 2,500 m) to 12–14°C in low-lying valleys. The absolute maximum temperature in Armenia has been observed in Meghri region (southeast of Armenia) in 2011 reaching 43.7°C, while the absolute minimum temperature, −42.2°C, has been recorded near Ashotsk (at Paghakn station) in 1961. The country experiences a predominantly dry climate, with an average annual precipitation of 592 mm. The Ararat Valley and Meghri regions are the most arid, receiving only 200–250 mm of precipitation annually.

Positioned between the Mediterranean and the Middle East – both climate change 'hotspots' and water-stressed regions[45] – the country's continental climate and mountainous relief intensify its vulnerability to climate change. An increase in annual mean temperature by 1.7^{0}C and reduction in annual mean precipitation by approximately 18.9 per cent has already been observed in Armenia by 2024 relative to the baseline average for 1961-1990[46]. Climate change and variability contribute to the country's high exposure to hydrometeorological hazards and extreme weather events, including droughts, heatwaves, flash floods, hail, frost, which frequently trigger emergency situations and natural disasters, such as landslides and mudflows, and in turn influence rural livelihoods, food security, land-use, settlement patterns, ecosystems and society in general with substantial socioeconomic losses.

Projections indicate that further warming of annual air temperature by 4.7°C by 2100, with significant reductions in precipitation, snow cover and river flow, will exacerbate water scarcity and desertification processes.[47] The observed and projected climate

[45] IPCC, AR6 Synthesis Report: Climate Change. 2023
[46] Armhydromet, 2025; Environment and natural resources in RA for 2024, Brief characteristics of hydrometeorological conditions; https://www.armstat.am/en/?nid=81&id=2764
[47] Armenia's Fourth National Communication to Climate Change, 2020

change and variability, along with hazard exposure, shape the country's overall vulnerability and adaptation priorities.

Demographics

Information on population can be found in section 1.1National Circumstance: Population.

Urbanization is relatively high in Armenia: around 64 per cent of the population resides in urban areas, with Yerevan only, the capital, concentrating about 1.1 million inhabitants.[48] This has led to uneven population distribution, with rural areas experiencing depopulation and ageing, while Yerevan and a few regional centres continue to expand. Accordingly, one-third of the population, who reside in rural communities, remain dependent on agriculture and natural resource-based livelihoods which are highly sensitive to climate change impacts. As climate-induced shifts in water availability, crop productivity and pasture conditions intensify, food security for vulnerable rural households is becoming increasingly at risk.

Approximately 23.7 per cent of the total population of Armenia lives under the national poverty line.[49] Poverty is exacerbated by an unemployment rate of 13.9 per cent,[50] and an unequal distribution of gendered poverty. Because of their financial and social situations, the population groups living below the poverty line are vulnerable to different aspects of climate change, such as extreme temperatures and more frequent natural disasters. Poorer households are especially vulnerable to climate change as they reside mainly in rural areas and tend to rely solely on agriculture for their livelihood.

Gender dynamics significantly influence demographic trends. Women make up 53 per cent of the total population. Men are more engaged in external labour migration, primarily to the Russian Federation, leading to a high share of FHHs in rural communities. Labour-force participation is markedly gendered: men 68 per cent versus women 32 per cent (ages 15+).[51] Women are more concentrated in services, education and healthcare, while men dominate in construction, transport and industry. This division shapes gender-specific vulnerabilities to climate hazards: for example, droughts and water scarcity disproportionately affect rural women who manage household water and agricultural plots, while men in Construction and Energy are more exposed to occupational heat stress.

Economy

Macroeconomic trends of Armenia indicate steady growth in recent years, with GDP expansion in 2022–2024 driven mainly by services, construction and industry. Agriculture accounts for only about 7.8 per cent of GDP[52] but plays a critical role in rural livelihoods and employment.

The country's limited arable land and water constraints make agriculture highly sensitive to climate variability, particularly to more frequent and intensive droughts, hail and unseasonal frosts. Energy security is also closely linked to climate: hydropower provides roughly one-third of the electricity generation in Armenia, making it vulnerable to

[48] Statistical Committee of RA, 2023 (https://www.armstat.am/file/article/marzer_2023_4.pdf)
[49] Statistical Committee of RA, Armenia Poverty Snapshot over 2020-2023, 2024 (https://armstat.am/file/article/poverty_2024_en_2.pdf)
[50] Statistical Committee of RA, Statistical Indicators, Time Series, 2024 (https://www.armstat.am/en/?nid=12&id=08010)
[51] World Bank Gender Data Portal, 2022
[52] Statistical Committee of RA (https://armstat.am/file/article/sv_03_25a_112.pdf, page 14)

fluctuations in river flows. Thus, climate hazards pose systemic risks across sectors, threatening economic stability and SDGs.

Projections indicate that climate-driven impacts could shrink Armenian GDP by up to 3 per cent by 2050 and raise poverty by 2.7 per cent by 2030, if unaddressed.[53] Another research highlights that, in a worst-case scenario, Armenian GDP could shrink by around 18 per cent by 2072, with the debt-to-GDP ratio reaching about 140 per cent - driven partly by projected approximately 40 per cent reductions in river flows impacting hydropower, agriculture and infrastructure.[54]

Infrastructure

The physical infrastructure of Armenia is highly climate-sensitive, given both its mountainous geography and legacy of under-investment. The country relies on an extensive but ageing road network, much of which is vulnerable to landslides, floods, rockfall and extreme temperatures. Approximately 96 per cent of freight and passenger transport depends on roads, while climate-induced disruptions often isolate rural communities and impede access to markets and services. Energy infrastructure is also at risk: projected reductions in river flow by 8 per cent–14 per cent by 2040 threaten the reliability of hydropower. At the same time, thermal power plants (TPP) and transmission systems are exposed to heat stress and extreme weather events. water infrastructure is mostly deteriorated and inefficient leading to high leakages and losses (approximately 70 per cent from irrigation infrastructure), thereby aggravating water scarcity during peak periods for irrigation water demand.

Urban and social infrastructure, particularly in Yerevan and other major cities, face mounting challenges. The centralized drinking water supply infrastructure is also ageing and inefficient, and high rates of water losses during transit exacerbate vulnerabilities especially during drought stress. The housing stock and public buildings add another layer of vulnerability. Many MABs, residential blocks, schools, hospitals and administrative buildings were built during the Soviet period, with low EE and limited resilience to climate extremes and climate triggered hazards.

According to the WB's assessments,[55] 39 per cent of the poorest households live in dilapidated homes, particularly in Ararat, Armavir, Lori and Shirak marzes, heightening exposure to flood and weather-related damage. In Yerevan, annual flood-related damages are equivalent to 8 per cent of the total housing value, while in Lori and Tavush, they reach 21 per cent**.** These findings highlight that climate-proofing of housing, schools and healthcare facilities, together with modernization of water supply and urban infrastructure, is critical not only for resilience but also for reducing poverty and inequality.

Recognizing all these risks, the Republic of Armenia has begun integrating climate resilience into infrastructure planning. International partners are supporting resilience investments in the country; however, adaptation needs for infrastructure sector far exceed available domestic resources, underscoring the importance of sustained international finance, technology transfer and private sector engagement.

[53] World Bank, 2024. Armenia: Country Climate and Development Report (https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099110524115029619)
[54] IMF, 2022. Armenia: Technical Assistance Report - Quantifying Fiscal Risks from Climate Change (https://www.imf.org/-/media/Files/Publications/CR/2022/English/1ARMEA2022003.ashx)
[55] World Bank, 2024. Armenia: Country Climate and Development Report, 2024

Adaptive capacity

Adaptive capacity of Armenia reflects both strengths and constraints across institutional, socioeconomic and environmental dimensions. Over the past years, the country has advanced its climate governance framework through development and adoption of the National Adaptation Plan (NAP) (2021), integration of climate risks into national development strategies, and establishment of sectoral adaptation priorities in water, agriculture, and health sectors (2022-2023), with other sectors – energy, tourism and settlements/infrastructure in the process of mainstreaming climate considerations and adaptation priorities into sectoral policies and programmes.

In the meantime, socioeconomic conditions shape adaptive potential. High literacy rates (99.8 per cent)[56] and a strong educational system provide a foundation for adaptive skills, yet Armenian economy remains vulnerable due to its dependence on external trade, limited diversification and rural poverty. Outward labour migration places additional pressure on rural communities, leaving many FHHs with fewer resources for adaptation. Gender inequalities, particularly in access to finance, land and decision-making, further constrain adaptive capacity at the household and community levels.

The technical capacity of Armenia is gradually improving through climate projections modelling, risk assessments, yet investments in early warning systems, monitoring networks and research remain limited. Civil society organizations and local communities are demonstrating strong engagement in climate adaptation initiatives, particularly in agriculture and water management, but often lack sustainable funding. International climate finance and technical support have been critical in piloting adaptation measures; yet, scaling up and sustaining these interventions at national level remains a challenge.

Overall, the adaptive capacity of Armenia is characterized by a combination of institutional progress, human capital and active civil society, challenged by financial and economic constraints, rural vulnerabilities and gender disparities.

Human capacity

Armenia has a skilled academic and scientific community, including research institutions (e.g., Armenian State Agrarian University, the "Hydrometeorology and Monitoring Centre" State Non-Commercial Organization (SNCO) under the MoE, National Academy of Sciences) focusing on climate, agriculture, hydrology, among other areas. These institutions provide technical input into vulnerability and risk assessments and adaptation planning.

Meanwhile, the workforce in government and local municipalities lack specialized training and practice in climate adaptation and risk management. This gap limits their ability and slows down the appropriate implementation of adaptation priorities and climate-resilient service delivery, reducing the effectiveness of disaster preparedness and response, increasing economic and social costs. Limited extension services for local communities and farmers constrain the uptake of climate-resilient practices.

Financial capacity

Domestic resources for adaptation remain limited in Armenia. While the country is taking steps to integrate adaptation into the Government's Medium-Term Expenditure Framework to channel climate resilience considerations into state budgeting, much of its adaptation finance is sourced from international partners. *According to the Adaptation*

[56] https://worldpopulationreview.com/country-rankings/literacy-rate-by-country

Gap Report (2023) of UNEP, adaptation finance flows to developing countries cover less than 10 per cent of identified needs - a trend well reflected also in the reliance of Armenia on external funding for large-scale infrastructure projects. Ensuring sustained access to finance and climate-smart technologies is critical for enhancing long-term adaptive capacity.

4.2.2 Institutional arrangements and governance, including for assessing impacts, addressing climate change at sectoral level, decision-making, planning, coordination, addressing cross-cutting issues, adjusting priorities and activities, consultation, participation, implementation, data governance, monitoring and evaluation and reporting

Republic of Armenia has established a multi-layered institutional framework to plan, coordinate and implement adaptation actions. These arrangements combine national policy leadership, sectoral implementation roles, subnational engagement and participation by civil society and development partners. The NAP has formalized many of these structures and provides a road map for mainstreaming adaptation across priority sectors and governance levels.

The MoE is the designated UNFCCC focal point and leads national climate policy (including the NDC and NAP processes), national reporting under UNFCCC and Paris Agreement, and liaison with international partners.

To reinforce cross-sectoral coherence for climate action, Armenia maintains an Inter-Agency Coordinating Council on Climate Change (IACCC). While cross-sectoral coherence for climate adaptation is to be reinforced by IACCC, the Council continues to demonstrate limited effectiveness. The Council currently does not hold an operational mandate, as a result, its role is largely consultative, with limited influence on sectoral decision-making or resource allocation. Strengthening its authority, regularizing its work and linking it more directly to national planning and budgeting processes remain critical for effective adaptation governance.

Sectoral ministries hold primary responsibility for translating NAP priorities into sector development programmes, regulations and investments.

The table below summarizes the main institutions involved in adaptation governance, planning and implementation in Armenia.

Table 4-1. Key institutions involved in climate change adaptation

Institution	Adaptation-related mandate, roles and responsibilities
Ministry of Environment	• *National coordination and reporting:* UNFCCC focal point; leading national climate policy, national reporting and liaison with international partners. • *Cross-sectoral coordination:* through the IACCC, coordinating line ministries, government agencies, civil society and development partners to ensure integration of adaptation priorities across sectors. • *Adaptation mainstreaming:* Development of guidelines for integrating adaptation and climate risk into sectoral and regional development strategies. • *Science, data, and early warning:* through its professional Armhydromet agency, providing meteorological, hydrological and agrometeorological observation data and analytics, developing climate projections, ensuring climate hazard risk mapping, monitoring and early warning systems to inform national and local planning.

	• *Knowledge and capacity development:* supporting knowledge transfer and training of senior officials, policymakers and decision makers to enhance institutional and technical capacity for adaptation and resilience. • *Technology and innovation:* guiding development of a national strategy on adaptation technologies, promoting the identification, testing and scaling of climate-resilient solutions. • *Climate finance and budgeting:* leading efforts to design and implement a climate budget tagging system, enabling transparent tracking of public and private expenditures for adaptation.
Ministry of Economy	• *Mainstreaming adaptation:* Ensuring climate risks and adaptation are integrated into agriculture sector strategy, national economic strategies, tourism development policies and sectoral investment programmes. • *Agriculture and rural development:* Spearheading mainstreaming of climate-smart agriculture and sustainable land management to enhance resilience of rural economies. • *Food security and value chains:* Safeguarding food production, processing, storage and distribution systems against climate shocks to reduce vulnerability of consumers and producers. • *Tourism sector resilience:* Developing and promoting climate-resilient tourism strategy, including protection of cultural and natural heritage sites, diversification of tourism products to reduce seasonal climate risks, and promotion of ecotourism that supports adaptation and sustainable livelihoods. • *Private sector engagement:* Incentivizing green investments and supporting small and medium enterprises (SMEs) in adopting climate-resilient technologies and practices across agriculture, industry and tourism sectors. • *Research and innovation:* Supporting agricultural institutes in developing climate-resilient crops, efficient irrigation methods. • *Financial mechanisms:* Designing crop insurance schemes, concessional lending and other instruments for farmers, SMEs and tourism enterprises to mitigate financial shocks from climate variability.
Ministry of Territorial Administration and Infrastructure	• *Mainstreaming adaptation:* Ensuring climate risks and adaptation are integrated into Energy and Transport sector strategies, regional/marz development plans and investment programmes. • *Infrastructure resilience:* Incorporating climate risks in the design, construction, and maintenance of Energy (hydropower and energy transmission/distribution systems), water (irrigation and drinking water supply), Transport and urban infrastructure. • *Regional/marz capacity development:* Supporting local governments in mainstreaming and implementing adaptation actions at subnational (marz/community) levels. • *Disaster preparedness:* Coordinating with respective ministries on climate triggered disaster risk reduction (DRR) and early warning activities.
Ministry of Health	• *Mainstreaming adaptation:* Ensuring climate risks and adaptation are integrated into healthcare sector strategy, policies and programmes. • *Health risk assessment:* Monitoring and addressing climate-related risks, including heat stress, vector-borne, water and food related diseases. • *Emergency preparedness:* Developing response systems for climate-induced health crises (heatwaves, floods, epidemics).

	• *Data and surveillance:* Enhancing epidemiological monitoring systems linked with climate information services. • *Healthcare infrastructure:* Ensuring resilience of hospitals, clinics and essential facilities are strengthened to climate shocks. • *Public health campaigns:* Promoting awareness on climate-sensitive diseases and adaptation behaviours. • *Capacity development:* Ensuring health professionals are trained in climate-health risks and adaptive responses.
Ministry of Labour and Social Affairs	• *Social protection:* Integrating climate resilience into social protection systems to safeguard vulnerable groups from climate-induced livelihood shocks. • *Gender equality:* Developing and implementing gender strategies and action plans that ensure adaptation policies are inclusive, equitable and responsive to women's and men's differentiated vulnerabilities.
Ministry of Internal Affairs	• *Disaster risk reduction:* Leading national DRM and civil protection systems, with integration of climate change related risks, and population protection system planning processes. • *Rescue Service operations:* Implementing emergency response and recovery measures for floods, landslides, wildfires, and other climate-induced hazards, including deployment of specialized teams and equipment. • *Community resilience:* Supporting communities and local governments in climate-related contingency planning and preparedness activities.
Ministry of Foreign Affairs	• *Climate diplomacy:* Representing Armenia in international climate change negotiations and dialogues under the UNFCCC, Paris Agreement and other relevant global frameworks related to adaptation • *Integration into foreign policy:* Ensuring adaptation priorities and resilience objectives of Armenia are reflected in international development partnerships and diplomatic engagements • *Partnerships and cooperation:* Advancing bilateral and multilateral cooperation, as well as regional partnerships on adaptation • *Knowledge and finance mobilization:* Facilitating knowledge exchange, and access to climate finance to support national adaptation priorities
Ministry of High-Tech Industry	• *Adaptation technologies:* Developing strategies for identification, testing, and scaling up of climate-smart adaptation technologies, and supporting establishment of economic mechanisms for their introduction, uptake and sustained application across key NDC sectors
Ministry of Education, Science, Culture and Sports	• *Climate education and awareness:* Integrating climate change, adaptation and environmental sustainability topics into national curricula and teacher training programmes at all educational levels • *Youth engagement:* Encouraging youth participation in climate action, innovation challenges and community adaptation initiatives
Statistical Committee	• *Adaptation monitoring indicators:* Coordinating with line ministries on development of climate-related indicators, data collection and reporting
Urban Development Committee	• *Construction norms:* Ensuring revision of construction norms for Urban Buildings and infrastructure to integrate climate risk management and adaptation considerations into respective norms and regulations
Regional Administrations and	• *Mainstreaming adaptation:* Ensuring integration of climate change adaptation into marz/regional, municipal and community development plans, local implementation of adaptation actions

Municipal Authorities	
Academia & Research Institutes	• *Knowledge support:* Supporting scientific research on climate change, risk mapping, vulnerability assessments and knowledge base development and transfer

Institutional capacity is further supported by donor organizations, private sector partners, civil society and NGOs, which play a pivotal role for on-the-ground adaptation implementation at national and subnational levels, through capacity-building in climate resilience, disaster preparedness and green technologies, outreach and awareness-raising to foster behavioural change and societal support for adaptation, community-based pilot projects, among other initiatives.

4.2.3 Legal and policy frameworks and regulations

Adaptation governance in Armenia is guided by a consolidated legal and policy architecture that integrates climate risk management across vulnerable sectors. The NDC (2021-2030) and the NAP (2021-2025) form the core of this system. The NDC positions adaptation as a key pillar of sustainable development and poverty reduction, while the NAP outlines a phased and institutionalized approach to resilience-building across six priority sectors – water, agriculture, health, energy, tourism, and infrastructure/settlements - defining roles, monitoring arrangements and financing needs.

A series of sectoral strategies, adopted through Government Decrees, operationalize the NAP at the sector level by embedding climate risk considerations into planning, regulatory measures, and service delivery. In particular:

- *Water Sector Adaptation Plan for 2022–2026 (adopted by Government Decree No. 1692-L, 2022)* establishes a structured road map for strengthening resilience of water resources and services.
- *Healthcare System Development Strategy for 2023–2026 (adopted by Government Decree No. 174-L, 2023)* integrates climate-sensitive health risks into system development and emergency preparedness.
- *Food Security System Development Strategy and 2023–2026 Action Programme (adopted by Government Decree No. 1083-L, 2023)* enhances resilience of national food systems to climate-related shocks and supports sustainable availability and access.
- *2020–2030 Strategy of the Main Directions Ensuring the Economic Development of the Agricultural Sector of the Republic of Armenia and the 2023–2026 Action Programme for Implementation (adopted by Government Decree No. 1222-L, 2023)* secures climate adaptation integration into agricultural policy reforms, extension services and risk management programmes.

Gender-responsive adaptation is reinforced through the *Gender Policy Strategy and Action Plan for 2025–2028 (adopted by Government Decree No. 482-L, 2025),* which defines the 6th priority "Development of gender-sensitive and gender-responsive approaches to climate change, application of inclusive principles and raising awareness", including measures which ensure the integration of gender issues in the planning processes of adaptation and development programs. In order to coordinate and monitor the implementation of the defined measures, a Council on Women's Issues and an attached

working group have been established under the Deputy Prime Minister of the Republic of Armenia, headed by the Deputy Minister of Labor and Social Affairs of the Republic of Armenia.

Climate finance and budget reforms also play a central role in enabling implementation. In 2021, climate budget tagging system was introduced to track domestic and international expenditures for adaptation, enhance fiscal transparency and support more effective resource mobilization.

Armenia has additionally advanced legal reforms that embed adaptation into regulatory and institutional practice. Amendments to *the Law on Environmental Impact Assessment and Expertise (2023)*[57] introduced explicit requirements for climate risk screening in project appraisal. Revisions to the *Water Code (2022),* updates to building codes and enhanced regulations for water management and agricultural support schemes further integrate resilience considerations into planning, permitting and implementation processes.

To consolidate these developments, the Climate Law was developed and is in the final stage of approval by the National Assembly of Armenia– aiming to establish a comprehensive legal basis for adaptation and mitigation, including binding obligations for integrating climate risks into sectoral development plans, institutional responsibilities, coordination mechanisms, enhancing financing mechanisms. Its adoption will mark a transition from policy-level commitments to enforceable legal requirements.

4.3 Impacts, risks and vulnerabilities as appropriate

Since mid-1990s, numerous analytical studies have been undertaken in Armenia to assess climate change trends and hazards, develop climate projections and evaluate sectoral vulnerabilities. The analyses of multi-year hydrometeorological observation records confirm that Armenia is undergoing a clear warming trend consistent with broader regional and global climate change patterns.

4.3.1 Current climate trends and hazards

Climate trends

Temperature: Over the past decades, Armenia has experienced a marked increase in temperature. Between 1935 and 1996, the country's annual mean temperature rose by about 0.2^0C, by 2007 the increase reached 0.72^0C, by 2012 it was 0.94^0C, by 2016 it rose by 1.12^0C, by 2020 - 1.62^0C, and by 2024 the total warming since 1929 amounted to approximately 1.7^0C relative to the baseline average period for 1961-1990.[58] Both General Circulation Models (GCMs) and Regional Circulation Models (RCMs) confirm a steady warming trend across all seasons.

[57] https://www.arlis.am/hy/acts/178443/latest
[58] Armhydromet, 2025

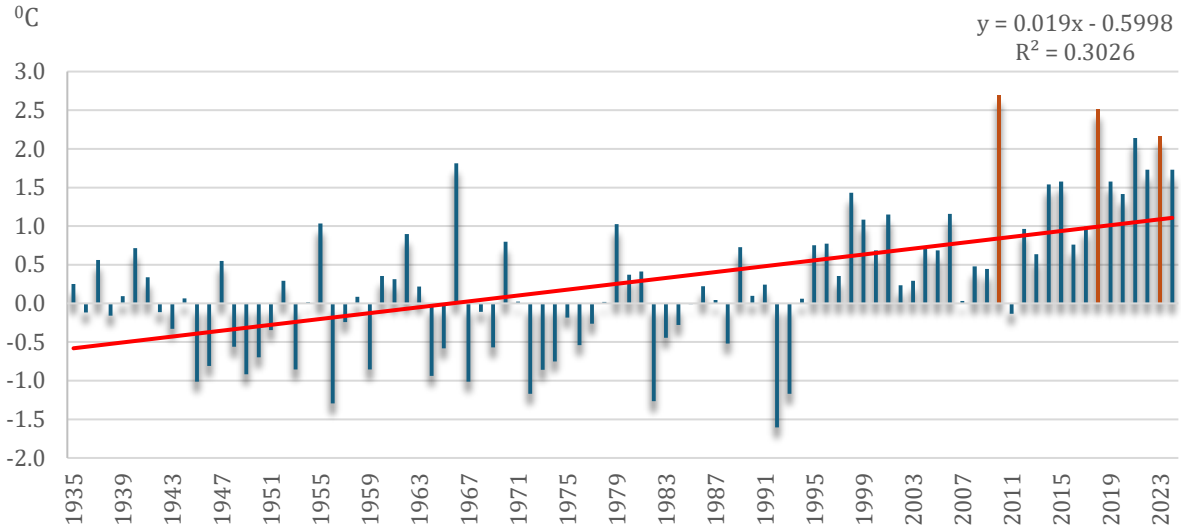

Figure 4-1. Deviation of annual average temperature (°C) in Armenia relative to the 1961-1990 baseline average.

Source: Armhydromet, 2025

According to a recent study, the three warmest years over the entire observation period were observed in the last two decades: in 2010, 2018 and 2023.[59] The most prominent warming trends have occurred during summer months with the multi-annual mean temperature increasing by 2.1°C.[60] Winters have also warmed considerably - with the mean temperature increasing the 1961-1990 average by 1.7°C, over the same period. The winter of 2023–2024 has been the second warmest on record since 1935 with the mean temperature exceeding the 1961-1990 average (-1.5°C) by 4.0°C. Although Armenia does not host glaciers, it has permanent snow cover and seasonal ice in high altitudes, which have shown retreating trends in recent decades. Warmer temperatures lead to increased rates of evaporation, reduced snow cover, earlier snowmelt, with peak flows occurring earlier in the year, often resulting in flooding and inundations, and causing late-season shortages, diminishing natural water storage ability and increasing summer water stress for irrigation, ecosystems and hydropower.

Precipitation: Meanwhile, average annual precipitation has reduced by about 18.9 per cent over the period 1935-2024 relative to the above baseline,[61] though unevenly distributed: northern, southern and central regions are becoming more arid, especially the Ararat Valley and southern regions show drying trends, while slight increases are observed in the Shirak plain, the Lake Sevan basin and parts of Aparan and Hrazdan. According to a recent expert study on seasonal trends, the strongest decline in precipitation has been observed in summer months - by 30.2 per cent in the period of 1935-2024.

[59] A. Gevorgyan, et. al., 2025. Climate Change Impact on Extreme Temperatures and Heat Waves in Armenia, International Journal of Climatology (https://rmets.onlinelibrary.wiley.com/doi/full/10.1002/joc.8802)
[60] Armhydromet, Climate Analysis, https://www.armmonitoring.am/page/1544
[61] Armhydromet, 2025

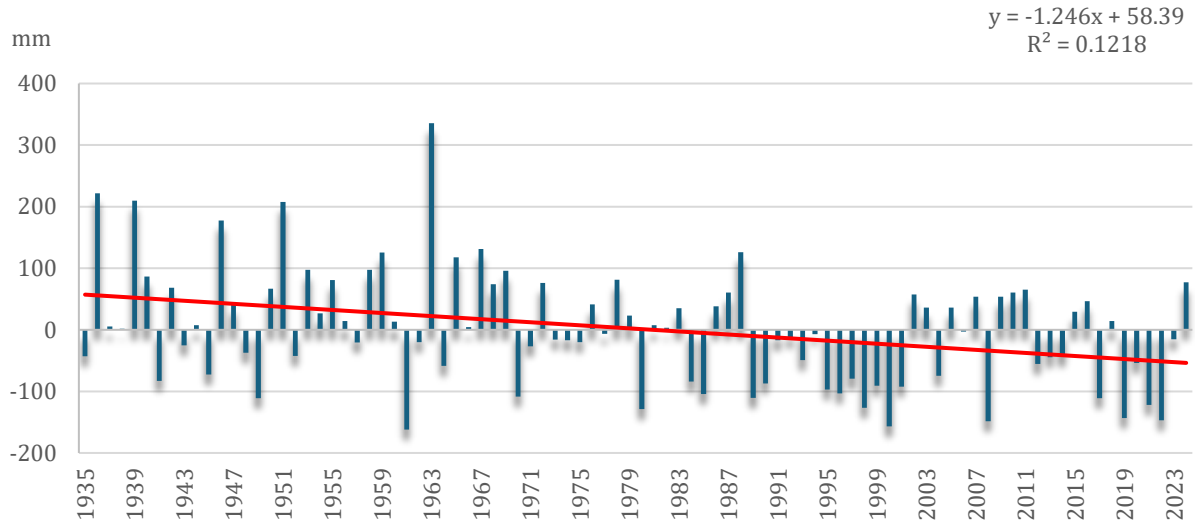

Figure 4-2. Deviation of annual average precipitation (mm) in Armenia relative to the 1961-1990 baseline average

Source: Armhydromet, 2025

Climatic hazards

Beyond slow-onset climatic changes - rising temperatures and shifting precipitation patterns, Armenia is exposed to a range of recurrent and rapid-onset climatic and hydrometeorological hazards that exacerbate existing vulnerabilities, undermining the resilience and increasing the likelihood of loss and damage across sectors. Recent national assessments reveal an increase in the frequency and intensity of hydrometeorological hazards (droughts, dry spells, heatwaves, heavy rainfall, hail, frost, strong winds, floods, landslides and mudflows). Hazard specific trends are discussed in more detail below.

Droughts: Droughts in Armenia manifest across multiple dimensions: meteorological (precipitation deficits), hydrological (reduced streamflow and groundwater recharge), agricultural (insufficient soil moisture to sustain crop yields), and socioeconomic (adverse impacts on livelihoods, the economy and society). Their severity is being intensified by ongoing warming trends. Over the period 2000–2017, the number of strong and very strong drought days has increased by approximately 33 days relative to the 1961–1990 average (87 days). In the lowland regions of Armenia, droughts occur almost annually, while in foothill areas their recurrence is estimated at around 50 per cent. The drought-affected zone is expanding into higher elevations with an earlier seasonal onset. The Ararat Valley and southern Armenia are particularly affected, where crop losses due to droughts amount up to 30-50 per cent in certain years. Livestock is also adversely affected by drought, both directly and indirectly, primarily through reduced fodder availability and diminished pasture productivity.

Heat waves and dry spells: A recent study, analysing 1979–2023 data from 40 meteorological stations across Armenia, reveals that the increased frequency and intensity of heat waves, extremely warm temperatures and dry spells in Armenia are heightening the risk of prolonged heat stress with significant implications for agriculture, water resources, public health and overall climate resilience. The severity of heat waves over urban districts, especially over the capital city Yerevan, has been significantly

exacerbated by *urban heat island effect* - with stronger nighttime warming and longer consecutive hot nights in built-up districts with limited vegetation cover. The nighttime temperatures in Yerevan have reached 25°C–28°C during heat waves, while the maximum continuous duration of nighttime heatwave events has reached 10–12 days with shrinking daily swings between high and low temperatures. The dry spells and prolonged nighttime high temperatures negatively affect sleep, increase the stress level and combined with poor air quality, cause serious health issues for Yerevan population, especially for the elderly and those with cardiovascular and respiratory diseases.[62]

Heavy rainfall and flash floods: Although the mean annual precipitation is decreasing in the country, the incidence of intense rainstorms, river overflows due to early snowmelt is increasing contributing to higher river peaks, flash flooding, inundations, sediment transport and damage to small-scale infrastructure and agriculture. The May 2024 catastrophic flash floods in Lori and Tavush regions are illustrative examples of increasing severe flood risk within heavy rainfall context, when Debed and Aghstev Rivers rose sharply (more than 2 metres in one day) resulting in extensive damage to infrastructure, agriculture and even several cases of fatalities. The disaster caused 2 100 job losses, affected 149 businesses, left 25 homes beyond repair, significantly damaging 244 additional dwellings.[63] Critical infrastructure was also severely impacted. Such impacts are especially observed in river basins with steep slopes and narrow channels. The World Bank (WB) estimates indicate that floods affect 40 000 people annually, causing USD 100 million in GDP losses.

Hailstorms: The frequency and intensity of hailstorms in Armenia, often characterized by hailstones exceeding 20 mm in diameter, have increased over recent decades. These events resulted in significant localized damage especially to high value crops, orchards and vineyards. Livestock losses have also been reported in recent decades, with some households experiencing significant harm to their cattle farms. Particularly affected areas include the Ararat province and Shirak Plain, where hail occurrences are most frequent during late spring and early summer coinciding with critical growth stages of agricultural crops and the presence of livestock.

Frost: Incidences of late spring and early autumn frosts, particularly common in the Ararat Valley and adjacent foothill agricultural zones, are becoming increasingly frequent causing considerable damage to orchards and vineyards during flowering and early vegetative stages, leading to substantial crop yield losses and negatively affecting both the agriculture sector and the broader economy.

Strong winds: Armenia experiences frequent strong winds, particularly during spring and autumn, with wind speeds often exceeding 20 m/s (72 km/h) and gusts reaching 25–30 m/s (≈90–108 km/h) in exposed areas. These winds cause substantial damage across multiple sectors. *In agriculture*, strong winds and gusts cause damage to crops, particularly cereals and vegetables, increase soil erosion and reduce long-term land productivity resulting in overall yield losses. *Infrastructure* is also at risk: high winds and gusts often damage power lines, roofs and other structures leading to economic losses. Urban population, particularly in the capital city of Yerevan, face heightened *health risks* from both direct and indirect effects of dust storms and air pollution exacerbated by

[62] A. Gevorgyan, et. al., 2025. Climate Change Impact on Extreme Temperatures and Heat Waves in Armenia, International Journal of Climatology.
[63] Post Disaster Needs Assessment (PDNA): Armenia Floods, May, 2024

strong winds. These impacts combined increase overall vulnerability of population, especially with respiratory and cardiovascular diseases in densely populated areas.

Wildfire and forest fires: Forest fires in Armenia have become increasingly frequent and severe over recent decades, driven by rising temperatures, prolonged heatwaves and intensified drought conditions. Hotter summers, declining soil and vegetation moisture significantly elevate fire risk, particularly in semi-arid mountain forests. Between 2009 and 2015, 294 fire incidents were registered, affecting over 3,000 ha of area.[64] Whereas, in 2017 alone, during an exceptionally hot and dry summer, devastating fires destroyed about 3,000 ha of forests in the Khosrov Reserve. Monitoring data from up to 2025 confirm a rising trend in wildfire and forest fire.

Landslides and mudflows: Landslides are observed in all regions of the country that are characterized by high and steep slopes.[65] Disaster records indicate increasing landslide and mudflow events in the country are associated with intense rainfall events, exacerbated by unsustainable land-use pressures. Approximately 15 per cent of Armenian population is exposed to landslide hazards.[66] The active landslide zones in the country are especially concentrated in Lori, Tavush and Syunik regions. The geographic distribution of hazards often overlaps with densely populated or economically important areas, increasing exposure levels across sectors and regions. There are approximately 3 000 landslide sites in Armenia, of which 2 504 cover more than 2 ha. Within recent years, landslides have damaged 233 settlements, hundreds of residential buildings, 240 km of highways, 4.8 km of railway lines, communication and energy infrastructures. A WB study indicates that landslide and mudflow damage accounts for about US$17.2– US$20 million in Armenia.[67]

4.3.2 Future projections under climate change scenarios (2040-2100)

Temperature: Future projections suggest that under the high-emission scenario (RCP 8.5), the annual average temperature will rise by around 2.5°C during 2040–2059 and reach about 4.7°C by 2100. By the end of the century, this level of warming could be roughly 35–40 per cent above the global average, placing Armenia among the regions expected to experience the most pronounced temperature increases worldwide.

Projected changes are, however, not spatially uniform. Lowland regions (notably the Ararat Valley and southern provinces) are projected to experience some of the largest temperature increases and stronger drying trends, increasing the risk of heat stress and drought, whereas, higher-altitude regions are expected to experience more moderate warming. The timing of snowmelt and seasonality of run-off is expected to shift earlier in the year, reducing late-season water availability in many basins.

Figure 4-3 demonstrates projected changes in annual average temperature and inter-annual change in monthly average temperature by 2070.

[64] Environment and Natural Resources in RA, 2009-2016, www.armstat.am

[65] V. Boynagryan, Landslides in Armenia, National Academy of Sciences, 2009.
Alice O. Matossian et al., Geosciences, 2020. A New Landslide Inventory for the Armenian Lesser Caucasus: Slope Failure Morphologies and Seismotectonic Influences on Large Landslides.
https://doi.org/10.3390/geosciences10030111

[66] Disaster Risk Management Strategy of Armenia, 2023

[67] World Bank, 2018. Modernizing Weather, Climate and Hydrological Services: A Road Map for Armenia.

Warming during July to September is anticipated to occur about 50 per cent faster than during the cooler months of November to April, accompanied by an increase in consecutive dry days (by roughly 4 per cent–11 per cent).

The current annual probability of a heat wave (defined as a period of three or more days where the daily temperature is above the long-term ninety-fifth percentile of daily mean temperature) is around 3 per cent. The projections under the RCP 8.5 scenario show that this probability will increase to 18 per cent by 2100.[68]

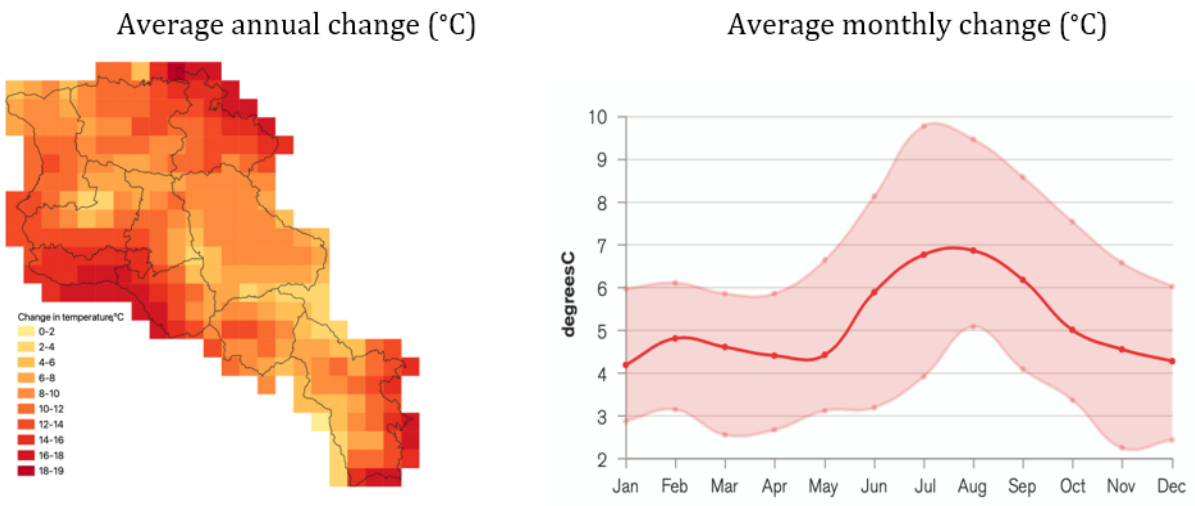

Figure 4-3. Projected change in temperature (°C) by 2070 relative to the 1961-1990 baseline average

Source: Adapted from Armenia's Fourth National Communication on Climate Change (2020)

Precipitation: Precipitation projections show greater variability and uncertainties compared to temperature trends. Estimates suggest a reduction of precipitation by about 2.7 per cent by 2040, 5.4 per cent by 2070, and up to 8.3 per cent by 2100, relative to the baseline annual average of 592 mm recorded for the 1961–1990 period. Table 17 illustrates precipitation and temperature projections by 2100.

Below is the projected spatial distribution of precipitation under RCP8.5/METRAS for the entire territory of Armenia by the end of the century using downscaled, regionally calibrated models (e.g. METRAS) and climate scenario ensembles (e.g. RCP8.5) in the framework of NC4 of Armenia:

[68] World Bank, 2018. Modernizing Weather, Climate and Hydrological Services: A Road Map for Armenia.

Annual mean precipitation (1961–1990) *Projected annual mean precipitation by 2070*

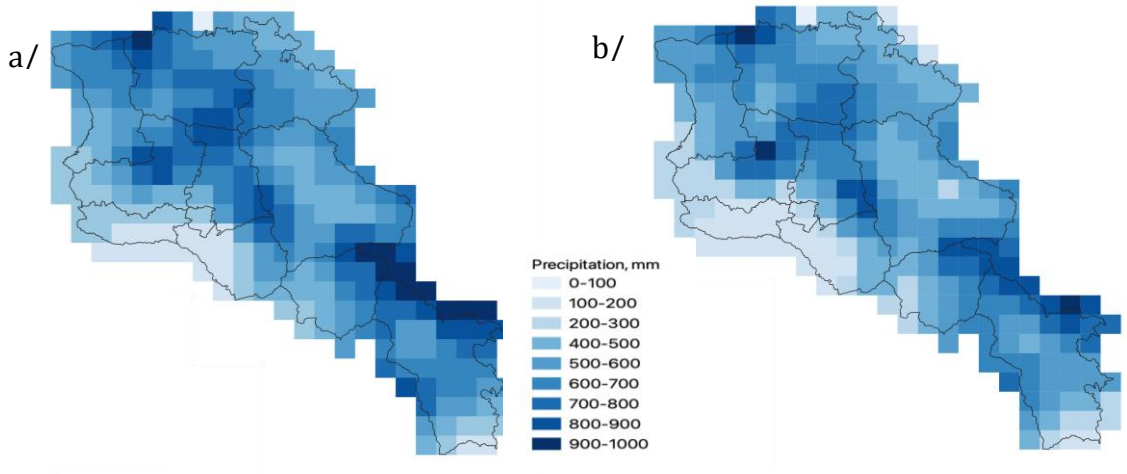

Figure 4-4. Projected precipitation (mm) by 2070 (b) relative to the 1961-1990 baseline average (a)

Source: Adapted from Armenia's Fourth National Communication on Climate Change (2020)

Table 4-2. Projected mean annual temperature and precipitation in Armenia under RCP8.5/METRAS (relative to 1961–1990 baseline)

Period	Mean Annual Temperature (°C)	Mean Annual Precipitation (mm)	Change versus 1961–1990 (°C / %)
1961–1990	5.5	592	-
2011-2040	7.1	576	+1.6 °C / −2.7 %
2041-2070	8.8	560	+3.3 °C / −5.4 %
2071-2100	10.2	543	+4.7 °C / −8.3 %

Extreme events, including heatwaves, more extreme droughts, more intense heavy precipitation (with associated flood and landslide risks), hailstorms, are expected to increase in both frequency and intensity, heightening risks for agriculture, ecosystems, infrastructure and human health. At present, Armenia faces a significant annual probability of severe meteorological drought. The models project a dramatic increase in the annual probability of drought increasing to over 80 per cent under RCP8.5 by 2100. This means that what is currently a 1-in-100-year event may recur every 10 years or less (WB and ADB, 2020).[69] By 2050, the number of days with extreme rainfall is expected to increase from 5 to 32.

4.3.3 Observed and potential impacts of climate change, including sectoral, economic, social and environmental vulnerabilities

Country's vulnerability to climate change

Armenia is highly vulnerable to the adverse impacts of climate change due to its complex mountainous terrain, semi-arid climate and heavy dependence on climate-sensitive

[69] World Bank and Asian Development Bank (2020) Armenia: Climate Risk Country Profile

sectors such as agriculture, water resources and energy. The country's ecosystems and human settlements are already experiencing the compounded effects of rising temperatures, declining precipitation and more frequent extreme weather events. These shifts are intensifying water scarcity and land degradation, leading to reduced agricultural productivity, increased irrigation demand and placing additional pressure on already limited water resources.

Over the past 25 years, climate-induced disasters - primarily droughts, floods, hail, and landslides - have caused over USD 1.5 billion in recorded damages, equivalent to approximately 0.6 per cent of GDP annually. Rural communities, whose livelihoods rely heavily on natural resources and climate-sensitive infrastructure, bear the most severe losses. Climate shocks have also accelerated environmental degradation, contributing to soil erosion, declining water quality, and growing stress on forests and biodiversity.

Socioeconomic vulnerabilities, such as rural poverty, uneven development, limited adaptive capacity in local communities, and ageing infrastructure, further heighten the sensitivity of Armenia to climate impacts. The combination of environmental and socioeconomic pressures increases the likelihood of adverse consequences for livelihoods, ecosystems and national development objectives.

The following presents a summary of sectoral vulnerabilities and potential impacts.

Agriculture

Observed impacts include recurring drought-related crop losses, pasture degradation, and livestock heat stress. Annual losses from climate hazards - particularly drought, hail, frost, and excessive rainfall - are estimated at AMD 15-30 billion (USD 37-75 million). Extreme events increasingly disrupt production of wheat, potatoes, fruits, and grapes. In drought years, yields in rain-fed regions have fallen by 15 per cent to 40 per cent, while pasture productivity has declined by 7 per cent to 10 per cent, worsening feed scarcity for livestock.

Potential impacts and vulnerabilities include projected declines of up to 24 per cent to 37per cent in the yields of major crops by 2050 without adaptation. Heat stress and reduced soil moisture are expected to increase livestock mortality rates and reduce milk productivity. Pest and disease outbreaks may rise by 15 per cent to 25 per cent in frequency and geographic spread. Smallholders, who form the majority of producers, remain highly vulnerable due to limited irrigation coverage (according to the Land Balance of 2020, approximately 8 per cent of agricultural land is irrigated), low adoption of climate-smart practices, and very low penetration of agricultural insurance.

Water

Observed impacts include seasonal water shortages, declining summer river flows, increased sedimentation, and flood damage. In several basins, summer low-flow volumes have decreased by 20 per cent to 30 per cent over recent decades. Flood-related damage to water infrastructure has increased maintenance needs by 30 per cent to 40 per cent in affected areas. Water quality deterioration, especially in Lake Sevan, has intensified during heatwaves and low-flow years, contributing to algal blooms and ecosystem stress.

Potential impacts and vulnerabilities include hydrological projections showing up to a 39 per cent decline in annual river flow by 2100, and a 20 per cent to 25 per cent reduction in inflows to Lake Sevan by 2030. Competing demands for irrigation, hydropower, and municipal water will intensify, raising risks of supply shortages. Ageing water systems,

low irrigation efficiency (40 per cent to 45 per cent in many systems), and limited basin-level management capacity heighten vulnerability. Water quality risks are expected to worsen, increasing degradation of aquatic ecosystems and treatment costs.

Health

Observed impacts include increased heat stress among vulnerable groups during heatwaves, increased hospitalizations during extreme events, with the number of heatwave days tripling in some regions over the last two decades. Flood-related contamination has led to localized outbreaks of water-borne diseases. The expansion of the habitats (favourable living areas) of carriers and vectors of zoonotic diseases in humans and animals signals an increased risk of disease transmission in high-altitude areas.

Potential impacts and vulnerabilities include substantial increases in heat-related morbidity and mortality, (including infectious diseases) by 2050. The frequency of heatwaves is expected to rise 2–3 times, increasing cardiovascular and respiratory risks. The burden of water- and food-borne diseases may grow in regions with ageing water infrastructure. Health facility damages from floods and landslides are expected to increase the burden on emergency care system and reduce access to healthcare services, particularly in rural areas where service provision is already limited.

Energy

Observed impacts include reduced hydropower generation during drought years and operational disruptions from floods and landslides. Hydropower, which supplies roughly 30 per cent to 33 per cent of Armenia's electricity, has experienced output reductions of 10 per cent to 15 per cent in dry years. Heat extremes reduce the efficiency of thermal plants and transmission systems, increasing operational and maintenance costs.

Potential impacts and vulnerabilities include projected declines of 15 to 20 per cent in hydropower output by 2040 under high-warming scenarios. Declining water resources will further result in insufficient water availability for the cooling systems of TPPs and the nuclear power plant, along with increased electricity demand for system cooling. Increased reliance on imported natural gas may raise electricity prices and energy security risks. Extreme weather events are expected to increase damage to transmission and distribution infrastructure, particularly in hazard-prone regions. Ageing assets and limited diversification of renewable energy sources further heighten sectoral vulnerability.

Tourism

Observed impacts include damage to infrastructure from floods, landslides, and wildfires; reduced attractiveness of natural areas; and disruptions to cultural and nature-based tourism. Winter tourism has already been affected by shorter snow seasons, particularly in Tsaghkadzor, Jermuk, and Ashotsk. During hot summers, heatwaves reduce visitor comfort and increase cooling costs for tourism operators.

Potential impacts and vulnerabilities include further reductions in winter tourism potential, with snow-reliant destinations projected to lose 20 per cent to 40 per cent of snow cover days by mid-century. Increased frequency of floods and landslides threatens access to heritage sites and other touristic areas. Economic losses may rise in rural communities where tourism is becoming a major supplementary livelihood, though systematic data on tourism-specific climate losses remain limited.

Settlements and infrastructure

Observed impacts include damage to homes, public facilities, transport networks, and utilities from floods, landslides, hail, and heat extremes. Urban areas, particularly Yerevan, and rural settlements in mountainous and low-lying marzes (Shirak, Lori, Syunik) have experienced recurring property losses, road closures, and disruptions to water supply and electricity. Extreme rainfall and heatwaves accelerate deterioration of roads, bridges, and energy networks. Annual losses from climate-related events are estimated at AMD 20–40 billion (USD 50–100 million).

Potential impacts and vulnerabilities include projected increases in extreme rainfall, landslides, and heat events, raising the risk of infrastructure failure and service disruptions. By mid-century, 15 per cent to 25 per cent more households – both urban and rural - may be exposed to flood and landslide hazards. Vulnerabilities are heightened by aging, poorly maintained infrastructure, limited adaptive capacity, and low access to emergency services in smaller towns and rural areas. Adaptation needs include climate-resilient urban and rural planning, retrofitting of key infrastructure, slope stabilization, improved drainage, and early warning systems.

Climate risk profile

Armenian climate risk profile is shaped by its exposure and vulnerability to climate-related natural hazards. According to the European Commission's INFORM Risk Index (2019), Armenia ranks 101st out of 191 countries.[70] Figure 35 presents the spatial distribution of climate risks across Armenia, reflecting regional variation in hazard exposure, vulnerability and coping capacity. The map highlights areas where combined physical and socioeconomic factors contribute to higher relative risk levels.

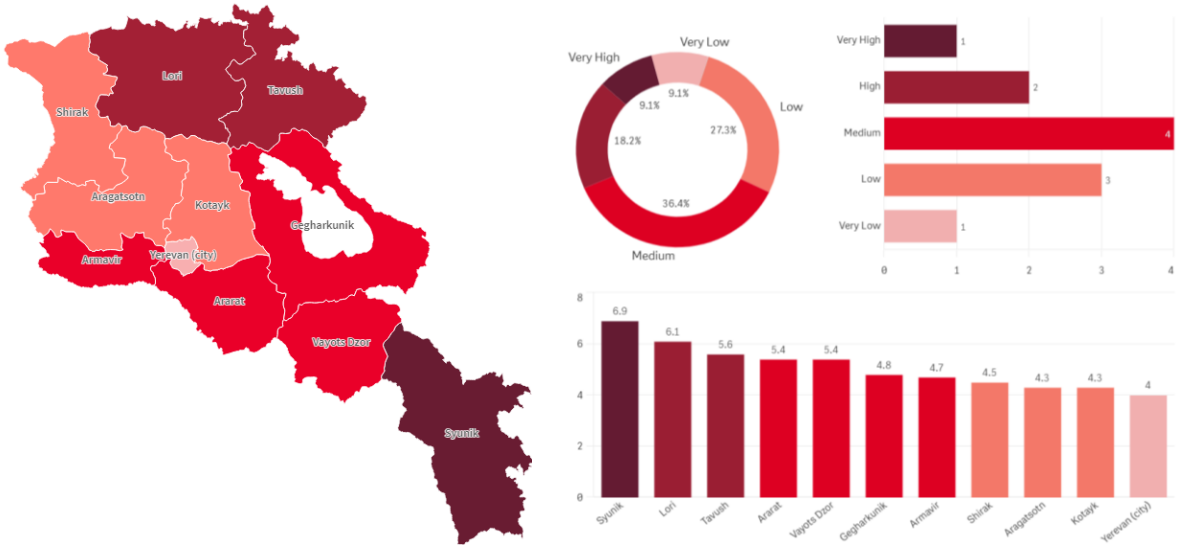

Figure 4-5. Subnational spatial distribution of climate risks across Armenia.

Source: EC, INFORM Risk Index, 2019[71]

[70] WB, ADB, Armenia Country Risk Profile, 2021. *Note: The Inform Risk Index incorporates climate and socioeconomic projections to analyze how risk will change as a result of climate change under different emission and population scenarios.*

[71] European Commission (2019). INFORM Index for Risk Management. Armenia. *https://drmkc.jrc.ec.europa.eu/inform-index*

NDC of Armenia (2021-2030) identifies the following seven sectors as vulnerable to climate change and prioritizes for adaptation: agriculture, water resources, human health, energy, tourism, human settlements and infrastructure, and natural ecosystems. Based on this, in the framework of the UNDP/GCF supported project on national adaptation planning in Armenia (2019-2022), six priority sectors were selected for more in-depth climate risk vulnerability assessment and adaptation planning.

Approaches, methodologies and tools

The assessment approach of current and projected climate trends, hazards and associated impacts in Armenia has been aligned with the IPCC approaches, particularly the methodology for risk and vulnerability assessment (IPCC AR5 conceptual framework), which conceptualizes climate risk as the result of interactions among climate hazards, exposure and vulnerability - with vulnerability further influenced by sensitivity and adaptive capacity - as represented in the IPCC's visual risk framework.[72] In accordance with this methodology, Armenia's adaptation assessments combine observed climate data and downscaled climate projections with sectoral vulnerability analyses across agriculture, water resources, energy, tourism, human health and socio-economic systems to characterize current and future climate hazards and sensitivities.

While there is high confidence in temperature increases, greater uncertainties remain in precipitation and extreme event projections. Meanwhile, challenges in applying the-above-mentioned framework included data gaps at sub-national levels, limited impact functions for specific sectors, and uncertainty about future socio-economic development and adaptive capacity, all of which influence the precision of vulnerability and risk estimates. However, the approach of applying the IPCC methodology for risk and vulnerability assessment has been followed to ensure structured, internationally consistent basis for understanding climate-related vulnerabilities and prioritizing adaptation responses in Armenia.

4.4 Adaptation priorities and barriers

The adaptation agenda of Armenia is based on its international and national commitments and structured plans, reflecting an integrated approach to climate resilience. Under the NDC 2021-2030, the NAP (2020), the Government-approved Water Sector Adaptation Plan (2022-2026), and sector strategies for agriculture and health, Armenia has defined a set of priority areas for adaptation. These priorities are also articulated in National Communications (NCs), and reinforced via legislative instruments such as the Climate Law (in the final stage of approval), the Law on Environmental Impact Assessment and Expertise (2021), and provisions of the Water Code (2022). These priorities span from legal and regulatory reforms, infrastructure improvements and investments, data, monitoring, technologies, gender and social inclusion, subnational planning, to ecosystem-based management, and capacity building. Below is an elaboration of those priorities, current progress and challenges for adaptation barriers.

[72] https://www.researchgate.net/figure/The-IPCC-AR5-conceptual-framework-with-risk-at-the-center-22_fig2_324912485

4.4.1 Domestic priorities and progress towards those priorities

a) Legal and regulatory reform

Armenia recognizes the importance of a coherent legal and institutional framework to mainstream adaptation across sectors. The Climate Law prioritizes establishment of a comprehensive legal basis for climate governance, delineating institutional mandates, coordination mechanisms and long-term planning instruments. It further aims at integrating climate considerations into sectoral strategies, policies, mobilization of financial resources, introduction of innovative finance mechanisms, formation and development of institutional systems for coordination, monitoring and accountability of climate actions, among others. Complementary reforms under the Law on Environmental Impact Assessment and Expertise (2021) and the Water Code are strengthening the consideration of climate risks in environmental and water management decisions. Ongoing revisions of land and forest legislation also consider climate resilience, soil protection and ecosystem restoration principles. Together, these measures seek to provide an enabling environment for systematic adaptation planning and implementation at national and subnational levels.

b) Climate-resilient infrastructure and investment

Enhancing infrastructure resilience is a central national priority, particularly in the water, Energy, Agriculture and health sectors. The Water Sector Adaptation Plan (2022–2026) outlines actions to improve irrigation efficiency, rehabilitate water supply and drainage systems, and integrate climate projections into infrastructure design standards. In the Energy sector, the focus is on upgrading hydropower facilities to adapt to altered river flows, strengthening grid resilience to temperature extremes, and advancing EE and demand-side management. Climate-proofing of agricultural infrastructure - including irrigation technologies, greenhouses and storage facilities that support food security under changing conditions are also prioritized, while in the health sector, measures focus on upgrading health facilities, ensuring climate-proof service delivery and expanding surveillance systems for climate-sensitive diseases. Climate risk screening is recognized as a priority for infrastructure planning and investments to support long-term resilience and sustainable growth, enabling risk-averted investments and helping prevent maladaptation.

c) Data, monitoring and knowledge systems

Strengthening data and monitoring systems is a key national priority to support evidence-based adaptation planning and decision-making. Armenia aims to enhance climate information services, hydrometeorological observation networks and data-sharing mechanisms across sectors and institutions. Digitalization and the adoption of geographic information systems (GIS) and remote sensing for hazard, vulnerability and risk mapping, land-use planning and water resource management are advancing. Efforts are also targeted at strengthening national and sectoral adaptation monitoring systems through the development of harmonized indicators and national databases aligned with adaptation targets. These measures are intended to enable systematic tracking of progress under the NDC and NAP, improve risk forecasting and early warning capacities, and foster greater integration of scientific and local knowledge in resilience planning.

d) Gender equality and social inclusion

Armenian NDC, NAP and its sectoral instruments emphasize that adaptation policies must be inclusive and equitable. Women, smallholder farmers, rural households and communities in hazard-prone areas are among those most vulnerable to climate impacts. Government policy encourages the integration of gender and social inclusion considerations across all adaptation measures. This includes ensuring balanced participation in decision-making, access to finance and technologies, and targeted capacity-building programmes. Collaboration with civil society and local organizations helps to reach marginalized populations and promote community-driven adaptation initiatives that enhance resilience and livelihood security. Capacity-building workshops and awareness-raising campaigns are helping to integrate social inclusion considerations into local adaptation initiatives.

e) Subnational and local adaptation planning

Recognizing that many impacts manifest at the local level, Armenia prioritizes the decentralization of adaptation planning. Armenian NAP supports the integration of climate resilience into regional and community development strategies. Efforts are under way to strengthen local government capacities, mainstream climate considerations into land-use and territorial planning, and align adaptation priorities with socioeconomic development objectives. The Government also promotes the establishment of local adaptation plans and pilot initiatives to demonstrate good practices in community-based adaptation, nature-based solutions and DRR. In this context, the development of SECAPs, in the framework of EU Covenant of Mayors, is under way, with seven signatory communities having already approved SECAPs that incorporate concrete adaptation measures for the 2020–2030 period. These initiatives demonstrate early progress in translating national adaptation priorities into actionable local strategies, while fostering community engagement and resilience-building at the subnational level.

f) Ecosystem-based and nature-based management

Ecosystem-based approaches are increasingly recognized and prioritized as cost-effective and sustainable means of reducing climate risks. Priorities of Armenia include the restoration and sustainable management of forests, grasslands and riparian ecosystems; combating land degradation; and enhancing watershed and biodiversity conservation. Nature-based Solutions are promoted as part of the Water Sector Adaptation Plan and forest landscape restoration programmes. Integration of ecosystem services valuation into planning and investment decisions is also being advanced. These efforts contribute to both adaptation and mitigation goals while strengthening ecosystem resilience and rural livelihoods.

g) Capacity-building, research and knowledge management

A cross-cutting priority is to strengthen institutional and technical capacity for climate adaptation. This includes training government officials, research institutions and local stakeholders in vulnerability assessment, scenario modelling and adaptive planning. Academic and applied research on climate impacts, cost–benefit analyses and adaptation technologies is being expanded. The development of knowledge-sharing platforms and partnerships supports evidence-based policymaking and continuous learning.

h) Technology development and transfer

Armenia recognizes technology development and transfer as a central driver for achieving climate resilience. National priorities focus on strengthening institutional, technical and financial frameworks that facilitate the identification, adoption, and scaling

of climate-smart and resource-efficient technologies across key sectors, including water, Agriculture, Energy and Waste Management.

The NAP (2021) and Technological Needs Assessment (TNA, 2015) of Armenia emphasize innovation, research partnerships, and capacity-building as important areas for promoting adoption of climate-resilient technologies across sectors and prioritize the integration of technologies into sectoral planning. Specifically, the NAP identifies priority adaptation technologies for the agriculture and water sectors, such as climate-resilient irrigation systems, efficient water monitoring and metering, drought-resistant crop varieties, digital farm management systems, early warning and DRM systems, and ecosystem-based adaptation measures. In the Energy and Industrial sectors, emphasis is placed on modernizing energy infrastructure to withstand climate extremes, renewable energy technologies, energy-efficient building materials and smart grid management.

Meanwhile, Armenia's NDC (2021–2030) emphasizes international cooperation for technology transfer and innovation financing, particularly through partnerships with multilateral funds, United Nations agencies and regional initiatives. The government aims to establish enabling environments for private sector engagement in green technology markets, including through fiscal incentives, public-private partnerships and innovation platforms that connect local research institutions with international technology providers.

Overall, the Armenian approach to technology development and transfer reflects a dual focus on enhancing adaptive capacity and advancing green economic modernization, ensuring that technological innovation contributes both to climate resilience and SDGs

4.4.2 Adaptation challenges, gaps and barriers

Armenia faces multiple challenges and a range of cross-cutting and sector-specific gaps and barriers that constrain the effective planning, implementation and scaling up of climate change adaptation measures.

Cross-cutting adaptation challenges, gaps and barriers

The cross-cutting challenges, gaps and barriers span across multiple dimensions, including institutional, legal and governance arrangements, data, knowledge, information and technology systems, financial limitations, socioeconomic and social equity related considerations.

Governance and institutional challenges, gaps and barriers continue to limit adaptive capacity by impeding decision-making, coordination and the flow of resources to priority areas. Climate change considerations are not yet systematically integrated into the functions of key public administration bodies, while cross-sectoral coordination on information collection, analysis, exchange and planning remains insufficient. In some cases, mandates, responsibilities between institutions overlap, which weakens the follow-through. The IACCC for the fulfilment of requirements and provisions of the UNFCCC, serves as a key coordination mechanism, yet its effectiveness is hindered by weak information flows and limited engagement across institutions. In the meantime, lack of formal and functional adaptation monitoring and evaluation (AME) system hinders the country's ability to track progress on adaptation implementation and inform evidence-based decision-making.

Legal and regulatory challenges, gaps and barriers: Armenia has made notable progress in establishing climate policies and sectoral adaptation plans; however, significant gaps remain in the legal and regulatory framework that constrain effective adaptation. Many laws/programmes set general principles but fewer set binding standards or obligations that are based on climate projections and vulnerabilities. Sector-wise, while some sectors have incorporated climate considerations into their development strategies, adaptation has not yet been fully and systematically mainstreamed across all sectors and levels of governance - the energy and tourism sectors remain without fully developed adaptation strategies, and subnational level adaptation planning is still at an early stage. This leaves critical areas of the economy and society insufficiently prepared to address climate risks. In addition, enforcement of existing policies and plans is uneven, limiting their practical impact. Adaptation measures foreseen in strategies are sometimes delayed, underfunded or carried out only partially.

A key gap is also the absence of clear provisions for climate-induced *losses and damages* in Armenian legal and policy frameworks. Current legislation does not fully address economic losses from droughts and floods or non-economic damages such as ecosystem degradation, limiting the country's ability to plan, compensate and integrate these risks into investment and resilience measures.

Data, information and knowledge barriers hinder effective adaptation by constraining awareness and evidence-based decision-making. Climate, hazard, socioeconomic and impact-related data remain fragmented, and access to data, particularly at subnational/community levels, is limited. The absence of locally relevant assessments and disaggregated information restricts regional planners' and communities' ability to understand risks in specific geographic contexts.

Technical and technological barriers: From a technical perspective, there are notable methodological and analytical gaps in several key areas. Armenia lacks standardized tools for assessing *loss and damage* resulting from climate-related hazards, as well as robust methodologies for evaluating *climate risks to critical infrastructure, ecosystem-based adaptation effectiveness* among others. The absence of such frameworks hinders the ability to generate consistent, comparable and policy-relevant data for both national adaptation planning and international reporting. Developing localized yet internationally compatible tools and methodologies would strengthen the evidence base of Armenia, improve planning and support more effective engagement in global climate processes. These shortcomings are further aggravated by insufficient use of modern technologies for data management, sharing and awareness-raising. Challenges in accessing international climate technologies and integrating them into national systems impede the adoption of innovative solutions.

Financial barriers remain a significant constraint for implementation of adaptation measures at national and local levels. Effective adaptation at the local level is constrained by lack of dedicated financing mechanisms, leaving communities dependent on national and donor resources. Increasing levels of adaptation finance, both domestic and international, is essential to enhance resilience.

Socioeconomic barriers significantly influence capacity of Armenia to adapt to climate change. Key sectors of the economy, including agriculture, forestry and water-dependent Industries, such as hydropower, remain highly sensitive to climate variability and rely heavily on natural resources, which increases vulnerability to climate-related shocks. Furthermore, the private sector's role in adaptation planning and implementation

remains minimal, constrained by financial limitations, limited technical capacity and gaps in institutional support, which collectively reduce the scale and sustainability of adaptation efforts.

Sector-specific adaptation challenges, gaps, barriers and opportunities

Adaptation barriers also manifest in sector-specific ways, reflecting the unique exposure, sensitivity and adaptive capacity within different areas of the economy and society. Understanding these sector-specific gaps is critical for designing targeted interventions, optimizing resource allocation and ensuring that adaptation measures are effective, efficient and equitable. The following table outlines key challenges, gaps and barriers, gaps across priority sectors identified in Armenia's NDC.

Table 4-3. Sector-specific challenges, gaps, barriers and opportunities

Sector	Challenges, gaps and barriers	Opportunities
Water Resources	• Reduced water availability and quality due to variable river flows, frequent droughts and over-extraction for agriculture and domestic use	• Strengthening implementation and financing of basin management plans through integration with climate adaptation targets and local development programmes
	• Overuse of groundwater in the Ararat Valley causing pressure decline and threatening irrigation and drinking water supply	• Advancing groundwater management, protection and monitoring measures of aquifer recharge in the Ararat Valley to address over-extraction
	• Ageing infrastructure and high losses in irrigation and water supply systems, with limited capacity and financing for rehabilitation	• Rehabilitation and modernization of irrigation and water supply infrastructure to reduce losses and increase efficiency. Scaling up efficient water-use technologies such as drip irrigation, water reuse and energy-efficient pumping to reduce demand and losses
	• Insufficient monitoring and data on hydrology, snow and groundwater, constraining forecasting and adaptation planning	• Enhanced hydrometeorological, including snow monitoring, groundwater observation networks for improved water balance assessments, forecasting and adaptive decision-making
	• Degradation risks for Lake Sevan from over-abstraction and eutrophication threatening ecosystem balance and water security	• Implementation of Lake Sevan ecosystem restoration measures and pollution control programmes to secure long-term water resilience
	• Limited transboundary cooperation on shared rivers and ecosystems constraining joint adaptation and risk management	• Strengthen transboundary dialogue and data exchange with neighbouring countries through bilateral and regional platforms, supported by international frameworks and technical assistance
Agriculture	• Predominantly rain-fed systems highly vulnerable to droughts and precipitation shifts	• Expand irrigation efficiency programmes, promote climate-resilient water management, and scale up use of drought/heat-tolerant crop varieties
	• Limited access to modern irrigation technologies, water-saving practices and on-farm advisory services	• Incentivize adoption of efficient irrigation systems (e.g. drip, sprinkler), strengthen agricultural extension services
	• Insufficient availability of climate-resilient seed varieties and limited capacity for research, testing and dissemination	• Enhance national seed breeding and testing programmes, and support partnerships between research institutions and farmers for adaptive variety trials

	• Low capacity of smallholder farmers to invest in adaptation due to financial and technical constraints	• Expand access to climate finance and insurance mechanisms, promote microcredit schemes and risk-sharing instruments for smallholders
	• Limited integration of climate risk information and early warning into farm level decision-making	• Improve climate information services, expand agro-meteorological networks and ensure timely dissemination of seasonal forecasts and advisories
	• Degradation and overgrazing of pastures reducing productivity and increasing erosion risks	• Implement sustainable pasture management plans, rotational grazing systems and restoration of degraded pasturelands through reseeding and erosion control measures
	• Reduced availability and quality of fodder due to droughts and shifting precipitation patterns	• Promote climate-resilient fodder crops, improve haymaking and storage practices, and support irrigation where feasible for fodder production
Energy	• High dependence on hydropower makes energy generation vulnerable to reduced water availability, droughts and changing river flow regimes	• Diversify the energy mix by expanding renewables, and introduce adaptive management for hydropower reservoir operations
	• Ageing energy infrastructure and limited climate resilience of transmission and distribution systems	• Modernize and climate-proof energy infrastructure, including reinforcement of grids and climate-resilient design standards
	• Increasing energy demand for cooling due to rising temperatures and more frequent heatwaves	• Promote EE measures in Buildings and Industry, and scale up passive cooling and sustainable urban design solutions
	• Insufficient integration of climate risk assessments into energy planning and investment decisions	• Incorporate climate risk and resilience assessments in national energy planning, investment appraisals and regulatory frameworks
Health	• Higher health risks from heatwaves, particularly for urban and vulnerable populations (elderly, children, people with chronic illnesses)	• Establish and enhance early warning systems, and promote population awareness on heat protection
	• Air quality deterioration and respiratory health impacts linked to urban pollution, dust storms and temperature inversions	• Enhance air quality monitoring, enforce emission controls and promote green urban infrastructure
	• Inadequate data and research on climate-health linkages, limiting evidence-based decision-making	• Expand interdisciplinary research and data collection on climate-health interactions in cooperation with academia and international partners
Tourism	• Increasing temperature extremes and shifting precipitation patterns affecting seasonality of tourism (especially winter and ecotourism)	• Diversify tourism offerings by promoting year-round and climate-resilient tourism activities (e.g., cultural, wellness and rural tourism)
	• Declining snow cover and shorter winter seasons reducing the attractiveness of mountain and ski tourism areas	• Invest in diversification of mountain tourism (e.g. hiking, eco-trails, cultural routes)
	• Increased risk of natural hazards (landslides, floods, wildfires) threatening tourist sites and infrastructure	• Integrate hazard and climate risk mapping into tourism planning and infrastructure design, supported by early warning systems
	• Limited climate risk awareness among tourism operators and local authorities	• Provide training and awareness programmes for tourism service providers and municipalities on climate risks and adaptive management

	• Degradation of natural and cultural heritage sites due to extreme weather and temperature variability	• Implement conservation and maintenance measures for vulnerable heritage sites, and promote sustainable visitor management
	• Insufficient infrastructure resilience (Roads, water supply, Waste management) in key tourist destinations	• Strengthen infrastructure standards and promote sustainable tourism facilities with improved water efficiency and Waste Management
	• Limited integration of climate adaptation into national and regional tourism strategies	• Mainstream climate change adaptation into tourism policy and investment planning, linking it with regional development and green economy programmes
Human settlements	• Increased exposure of urban and rural settlements to climate-related hazards such as floods, landslides and heatwaves	• Integrate climate risk assessments into urban and territorial planning, and implement Nature-based Solutions (NbS) for flood and landslide management
	• Ageing and climate-vulnerable housing stock with low EE and poor insulation	• Promote retrofitting and energy-efficient renovation programmes for residential buildings
	• Limited urban drainage and stormwater management systems, increasing flood risks in cities	• Upgrade drainage and stormwater infrastructure, introduce sustainable urban drainage systems and expand permeable surfaces
	• Insufficient integration of climate resilience into local development and infrastructure investment plans	• Mainstream climate adaptation into municipal development strategies and SECAPs
	• Limited technical and financial capacity of municipalities to implement adaptation measures	• Enhance local government capacity through training, access to climate finance and partnerships with development programmes
	• Rising urban heat island effects and declining air quality due to reduced green spaces and high vehicle emissions	• Expand urban greening and create shaded public spaces to reduce heat stress
	• Inadequate early warning and emergency preparedness for extreme weather events at community level	• Strengthen local early warning systems, community awareness and emergency response mechanisms for climate-induced disasters

Addressing these challenges is critical for strengthening the national adaptation framework of Armenia and building long-term resilience to adverse impacts of climate change.

4.5 Adaptation strategies, policies, plans, goals and actions to integrate adaptation into national policies and strategies

Armenia has developed, adopted and in the process of planning several key policies and strategies that strengthen climate change adaptation at the national, subnational and sectoral levels. In recent years, the country has increasingly integrated climate adaptation considerations into national strategies, legislation and sectoral development planning to enhance resilience to climate impacts. These strategic documents outline targeted short-, mid- and long-term measures to reduce climate risks and support adaptive capacity across priority sectors.

An overview of the most relevant adaptation-related strategies, policies and planning documents is presented in the table below.

Table 4-4. Key sector strategies, plans and policies

#	Key Adaptation Strategies, Plans and Policies	Objectives	Sector	Responsible Party	Gender inclusiveness
1.	Nationally Determined Contribution 2021-2030 of the Republic of Armenia to the Paris Agreement *(adopted by Government Decree N 610-L, 22 April 2021)* https://www.arlis.am/en/acts/151985	• Align the country's climate action with the Paris Agreement by committing to an economy-wide greenhouse gas (GHG) emission reduction of 40 per cent below 1990 levels by 2030. Also, NDC aims to strengthen adaptation measures, integrate green economy principles into development plans, and establish an enhanced transparency and accountability framework to track implementation progress	Cross-cutting	RA Government	Yes
2.	National Action Programme of Adaptation to Climate Change and List of Measures for 2021-2025 *(adopted by Government Decree N 749-L, 13 May 2021)* https://www.arlis.am/en/acts/152612/print/act (Arm) https://unfccc.int/sites/default/files/resource/NAP_Armenia.pdf (Eng)	• Reduce the country's vulnerability to climate change by strengthening institutional, technical and financial capacities to plan, implement and monitor adaptation actions across priority sectors. The NAP aims to integrate climate risk considerations into national and sectoral development planning; enhance climate-resilient policies, systems, and infrastructure; and support evidence-based decision-making to safeguard communities, ecosystems and the Economy from current and future climate impacts	Cross-cutting	Ministry of Environment	Yes
3.	Water Sector Adaptation Plan (WSAP) and its Programme of Measures for 2022-2026 *(adopted by Government Decree N 1962 L, 3 November 2022)* https://www.arlis.am/hy/acts/188853	• Establish the required legal, economic, technical and institutional prerequisites to contribute to the reduction and management of climate risks, taking into account the risk predictions and impacts of climate change, aiming to reduce socioeconomic negative consequences, losses and damages and to benefit from emerging opportunities. • Climate change adaptation considerations are integrated into the Water Sector Action Plan and	Water	Ministry of Environment	Yes

#	Key Adaptation Strategies, Plans and Policies	Objectives	Sector	Responsible Party	Gender inclusiveness
		its Programme of Measures for 2022-2026			
4.	Strategy for Restoration of Lake Sevan Ecosystem for 2025-2030 *(Draft Decree is under development)* https://ecoportal.am/en/sevan/download/document/689d411b-d0e5-4614-96b9-b77778779849/	• Provide a strategic pathway with a list of relevant actions that will lead to a significant restoration of Lake Sevan by 2030 and stabilization of the ecosystem. To improve the ecosystem of Lake Sevan, three groups of environmental targets have been identified: raising the lake level, improving water quality and intersectoral targets	Water	Ministry of Environment	Yes
5.	2023-2026 Action Plan for Implementation of the Agricultural Sector Strategy for 2020-2030 *(adopted by Government Decree N 1222-L, 20 July 2023)* https://www.arlis.am/hy/acts/180654/latest	• The 10-year vision is to have an agriculture sector that is sustainably developing, innovative, creates high added value, cares for natural resources and is in harmony with the environment, creates ecologically clean products and guarantees the well-being of people living in the countryside. This strategy is based on seven principles and is also aimed at inclusive growth, gender equality and institutional stability. Principle #6 is aimed at ensuring climate change adaptation, resilience and environmental sustainability through implementation of climate change awareness, adaptation, and mitigation measures for sustainable use of resources, ensuring the development of the agricultural sector by applying best practices in water and land resource management. • Climate change adaptation considerations are integrated into the Agriculture Sector Strategy and Action Plan.	Agriculture	Ministry of Economy	Yes

#	Key Adaptation Strategies, Plans and Policies	Objectives	Sector	Responsible Party	Gender inclusiveness
6.	"Food Security System Development Strategy and Action Plan for 2023-2026" *(adopted by Government Decree N 1083-L, 29 June 2023)* https://www.arlis.am/hy/acts/179892	• Ensure physical and economic access to food that meets health standards for all groups of the population, as well as to create prerequisites for resisting adverse changes in the domestic and external markets and the negative consequences of possible emergency situations. • The Strategy takes into account the considerations of the NAP (2021-2025), the Agriculture Sector Strategy (2020-2030), the Disaster Risk Management Strategy (2023-2030), and the Government Programme (2021-2026) and Transformation Strategy of Armenia for 2020-2050. It further recognizes the importance of ensuring resilience of food systems to climate risks, as well as the rights of women in food security. • Climate change adaptation considerations are integrated into the Food Security Strategy and its Programme of Measures	Agriculture	Ministry of Economy	Yes
7.	Agricultural Land-Use Efficiency Concept and Programme of Measures *(adopted by Government Decree N 68-L, 23 January 2020)* https://www.arlis.am/hy/acts/138498/latest	• Seeks to define the key directions of state policy to enhance the effective use of agricultural land. Its implementation is expected to improve land-use efficiency, strengthen agricultural productivity, bolster national food security and contribute to increased gross agricultural output	Agriculture	Ministry of Economy	NA
8.	Tourism Sector Strategy for 2026-2030 *(Draft Decree pending approval by the Government)*	• Position Armenia as an attractive, high-quality, safe and competitive boutique tourism destination throughout the year, offering holistic experiences grounded in the country's unique culture and pristine natural environment, while fostering inclusive and equitable economic development nationwide. • One of the principles of the Strategy is to strengthen resilience as a foundation for sustainability. The Strategy and its	Tourism	Ministry of Economy	Yes

#	Key Adaptation Strategies, Plans and Policies	Objectives	Sector	Responsible Party	Gender inclusiveness
		Action Plan underscore the need to enhance the tourism ecosystem's capacity to withstand geopolitical, economic, climate, and health-related risks/shocks. • It also aims at promoting inclusiveness and diversity in the tourism sector – both in employment and in service delivery – by ensuring equitable access and meaningful participation of women, youth, older persons and persons with disabilities. • Climate change adaptation considerations are integrated into the Tourism Sector Strategy			
9.	National Healthcare Strategy 2023-2026 and Programme of Measures *(adopted by Government Decree N 174-L, 9 February, 2023)* https://www.arlis.am/hy/acts/180350	• Establish guiding priorities for sector development in the coming years, with the aim of safeguarding population health, reducing morbidity and premature mortality, improving quality of life and increasing average life expectancy in the Republic of Armenia. • To achieve its objectives, the Strategy recognizes the need to assess health sector vulnerabilities to climate change and to reduce related impacts through the development and implementation of targeted adaptation measures. • Climate change adaptation considerations are integrated into the Healthcare Strategy and its Programme of Measures	Health	Ministry of Health	Yes
10.	Disaster Risk Management Strategy for 2023-2030 and 2023-2026 Action Plan *(adopted by Government Decree N 1717-L, 5 October 2023)* https://www.arlis.am/hy/acts/183691	• Establish an agenda in line with the Sendai Framework for Disaster Risk Reduction 2015-2030 and build a safe and resilient state and foster a culture of security, ensuring the protection of individuals, communities and society from disaster risks while promoting sustainable development grounded in risk awareness.	Cross-cutting	Ministry of Internal Affairs	Yes

#	Key Adaptation Strategies, Plans and Policies	Objectives	Sector	Responsible Party	Gender inclusiveness
		• Form a national risk management system with continuously developing capacities aligned with international standards. The system will include decision-making, implementation, and monitoring mechanisms focused on: (a) disaster risk reduction; (b) effective emergency response; and (c) post-disaster recovery. It prioritizes the protection of the most vulnerable groups of the population and ensures gender equality in the DRM processes			
11.	Government Programme for 2021–2026 *(adopted by Government Decree N 1363-A, 18 August 2021)* https://www.arlis.am/hy/acts/155313	• Emphasizes environmental protection policies aimed at strengthening the country's resilience to climate change by promoting the adoption of effective adaptation practices. • The Programme incorporates a list of activities focused on climate change adaptation and strengthening resilience	Cross-cutting	RA Government	NA
12.	Action Plan of the Government Programme for 2021–2026 *(adopted by Government Decree N 1902-L, 18 November 2021)* https://www.arlis.am/hy/acts/158031 *Adopted by Government Decree N 2300-L, 25 December 2023)* https://www.e-gov.am/gov-decrees/item/41907/	• Outlines numerous measures to implement the Programme, including actions related to adaptation, climate resilience and DRR across various government ministries, with particular coordination by the MoE	Cross-cutting	RA Government	NA
13.	2025-2028 Strategy and Action Plan for Implementation of Gender Policy in the RA *(adopted by Government Decree N 482–L, April 23, 2025)*	• Priority 6. Develop gender-sensitive and gender-responsive approaches to climate change, applying inclusive principles and raising awareness	Cross-cutting	Ministry of Social and Labour Affairs	Yes

#	Key Adaptation Strategies, Plans and Policies	Objectives	Sector	Responsible Party	Gender inclusiveness
	https://www.arlis.am/hy/acts/206364/latest				
14.	Armenia Action Plan for 2022-2024 under United Nations Security Council's Resolution 1325 "Women, Peace and Security" *(adopted by Government Decree N 803-L, 2 June, 2022)* https://www.arlis.am/hy/acts/163530	• Section II, Point 1: Participation, Goal 4: Ensure women participation in the development of policies and decision-making regarding the climate change mitigation and adaptation programmes at the national and community levels. (*The decision fully addresses the problems of women and girls in crisis referring to their security component.)*	Cross-cutting	Ministry of Social and Labour Affairs	Yes

Stakeholder engagement in adaptation planning and implementation

Stakeholder engagement has been a foundational element of Armenia's adaptation governance framework and has been embedded across the formulation and implementation of adaptation strategies, policies and plans. The development of the NAP and key sectoral adaptation instruments has been informed by broad consultations involving line ministries, regional and local authorities, academia and research institutions, civil society organizations, private sector actors and development partners. These participatory processes have helped ensure that adaptation priorities reflect sector-specific vulnerabilities, local development needs and implementation capacities, while strengthening national ownership and policy coherence.

Integration of gender perspectives and indigenous, traditional and local knowledge into adaptation

Integrating gender perspectives and indigenous, traditional and local knowledge into adaptation is critical for effective, equitable and sustainable adaptation interventions. NAP and sectoral plans of Armenia, strategies explicitly recognize the importance of gender-responsive approaches and community knowledge in shaping locally appropriate and socially inclusive measures that reflect differentiated vulnerabilities and capacities.

Recent capacity-building efforts have strengthened the understanding of women's roles in climate action and advanced gender mainstreaming across policies – under coordination of the IACCC and the Gender Working Group chaired by the Deputy Minister of Labour and Social Affairs. *However, limited gender-disaggregated data and indicators constrain systematic monitoring and tracking of gender-differentiated outcomes.*

Regional adaptation planning increasingly draws on community observations (a good practice example is shared in Section 4.8) and traditional practices. In Shirak and Tavush, consultations have informed regional plans by identifying measures such as crop diversification, seed preservation, pasture rotation and gravity-fed irrigation. NbS also build on local knowledge, such as erosion control using native vegetation and terracing.

Rural women play a growing role in self-adaptation through agrotourism and gastrotourism, establishing guesthouses, hosting master classes, and producing traditional foods. These activities help diversify income, rely on long-standing skills and help offset agricultural losses and high level of male migration.

While progress has been made for incorporating indigenous, traditional and local knowledge into adaptation – particularly through participatory planning, targeted capacity-building and recognition of community practices – further efforts are needed to systematically document, apply and monitor the traditional and gender-responsive approaches across sectors for assessing their effectiveness and creating replicable models for scale up. Continued institutional support and local engagement remain key to ensuring that adaptation measures are inclusive, culturally grounded and responsive to community priorities.

Adaptation Actions with Mitigation Co-Benefits in Armenia

National and sectoral adaptation measures of Armenia integrate actions that yield mitigation co-benefits, thereby advancing both resilience and low-emission development pathways. Key sectors where this synergy is emerging include water management, agriculture, land restoration and energy-efficient infrastructures.

Water management: The WSAP for 2022-2026 outlines measures and investments in watershed restoration, flood risk prevention, improved irrigation and catchment-based ecosystem management, which reduce climate vulnerability while simultaneously supporting the carbon sequestration resulting from improved soils, lowering energy demand for pumping and treatment, thereby reducing greenhouse gas (GHG) emissions.

Sustainable agriculture and land management: Through the Agriculture Strategy 2020-2030 and associated adaptation frameworks, Armenia promotes climate-smart agriculture, agroforestry, reforestation, landscape restoration, sustainable land management, improved soil carbon management and reduced fertilizer dependency. These adaptation actions strengthen food security and resilience and contribute to mitigation by increasing soil carbon stocks through carbon sequestration, reduced land degradation emissions.

Energy-efficient adaptation infrastructure: Adaptation interventions included in the draft Energy Sector Adaptation Plan and the WSAP for 2022-2026, such as water-saving technologies, efficient irrigation and energy-efficient water management, retrofitting buildings for climate resilience and upgrading water/energy infrastructure, embed EE and renewable technologies. By reducing energy consumption and shifting towards lower-carbon supply, they provide strong mitigation co-benefits while improving adaptation outcomes.

Institutional implications: Development of an adaptation M&E system by Armenia provides a platform to track not only adaptation progress but also the above-presented synergistic outcomes. Leveraging these co-benefits will help align investment priorities, facilitate national reporting under the ETF, and attract climate finance that addresses both adaptation and mitigation.

Integration of Climate Change into Development Planning and Capacity-Building Efforts

Armenia has progressively integrated climate change considerations into national development planning, and institutional programming, demonstrating a growing policy coherence between adaptation, mitigation and sustainable development objectives.

Climate action has become a cross-cutting element within key government planning frameworks, supported by international cooperation and technical assistance.

Institutionally, the MoE serves as the coordinating authority for national climate policy, ensuring alignment across government bodies. Inter-ministerial coordination is supported by the IACCC, which facilitates mainstreaming adaptation priorities into sectoral policies and donor-funded programmes. At the operational level, the ministries of Economy, Territorial Administration and Infrastructure, Health and Internal Affairs have specific mandates to implement adaptation measures within their sectors. They work closely with regional and local authorities to integrate climate resilience into development planning, infrastructure projects and public services. Additionally, technical support and capacity-building initiatives are provided through partnerships with international organizations, development agencies, and climate finance mechanisms to ensure effective implementation of climate adaptation and risk reduction strategies across sectors and country.

Capacity-building efforts have been central to enabling integration of climate change into development planning - both during development process of the NAP and in subsequent implementation efforts. With support from UNDP, the GCF, the GEF, the European Union and other partners, Armenia has implemented extensive training programmes for national and subnational institutions on climate risk assessment, vulnerability mapping and climate-responsive planning.

The country, however, needs further strengthening of its institutional mechanisms, data systems and technical skills to ensure that development planning contributes to resilient growth, supports the achievement of the SDGs, and aligns with the implementation of the Paris Agreement under the ETF.

Integration of climate change into local level adaptation planning

At the subnational level, Armenia has taken concrete steps to integrate climate change considerations into local development planning. To date, Sustainable Energy and Climate Action Plans (SECAPs) have been developed for eight communities of Armenia (out of 30 signatory communities in the country), including Gavar, Tashir, Vanadzor, Alaverdi, Spitak, Stepanavan, Gyumri and Yerevan (of which seven are already formally approved and slated under implementation by 2030). These efforts have been backed by EU4Energy Efficiency projects, UNDP/EU4Climate and USAID in Armenia. Work is currently under way to prepare SECAPs for an additional 11 municipalities in Armenia in 2026, including with GIZ-Armenia contribution.

These local level plans promote climate-resilient local development by combining EE, renewable energy deployment, and community level adaptation measures such as improved water management, green infrastructure and DRR.

Capacity-building and awareness-raising are integral components of the efforts of Armenia to mainstream climate action in local level. With support of a number of international partners, the MoE has organized extensive training programmes for regional and community authorities on vulnerability and risk assessment, adaptation planning and implementation of SECAP actions. Training sessions have enhanced municipal capacities to identify climate priorities and integrate adaptation measures into community development plans. These efforts have also promoted gender-responsive and inclusive approaches to local adaptation governance.

A methodological guide on "Development of climate change adaptation programmes for settlements" has been developed with UNDP NAP Programme's support and distributed to local governments in 2022 to support integration of climate change into municipality development planning, addressing climate-related risks and implement adaptation initiatives. While municipalities have received guidance, further technical and financial support is required to integrate adaptation measures effectively into urban and rural planning and proceed with implementation.

Nature-based solutions to climate change adaptation in Armenia

Armenia recognizes NbS as an essential approach to strengthening resilience to climate change. Ecosystem-based adaptation (EbA) and NbS are explicitly embedded as core principles in Armenian NDC and NAP, underscoring that the protection, sustainable management and restoration of ecosystems and the ecosystem services they provide form the foundation of climate change adaptation in Armenia.

NbS have been integrated across national and sectoral policies and are increasingly reflected in adaptation projects supported by international partners.

A range of NbS interventions have been carried out or planned through national (particularly with MoE's Environmental Projects Implementation Unit (EPIU)) and donor-funded programmes in Armenia, some of those include:

- *Ecosystem restoration and afforestation* in mountainous and semi-arid zones (Tavush, Lori, Gegharkunik), reducing soil erosion, landslide risk and flooding while enhancing local carbon storage
- *Riparian buffer restoration and floodplain rehabilitation*, planned under the WSAP and river basin management planning processes, improving flood control and water quality
- *Sustainable land management and agroforestry practices* promoted through FAO, GEF, and UNDP projects, including soil fertility restoration, planting and vegetative buffering that increase land productivity and drought resilience
- *Wetland and pasture rehabilitation* in selected highland ecosystems, improving biodiversity and water retention functions critical for downstream communities
- *Community level green infrastructure*, such as urban greening and slope stabilization, supported through the European Union and UNDP projects, reducing heat stress and improving local adaptation capacity

Co-benefits and contribution to national priorities. These NbS interventions are delivering multiple co-benefits beyond adaptation, including enhanced carbon sequestration, biodiversity conservation and improved livelihoods. They support the commitments of Armenia under the Paris Agreement, the NDC, SDGs - particularly SDG 13 (Climate Action), SDG 15 (Life on Land), and SDG 6 (Clean Water and Sanitation).

Armenia plans to further integrate NbS into regional and local development planning, particularly through community-based adaptation projects and the expansion of SECAPs. The forthcoming operationalization of the AME system will allow the Government to better assess and report on the effectiveness of NbS and their contributions to resilience and mitigation co-benefits under the ETF.

4.6 Progress on implementation of adaptation

Since the adoption of Armenian NAP, the country has made steady advancements in integrating climate risk considerations into national, sectoral and subnational planning. Significant progress has been achieved across priority sectors – including water, agriculture and health – where adaptation actions have been approved or integrated into respective sector strategies[73] and are now under implementation. Institutional strengthening has equally advanced, marked by the establishment of the Inter-Agency Climate Change Coordination Council, development of M&E guidelines, and preparation of resource mobilization and communication approaches to support the NAP process. Subnational progress has also begun, with adaptation plans prepared for four regions (marzes), and development initiated for the others. While several sectoral and enabling activities are ongoing or pending integration and approval – particularly in Energy, tourism and Forestry - work is under way to strengthen data systems, early warning capabilities and capacity development. Efforts towards the second NAP cycle (2026–2030) remain at an early stage. Overall, these actions are being implemented in line with the adaptation priorities set out in Armenia's NDC, particularly regarding strengthening climate resilience, improving governance and coordination, enhancing climate information and early warning systems, and advancing decentralized adaptation planning.

Summary of Key Achievements with National Adaptation Plan Implementation[74]

- 17 measures completed: including development and submission to the Prime Minister's office of adaptation plans for five sectors (of which 3 - water, agriculture, health –already approved and under implementation; 2 - Energy and tourism – in the process of integration into sector strategies), development of guidelines for preparation of climate change adaptation plans for settlement and marzes (sixth sector), development of adaptation plans for four regions (Shirak, Tavush, Gegharkunik and Syunik), establishment of Inter-Agency Climate Change Coordinating Council, development of strategic documents on adaptation communication and outreach, financial resources mobilization approaches, NAP evaluation and monitoring guidelines, action plan to improve climate change projections and early warning systems, training modules for decision makers, revision of construction norms, revision of the RA Law on Environmental Impact Assessment and Expertise, among others
- 6 measures ongoing: including the development of adaptation plans for transport infrastructures and forestry, climate adaptation plans for six regions (marzes), among a couple others
- 3 measures pending: including development of the NAP II for 2026–2030, an analysis of the 2021–2025 adaptation programme implementation, development of strategy on climate change adaptation-oriented technologies

[73] https://www.arlis.am/hy/acts/188853;
https://www.irtek.am/views/act.aspx?aid=157494#p22;
https://www.arlis.am/hy/acts/180350

[74] https://ndcpartnershipplans.com/public/view/bce1c0ff-6f1a-4db4-8053-35fccdbadf58

Progress with implementation of approved adaptation measures by the Government in water, agriculture and health sectors[75]

While Armenia has made solid progress in establishing the policy and planning frameworks, implementation of adaptation measures at sectoral and local levels is still lagging, due to limited financing and technical capacities. Full-scale implementation of sectoral measures requires more and sustainable financing, stronger monitoring and verification systems, data and information improvements, enhanced institutional and local capacities.

- Water Sector Adaptation Plan (WSAP) with its Programme of Measures for 2022-2026
  - Feasibility study for construction of 5 (out of 6) prioritized reservoirs, has been implemented through Government of Armenia support (addressing Measures #2).
  - With support from donor organizations (UNDP, USAID) and the state budget, several hydrological and meteorological monitoring stations have been upgraded, modernized, and rehabilitated, including the Semyonovka and Vardenyats hydrological posts (addressing Measure #3).
  - Irrigation water quality standards were developed and formally approved by the Acting Head of the "National Standardization and Metrology Authority" CJSC under the Ministry of Economy on 28 June 2024 (addressing Measure #6).
  - With support from the EU4Environment: Water Resources and Environmental Data project, the manual "Nature-based Solutions for River Basin Management" was developed, presenting replicable examples of NbS for flood prevention and stormwater management (addressing Measure #9).
  - Amendments to the Water Code introduced definitions related to floods and flood risk management and added relevant provisions (partly addressing Measure #11).
  - Under the EU4Environment project, a draft quantitative water management plan for the Kasakh River Basin was prepared; it will support maintenance of the environmental flow within the basin (addressing Measure #15).
  - Notable progress has been made in promoting integration of climate change considerations into private sector initiatives (addressing Measure #16).
  - Development of indicators to support M&E of climate change adaptation in the water sector was initiated in 2022 (addressing Measure #17).
  - With support of USAID Armenia Improved Water Management Programme, the rates and structure of natural resource use fees and environmental taxes for groundwater and surface-water abstraction were revised and submitted to the Government for approval and integration into the Tax Code (addressing Measure #18);
  - With support from the UNDP/GIZ EU4Sevan Project, a long-term national vision for Lake Sevan has been developed to inform the preparation of a strategy for restoration of the Lake Sevan ecosystem, taking into account climate change considerations (addressing Measure #19);

[75] https://ndcpartnershipplans.com/public/view/bce1c0ff-6f1a-4db4-8053-35fccdbadf58
https://mineconomy.am/media/32643/Razm1.pdf
https://mineconomy.am/media/28119/1.pdf
https://moh.am/uploads/hashvetv%20174-++%2019.03.pdf

- Capacity-building workshops and trainings were conducted for community leaders across almost all regions, focusing on water sector vulnerability and climate change adaptation, with a gender-responsive approach (addressing Measure #24).

- Agriculture Sector Strategy Implementation Action Plan for 2023-2026

Progress made refers to the following in particular:

- Promotion of certified seeds, seedlings and planting material production through scientific centres, registered seed producers and nurseries (addressing Measure #1.1)
- Promotion and dissemination of advanced irrigation technologies (addressing Measure #1.5)
- Implementation of the Intensive Horticulture Development Programme (addressing Measure #1.9)
- Establishment of a system for forecasting and early warning of hazardous hydrometeorological phenomena (addressing Measure #1.12)
- Implementation, M&E of the agricultural insurance pilot programme (addressing Measure #1.13)
- Development of new agricultural insurance products, in particular for agricultural crops, agricultural animals and agricultural property (addressing Measure #1.14)
- Implementation and improvement of the animal identification system (addressing Measure #2.4)
- Introduction of a rapid response system for outbreaks of the most dangerous diseases and pests (addressing Measure #2.8)
- Preventive measures against the penetration and spread of diseases and pests in the context of climate change (addressing Measure #2.9)
- Capacity-building of the Ministry of Economy and capacity building of rural enterprises in the context of the introduction of advanced technologies in agriculture and climate change (addressing Measure #5.1)
- Digitalization of the implementation process of agricultural support programmes (addressing Measure #7.1)

<u>Challenges and Delays with national and local level adaptation implementation</u>

The delays with implementation of national, sectoral and local level adaptation measures is mostly due to the following challenges:

- Institutional and inter-ministerial coordination challenges: fragmented institutional responsibilities; frequent institutional restructuring or policy turn over causing loss of momentum, plans' further revisions or re-prioritization
- Technical and capacity constraints: Limited technical expertise, specialized staff, and human resources within the national and local government
- Data and information limitations: Limited data-sharing mechanisms across agencies, gaps in vulnerability and climate impact data, which slow planning and investments
- Insufficient financing and budget allocation: Lack of dedicated national budget lines for adaptation creates uncertainty leading to partial implementation and dependence to external funding; limited ability to mobilize international climate finance due to administrative capacity gaps; co-financing requirements

sometimes difficult to meet; uncertain or unpredictable long-term financing undermines continuity of multi-year measures, shifting donor priorities due to government Administration changes may impede continuous funding

4.7 Monitoring and evaluation of adaptation actions and processes

In recent years, Armenia has made progress towards establishing a national framework for monitoring and evaluating adaptation. With support of the UNDP/GCF NAP project, under the coordination of the MoE a comprehensive AME Framework and Road map has been developed,[76] along with pilot indicators for the water and agriculture sectors and Standard Operating Procedures for operationalization of AME framework. These pilots will be expanded to other climate-vulnerable sectors as part of scaling up the AME system.

Current efforts focus on extending the indicator set, institutionalizing the AME Framework and securing formal approval through a government or ministerial Decree to ensure long-term implementation. This process will also support the creation of a national Information and Data Management System and formal data-sharing arrangements across institutions.

The MoE, through its IACCC, is expected to coordinate the AME system, provide technical review, validate the data and endorse the results. This reflects the Government's commitment to a systematic, evidence-based and gender-responsive approach to tracking adaptation. Once fully operational, the AME system will enable Armenia to meet its Paris Agreement ETF reporting requirements by providing structured and verifiable information on adaptation actions and their effectiveness.

The table below provides an overview of progress of Armenia towards establishing an AME Framework consistent with MPGs of the ETF.

Table 4-5. Progress of Armenia towards establishing an AME Framework

ETF / BTR Reporting Element	Corresponding AME Component / Output	Basis	Status
Institutional arrangements, policies and regulations for adaptation monitoring	Defined roles for MoE (Climate Policy Dept.), IACCC, and its Working Group on Reporting & Transparency	SOP for AME System (2023)	Established
Methodologies and frameworks for assessing adaptation actions and outcomes	Conceptual AME Framework: multilevel design, indicator typology (contextual/process/result), M&E cycle	Adaptation M&E Framework (2023)	Completed
Indicators for monitoring adaptation progress	Indicators' set (for water and agriculture sectors) with baseline, source, frequency, responsible body	Indicators Report (2023)	Completed for two sectors; to be scaled up and approved for implementation
Institutional and information arrangements for data	SOP reporting templates, QA/QC procedures	SOP for AME System (2023)	Developed

[76] https://nature-ic.am/en/publications/development-of-an-m&e-framework-for-climate-change-adaptation

collection and management			
Process to ensure quality and reliability of information	QA/QC templates, verification steps, Working Group review and approval	SOP for AME System (2023)	Developed
Progress in implementation of adaptation actions	Reporting templates at 1–4 levels	SOP for AME System (2023)	To be tested
Evaluation of adaptation effectiveness	Result indicators, outcome-level analysis and 5-year synthesis reporting cycle	Adaptation M&E Framework (2023)	T be implemented upon formal adoption of indicators
Lessons learned, challenges and good practices	Annual synthesis report and periodic review process under MoE coordination	Adaptation M&E Framework (2023)	To be implemented

4.8 Information related to averting, minimizing and addressing loss and damage associated with climate change impacts

Armenia faces increasing extreme weather events and climate-related hazards - including cases of floods, droughts, heatwaves and landslides - that have generated more than USD 1.5 billion in economic losses over the past 25 years, with disproportionate impacts on rural, particularly on climate-dependent communities. To avert and minimize future loss and damage, the country is integrating climate risk management into national strategies, sectoral policies and development planning. Key frameworks such as the NAP (2021) and the Disaster Risk Management Strategy (2023–2030) establish institutional mandates, prioritize adaptation measures, and guide prevention, preparedness and recovery efforts.

Practical actions to reduce loss and damage before it occurs include modernization of the Armhydromet service, expansion of hydrometeorological observation networks, enhancing hazard mapping and improvements to technological forecasting and early warning systems. Sector-specific measures - particularly under the WSAP (2022–2026) – promote irrigation modernization, integrated water resources management, climate-resilient infrastructure and ecosystem restoration. Complementary agricultural initiatives supported by FAO, IFAD and UNDP advance climate-smart practices that help stabilize yields, safeguard livelihoods and reduce climate-related economic and non-economic losses.

Additionally, to strengthen the country's capacity to address loss and damage once it occurs, Armenia has recently developed a Technical Guide for Climate Risk and Loss and Damage Assessment and an analytical report on methodological approaches tailored to national needs. These tools provide unified procedures, indicators, data requirements and institutional roles for systematic loss and damage quantification.

The recently developed Technical Guide for Climate Risk and Loss and Damage Assessment, together with the Analytical Report, clarify institutional roles, data flows and coordination mechanisms, providing a standardized basis for systematic loss and damage assessment and reporting across national and subnational levels.

Armenia aims to further strengthen its capacity to avert, minimize and address loss and damage by scaling up risk-informed planning, improving climate data systems and

expanding locally driven resilience measures. Continued alignment of adaptation finance with national priorities, stronger coordination across institutions and deeper integration of loss and damage considerations into sectoral investment decisions will be critical. By advancing these efforts, Armenia seeks not only to reduce the impacts of future climate hazards but also to build a more resilient, adaptive and inclusive development pathway for communities across the country.

Looking ahead, Armenia intends to strengthen its reporting on loss and damage in future BTRs by incorporating quantitative data, statistics and figures, as data availability and institutional capacities improve. This progressive approach will improve transparency, comparability and evidence-based decision-making in addressing loss and damage.

4.9 Cooperation, good practice, experience and lessons learned

International cooperation

International cooperation with Armenia for adaptation is characterized by diverse bilateral and multilateral agreements, technical cooperation with donor countries, and framework treaties with partner institutions – all oriented towards strengthening resilience, supporting adaptation implementation and integrating climate action into national development.

These agreements enable the creation of joint mechanisms, knowledge-sharing platforms and financing channels that align national adaptation policies with international standards and best practices. They demonstrate that adaptation efforts of Armenia are not isolated but embedded in a global and regional architecture of cooperation.

Regional cooperation

Armenia has engaged in regional cooperation to support climate change adaptation, particularly through the EU Eastern Partnership, UNDP-GCF readiness initiatives, UNDP-GEF CBIT Global Support Programme (GSP) and other initiatives. These platforms have facilitated exchange on vulnerability and loss and damage assessment methodologies, DRR, water management, AME frameworks and climate finance with regional countries. Programmes such as EU4Climate strengthened the NAP process of Armenia while promoting knowledge-sharing with neighbouring countries. Regional collaboration on hydrometeorological data, observations, joint monitoring (under the support of USAID Armenia), transboundary risk management, along with other climate studies have proven beneficial in harmonizing approaches, strengthening technical capacities, improving early warning systems, among others. Key lessons learned highlight the value of application of standardized assessment tools and approaches, importance of peer-to-peer learning and integrated DRR–adaptation planning for strengthening resilience within the South Caucasus region and the wider region.

Local cooperation

Adaptation implementation in Armenia at the local level has been supported through a combination of national implementing entities, municipal planning instruments and international cooperation. The EPIU of the MoE plays a central role in implementing local level adaptation projects working closely with municipalities and local institutions. Successful cooperation has been observed in projects that combine technical expertise, local ownership and financial support. The Forest Resilience initiative in Lori and Syunik regions, implemented with GCF support in partnership between EPIU, FAO, local

municipalities and community groups, is an illustrative example of successful cooperation at local level to build forest resilience by restoring degraded forests and strengthening ecosystem services. Through this partnership, over 500,000 seedlings were carefully nurtured in regional nurseries, with farmers and local volunteers actively participating in the planting and monitoring. Technical experts shared climate-smart forestry practices, while communities contributed through invaluable local knowledge about the terrain and water cycles. Such initiatives highlight that climate resilience can be built not only through external inputs (top-down approach), but by means of local collaboration, active participation engagement of communities, knowledge-sharing, trust, and strong sense of local ownership (bottom-up approach).

Another inspiring example comes from municipal SECAP development: eight municipalities across Armenia have now developed Sustainable Energy and Climate Action Plans (SECAPs). In these towns, local officials, civil society, and technical experts sit around the same table analysing vulnerabilities, prioritizing actions and designing projects for sharing with donor organizations for financing and implementation. These initiatives demonstrate how national policies can be translated into actionable local solutions, resulting in improved resilience through measures such as upgraded water infrastructure, climate-smart urban planning, NbS, ecosystem restoration and other locally tailored interventions. They highlight the value of local partnerships, while underscoring the importance of sustained local technical capacity and financing to ensure effective and lasting implementation.

Lessons learned from local cooperation

- Close coordination with municipalities improves local ownership and long-term sustainability
- Knowledge-sharing among municipalities accelerates uptake of best practices
- Institutionalizing local knowledge in planning improves long-term outcomes
- Municipalities require stable technical capacity and long-term financing for local level adaptation implementation
- Multi-partner alignment with municipal strategies increases synergy and reduces duplication
- Continuous data-sharing between local and national institutions improves adaptation tracking, among others.

Efforts to share information, good practices, experience and lessons learned

Good Practice Example 1: Empowering Women's Leadership in Climate Action in Armenia

Since 2019, the UNDP Climate Change Programme has championed the active engagement of women climate policy and action in Armenia. Through a series of workshops, trainings and awareness initiatives conducted with government institutions and civil society, the Programme has strengthened understanding of women's role as key agents of change and highlighted persistent gender gaps across the climate action value-chain.

A flagship initiative emerging from these efforts was the "Climate Change and Women in Armenia" Award, launched in 2022 and coordinated by the NGO *Women in Climate and Energy*, with support from UNDP and in partnership with the MoE, Ministry of Labour and Social Affairs, and the Council for Women's Affairs. The award recognized outstanding leadership and innovation by women contributing to climate mitigation, adaptation, education, awareness, climate finance and youth engagement.

The inaugural round attracted over 100 applications, showcasing diverse contributions from women across Armenia. In 2024, the second round received 115 submissions and introduced a new category – Community Actions in Climate and Policy – further expanding opportunities to acknowledge women's work at the grass roots level. Many of the showcased initiatives offered practical, scalable solutions that can be replicated by other businesses and communities.

Participants emphasized the awards' positive impact in creating a national platform to share best practices, build networks and highlight women's leadership in climate action. As noted by the Deputy Minister of Labour and Social Affairs and Chair of the Gender Working Group of Armenia:

"Equal use of the potential of women and men, as well as the formation of gender-centric capacities, are among the important safeguards for developing climate change mitigation and adaptation policies."

By elevating women's voices, fostering peer exchange and strengthening collaboration among stakeholders, this initiative demonstrates a strong model for gender-responsive climate action—one that advances inclusive participation and accelerates effective policy and practical solutions across Armenia.

Good Practice Example 2: Integrating Gender and Socioeconomic Dimensions into Regional Climate Adaptation Planning

To identify socioeconomic and gender dimensions of vulnerability to climate change at the community and marz (regional) levels, and, in parallel, to study the opinions of women and socially vulnerable population on their specific needs and adaptation options, a sociological survey was conducted in Shirak and Tavush regions in 2021. In total, 18 focus-group discussions (FGDs) and 300 face-to-face interviews with households in four regional cities and 14 rural settlements were conducted. More than half (55.2 per cent) of FGDs participants were women, and 56 per cent of the surveyed households in Tavush region and 35 per cent in Shirak region were women-headed households. The key findings include:

- Water resources and agriculture were identified as the most climate-affected sectors in both regions.
- Tavush communities highlighted declining water resources, poor drinking water quality and irrigation shortages as priority issues.
- In Shirak, respondents noted water scarcity, drying springs, reduced reservoir levels and irrigation challenges.
- Over 65 per cent of households reported experiencing increasing average temperatures and drought/desertification.
- Water supply and agriculture were considered the most important adaptation needs—by 90 per cent of households in Tavush and nearly half in Shirak.
- Women in rural areas prioritized sustainable water supply and organic agriculture as preferred adaptation measures.

Findings from the survey informed the development of regional climate adaptation plans for Tavush and Shirak.

4.10 Any other information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

4.10.1 Adaptation financing instruments in Armenia

Armenia has significantly expanded its portfolio of financing instruments to support climate change adaptation, particularly in the agriculture sector, which is among the most climate-vulnerable sectors.

Public financing remains the backbone of adaptation support. Key instruments include subsidized credit lines to improve access to capital for climate-resilient practices, concessional lending for modern irrigation and greenhouse development, and leasing schemes for agricultural machinery and on-farm infrastructure. In recent years, the Government has also increased funding for risk management measures such as hail protection nets, application of advanced irrigation technologies, construction of reservoirs and expanded the national agricultural insurance programme, which aims to reduce exposure to climate-related losses. Despite this progress, financing remains fragmented and climate conditionality is limited within most public support mechanisms.

Private sector financing for adaptation is growing yet remains risk-averse and predominantly supported through public subsidies or blended finance. Commercial bank lending to agriculture has increased in recent years; however, strict collateral requirements, limited financial literacy and comparatively high borrowing costs continue to restrict smallholders' access to finance. Green and sustainability-linked lending instruments are nascent. To enhance private sector engagement, further development of de-risking instruments - including insurance, guarantees and blended capital - as well as tailored financial products for smallholders, women and cooperatives is needed. The Central Bank of Armenia (CBA) has been prioritizing climate-related financial risks and conducting assessments on their implications for financial stability and strengthening the capacity of public and private institutions to apply climate-responsive and de-risking financial instruments - an essential step for increasing private sector investment in adaptation.

International financing plays an important role in expanding adaptation funding through grants, technical assistance and concessional credit. Support from mechanisms, such as the GCF, Adaptation Fund, GEF, and international financial institutions, including ADB, WB, EBRD, IFC and KfW, has contributed to initiatives in climate-smart horticulture, irrigation efficiency, value-chain development and institutional capacity-building. While these programmes have delivered valuable pilots and targeted investments, many remain project-based and are not systematically scaled or institutionally integrated. Strengthening coordination among respective ministries, embedding climate criteria into public finance instruments, and aligning donor initiatives with national priorities are critical to ensuring that adaptation financing becomes more cohesive, targeted and equitable over time.

5 Information on financial, technology development and transfer and capacity-building support needed and received

5.1 Introduction

This chapter presents a comprehensive account of the financial, technological and capacity-building support needed and received by Armenia under Articles 9, 10, 11 and 13 of the Paris Agreement. It reflects the commitment of Armenia to climate action and transparency, while highlighting institutional progress, challenges and future priorities.

National context and institutional arrangements

Armenia addresses climate change through sectoral development policies, supported by a robust public finance management system. Government Decrees N 2318-L (December 28, 2023) and N 852-L (June 26, 2025) and the draft Climate Law are aimed on establishing a methodology for tracking climate finance, enhancing transparency and accountability. The MoE leads coordination, supported by other ministries and local authorities.

Armenia tracks financial support through its national MRV system and reports it using the CTF tables. The country continues to face challenges in mobilizing adequate finance, particularly for large-scale infrastructure projects and long-term adaptation programmes. Barriers include limited domestic co-financing capacity, complex donor requirements and gaps in project preparation and bankability.

Support needed

Armenia requires substantial international support to meet its NDC and NAP targets. Key areas where support is needed are Mitigation: renewable energy, EE and sustainable transport; Adaptation: Climate-resilient agriculture, water management and DRR; Technology Transfer: Solar PV and wind technologies with energy storage and improved stability, smart agriculture and digital monitoring tools; Capacity-Building: MRV systems, institutional frameworks, and stakeholder engagement; and Carbon Markets: Participation in Article 6 mechanisms.

Support received

Team Europe has been Armenia's largest provider of bilateral ODA during the period 2014–2020 as per the publication "Global Gateway–Team Europe's Official Development Assistance to Armenia" (GG ODA).

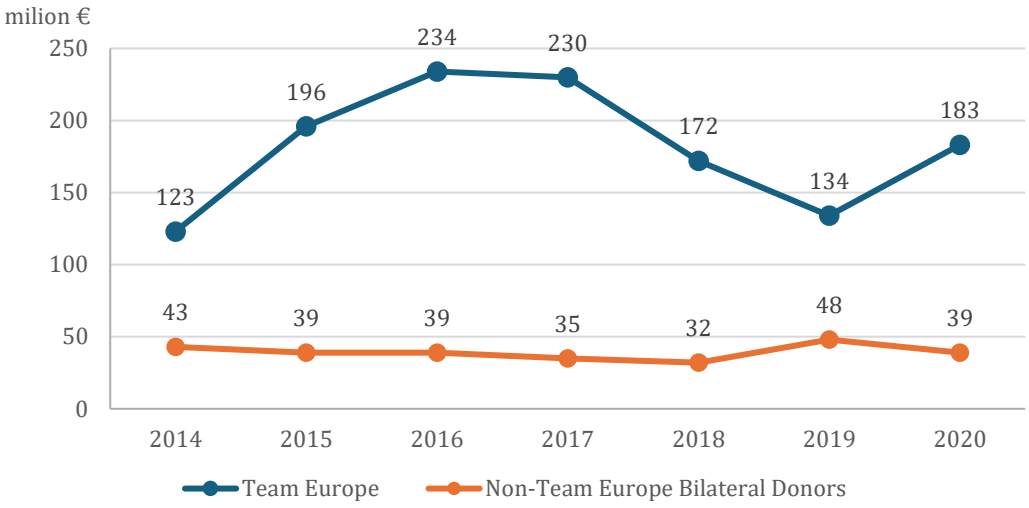

Figure 5-1. Bilateral ODA Trends 2014–2020

Source: GG ODA

The top ten ODA partners of Armenia and their contributions in 2020 are indicated in the following infographic, where Team Europe clearly stands out.

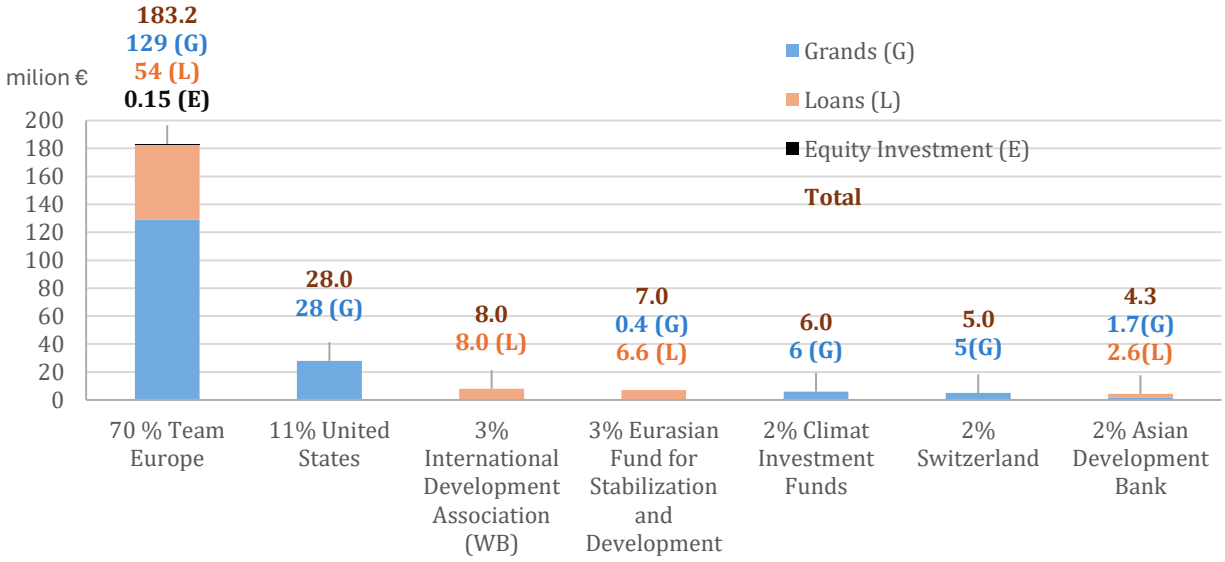

Figure 5-2. Bilateral ODA partners in 2020

Source: GG ODA

In addition to the €183 mln. Bilateral ODA, Team Europe has provided a further € 23mln. multilateral core contributions in 2020.

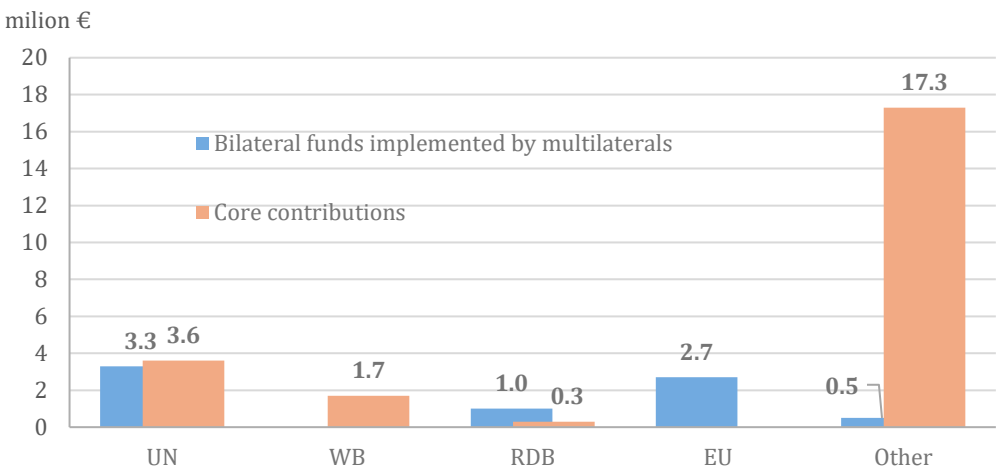

Figure 5-3. Team Europe's contribution through multilaterals

Source: GG ODA

Above ODA has assisted various sectors in Armenia. About 62 per cent of the support has been directed on government, civil society and human rights; jobs and growth; and general budget support.

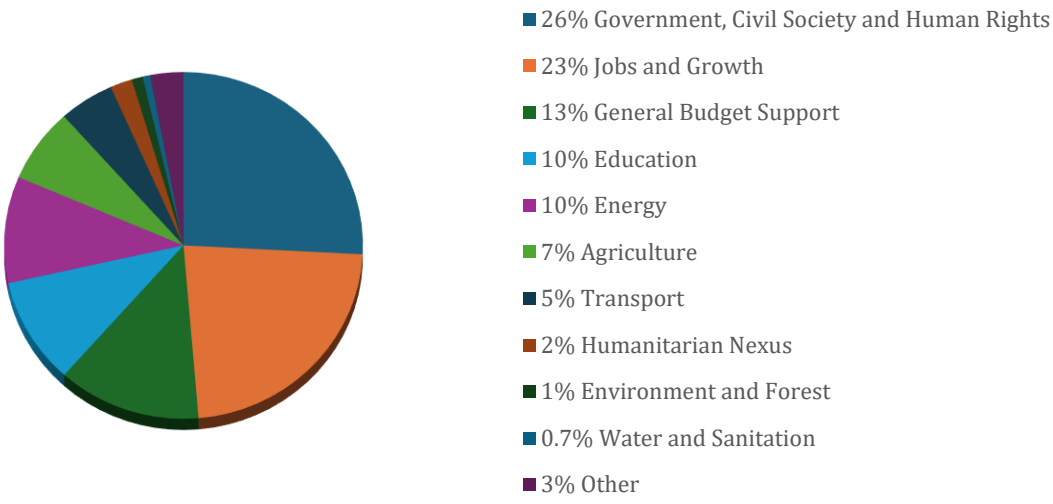

Figure 5-4. Main sectors funded by Team Europe

Source: GG ODA

However, only € 43 mln. have addressed climate mitigation and adaptation either as the principal objective or a significant objective.

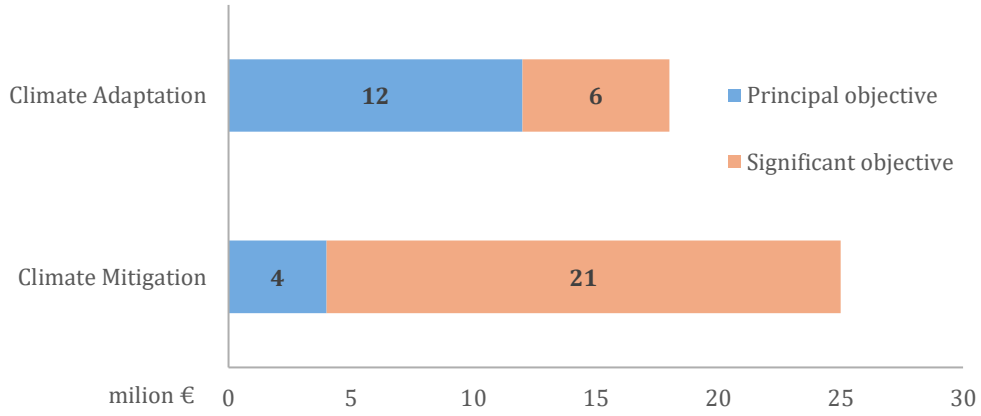

Figure 5-5. Team Europe's ODA targeting climate change

Source: GG ODA

During the reporting period 2021–2022, Armenia received significant climate finance from multilateral and bilateral sources, including the GCF, GEF, AF, the European Union, Japan and USAID. Notable projects include: USD 116 million for energy-efficient building retrofits; USD 4.2 million for adaptation in agriculture and water; and capacity-building support through EIB, GCF, GEF, UNDP, EU4Climate initiatives, RA government and Municipalities.

Technology development and transfer

Support was received across all stages of the technology cycle, such as: R&D: Climate modelling, renewable energy feasibility and agricultural innovation; Demonstration Projects: Irrigation systems, energy-efficient buildings and Waste Management; Deployment: Rooftop solar PV, early warning systems, and efficient appliances and Diffusion: Training, public awareness and regional collaboration.

Capacity-building support

Armenia benefited from technical assistance, institutional support and knowledge-sharing platforms. Key achievements realized through support include establishment of a national MRV system, training of over 490 professionals, integration of climate change into education and public awareness, and regional cooperation through Eastern Partnership and South Caucasus platforms.

Gender and social inclusion

Support needed and received are in line with Gender Policy (2025–2028) of Armenia which integrates climate-specific gender policies, emphasizing equal participation of men and women in climate decision-making, gender-disaggregated data and social impact studies, support for women and youth in green entrepreneurship and education.

Transparency and Article 13 implementation

The CBIT project enabled Armenia to transition to continuous MRV processes. Remaining challenges include expanding MRV coverage, improving data quality and QA/QC procedures, integrating gender-responsive indicators and legal reforms for institutionalizing transparency.

Recommendations for future support

To enhance climate action effectiveness, Armenia recommends:

- Inclusive Finance: Increasing access to concessional finance for gender-responsive and community-based projects;
- Local Innovation: Supporting domestic manufacturing and R&D for climate technologies;
- Subnational Capacity-Building: Strengthening local government and community engagement;
- Data Systems: Investing in integrated digital platforms for MRV and finance tracking;
- Public-Private Partnerships: Encouraging SME participation in climate solutions;
- Education and Awareness: Expanding climate literacy and vocational training;
- Legal and Institutional Reform: Assisting in developing mandates and governance frameworks.

5.2 National circumstances, institutional arrangements and country-driven strategies

Climate change in Armenia, in terms of cross-sectoral policy, is primarily addressed through sectoral development policies, and climate-related expenditures are allocated to programmes and measures formulated in accordance with sectoral development policy goals. Armenia has well-developed public finance management and budgeting systems, which are well-adapted to sectoral development policies. Institutional level responsibilities for project results and financial management are primarily concentrated in specific sectoral agencies. However, new institutional mechanisms will need to be put in place to identify, budget and account for costs related to cross-sectoral policies within the budgeting process. In this context, the Government emphasizes setting clear financial and budgetary frameworks in the field of climate change and improving the link between climate change policy and the budget.

From a practical point of view, one of the key challenges in integrating climate change into public finance management systems is the lack of appropriate institutional setup for the identification, classification and coding of climate policy measures. These are the key mechanisms that play a crucial role in terms of disaggregating and tracing those expenditures and outcomes and providing accountability at different stages of the budget process. To advance the integration of climate change mitigation and adaptation into the RA fiscal system and establish effective mechanisms for assessing climate-related public spending, a methodology and implementation guidance for Climate Budget Tagging have been developed under the UNDP project. This methodology has since been piloted in the selected RA public administration bodies. This initiative represents a strategic step toward modernizing fiscal management and mainstreaming climate action across budgeting processes. Building on the Guideline, UNDP facilitated targeted trainings and on-the-job technical assistance to equip key ministries and agencies with the practical skills to identify, classify, and track climate-related expenditures. Upon adoption of the Climate Law, the application of Climate Budget Tagging practice will become a mandatory part of the state budgeting process.

Establishing a system to track both national and international financial support for climate-related mitigation and adaptation activities, along with maintaining accurate

accounting and a high level of accountability, is essential for creating an effective MRV framework.

To enhance the regulation of procedures for collecting and reporting information on climate finance received by the Republic of Armenia for the implementation of the Paris Agreement, the MoE has developed a methodology for gathering and reporting relevant information. This methodology was approved by Minister of Environment order N202-L, dated June 7, 2024.

According to this order, by July 1 of each year, the MoE will gather information (through a specified form) from public administration bodies, the Central Bank, Yerevan Municipality and local communities regarding the previous budget year.

The order approves the format for submitting information, the procedure for completing the format, the methodology for collecting and reporting information, and guidelines for classifying climate change mitigation and adaptation activities by sector.

To prioritize climate-related activities, the OECD-DAC Rio Markers for Climate (Capacity4dev, 2025) are used. This system categorizes official development finance activities into three categories as shown in Table 21 below.

Table 5-1. Rio markers for climate

Relevance of activity to climate change	Description	Score
Not targeted	The activity does not target climate change	0
Significant objective	Climate change is an important but secondary objective	1
Principal objective	Climate change is the main objective of the activity	2

Source: The scoring system for climate markers, Rio Markers Handbook OECD-DAC Climate Markers

The order also defines the sources of climate finance, various financial support instruments and targeted directions of climate financing. The sources of climate finance include multilateral, bilateral, regional and other forms of funding. The instruments for financial support consist of grants, policy-based financing, loans, capital investments, guarantees and technical assistance. The targeted directions of climate financing are considered climate change mitigation, climate change adaptation and cross-cutting actions.

Starting from 2024, the MoE received information on climate-related projects and expenditures from donor organizations, public administration bodies and local communities. This data is gathered and input into the Project Portfolio System, which is a trial version of the electronic platform.

The Ministry of Education, Science, Culture and Sports contributes to climate-related capacity-building through curriculum reforms, teacher training and green education initiatives. Climate change and environmental sustainability are integrated into the national education strategy, with project-based learning and Science, Technology, Engineering and Mathematics (STEM) programmes targeting youth engagement and awareness. In addition to the Ministry of Education, Science, Culture and Sports, other state institutions are also engaged in technology transfer and capacity-building activities

The Ministry of High-tech Industry, while helping the formation of the government policy on industry and supporting high-tech startups and R&D activities, has undertaken several projects which assist in technology transfer and capacity-building on climate-related technologies such as "Neruzh" providing grants for startup technology and in several climate-related areas like agri-tech, smart-tech, industry-tech, clean-tech etc. among other areas. Activities of the ministry like "From Idea to Business" grant programme; Engineering City project have the potential to support adopting and using innovative technologies for mitigation and adaptation.

In 2023, the Ministry of Economy has included a framework of actions aimed at ensuring gender-sensitive environmental sustainability and climate protection in the current strategy for the economic development of the agricultural sector for 2020-2030. In particular, special approaches have been added to increase the entrepreneurial activity of rural women and youth in the field of smart and green agriculture, promote the involvement of women and youth in agricultural innovation systems, including the use of digital technologies, develop innovative e-learning platforms to engage women and youth in agriculture Initiatives and solutions.

The Ministry of Health had also prioritized the climate change related health issues in the Health System Development Strategy and Plan of Actions for 2023-2026, adopted by the government. Assessing health vulnerability to climate change, reducing climate change impacts by developing adaptation action plans, introducing the mechanisms for managing information flows on health changes correlated with climate change indicators, etc., are important directions of the above-mentioned strategy.

In April 2025, the government adopted the National Gender Strategy and Action Plan for 2025-2028, which, for the first time, includes the climate change related gender-specific PaMs. Prioritizing the gender-climate-change cross-cutting issues, the strategy has given great importance to the accessibility of climate change related gender-disaggregated data and relevant studies on gender and social impact of climate change, increasing awareness and ecological knowledge of women, ensuring equal participation of women in climate mitigation and adaptation decision-making at all levels of governance. The ministries of environment, health, territorial administration and infrastructures, labour and social affairs are responsible for its implementation.

5.3 Underlying assumptions, definitions and methodologies

For consistency and comparability of information, USD have been used as the currency unit for expressing the monetary value of support.

The midyear exchange rate of the relevant year, obtained from the Exchange Archive of the CBA was used for the conversion between USD and AMD.

Exchange rate applicable for the year of financial closure was used for the support needed, and the exchange rate applicable to the receiving year was used for support received. (Armenia, Central Bank of, n.d.)

Prioritized measures were identified from the updated NDC and Long-Term Low-Emission Development Strategy (LT-LEDS), and the NAP. Estimated costs of such projects were obtained from publicly available documents like the websites and annual reports of executing or lending agencies.

The period 2021–2022 was used for reporting the support needed and received, in line with the mitigation and adaptation action plans of the country. However, more recent information up to December 2023 was included when such information was available.

Climate measures were selected mainly from the NDC implementation plan and the NAP. Funding sources, and other relevant information were identified through the website of the MoE, websites and publications of government organizations, donors and other actors were used to gather funding details.

Support needed was collected from publicly available government documents including plans, policies and press releases; and websites and publications of donors and executing agencies

Information on committed and received support was collected from documents, press releases, annual reports and other documents published by state organizations, donors and executing agencies

Status of projects was identified as "planned" based on plans, press releases and other publications of the government, donors and executing agencies. Only those projects which are currently completed or actively pursued were considered.

Projects which have produced partial outputs, or structures or arrangements necessary for the project to proceed and currently active were categorized as "ongoing".

Projects which have produced the planned outputs and handed over to the relevant stakeholders or beneficiaries before or during the reporting period were categorized as "completed".

In addition to the government support, Armenia receives financial and technical support through several channels. The European Union, Germany and Japan are the main bilateral supporters. Multilateral organizations like the Asian Development Bank (ADB), WB, IFC, United Nations Environment Programme (UNEP), FAO and UNDP are the main support providers. Some NGOs provide support in sectors like forestry. Some climate actions are supported by several support actors as well. Support was categorized as bilateral, regional or multilateral considering the support partners identified through publicly available documents

Support for climate action was classified under mitigation if the main benefit is aligned with the NDC and mitigation action plans of Armenia, and the main outcome is the reduction of GHG emissions and achieving the NDC targets.

Support was classified as adaptation if the relevant action is aligned with Armenian NAP, and the main outcome is increasing resilience to the effects of global warming and its consequences.

When supported actions cover both adaptation and mitigation, they were considered cross-cutting.

Support which does not have to be paid back or explicitly indicated as grants was reported as grants. Support expressly indicated as concessional loans was reported as concessionary loans. Other loans were reported as non-concessionary loans.

Amounts indicated as equity in the publications of the government, donors or the executing agencies were reported as equity.

Projects whose implementation timelines ended prior to the reporting period were reported as support received, whereas projects with timelines extending into the future,

or projects with no specified ending timeline or unknown implementation status were reported as support needed.

In accordance with the MPGs for the ETF, Armenia identifies and reports climate-related support across key sectors and subsectors relevant to its NDCs and NAP as shown in Table 5-2below.

Table 5-2. Key sectors and subsectors for reporting

Ser. No.	Thematic Category	Prioritized Sectors
1	Mitigation	Energy, Transport, Waste Management, Industrial Processes and Forestry and Land-Use sectors and their subsectors
2	Adaptation	Water Resources, agriculture, health, disaster risk reduction sectors their subsectors
3	Cross-cutting	Education and capacity-building, and finance and governance and measures under those

Based on above priorities, following action areas are prioritized by Armenia:

Table 5-3. Prioritized action areas

Ser. No.	Thematic Category	Prioritized Action Areas
1	Mitigation	Deployment of renewable energy systems, energy efficiency and electrification of public transport
2	Adaptation	Implementation of climate-resilient irrigation systems, early warning systems and drought-resistant agriculture, Agriculture Pilot Insurance Schemes (NAP)
3	Technology Transfer	Introduction of solar PV, climate-smart agriculture technologies and digital monitoring tools
4	Capacity-Building	Training of government officials, development of MRV systems and stakeholder engagement

Sources: NAP, documents on the web

Based on publicly available documents, impacts of support received by Armenia include:

Table 5-4. Some impacts of support received

Ser. No.	Programmes / Activities	Impact
1	Renewable energy integration	GHG emissions reduction by an estimated 540,000 tons annually (WB Press Release, 2024).
2	Retrofitting buildings in Yerevan under the UNDP-GCF energy efficiency project	Energy savings of up to 60 per cent in Yerevan (UNDP, 2023).
3	Upgrading water supply and sanitation systems in 21 small towns and 91 villages	600,000 people benefited. Water availability improved from 6 hours to 14 hours. Reduced time spent by women to fetch water. Reduced waterborne diseases among children (ADB, 2014).
4	EU4Climate Programme	Enhanced institutional capacity for climate reporting and finance tracking (EU4Climate).

Sources: Documents on the web published by WB, UNDP, ADB, and EU4Climate

Estimated sector-wise results of support needed are shown below.

Table 5-5. Sector-wise support needed

Ser. No.	Thematic Category	Results of Support
1	Mitigation	Contribution to achieving the NDC target of limiting cumulative emissions to 2.07 tCO_2eq/capita by 2050 LEDS, 2023 scaling up the energy efficiency in Building and Transport sectors.
2	Adaptation	Increased coverage of early warning systems and improved water-use efficiency in priority regions (NAP), scaling the agriculture insurance system.
3	Technology Transfer	Transfer of technology and skills on: Thermal insulation, application of heat pump technology, and battery storage backed solar systems, HVAC upgrades, wind energy.
4	Capacity-Building	Establishment of a national MRV framework and provision of training in climate data management, development of regulatory framework for Article 6 mechanisms application.

Sources: UNDP LEDS, NAP

Support that is in line with the TNA of Armenia and sectoral strategies, and involved in the introduction, adaptation, or scaling of climate-relevant technologies, and improving awareness and technical capacity of Armenian stakeholders was identified as technology development and transfer and capacity-building support.

Double counting may occur when the same support is reported multiple times under different categories (e.g. mitigation and adaptation), by different institutions (e.g. donor and recipient), or across different reporting cycles. To mitigate this risk, Armenia will improve on centralized data collection through the MoE, use of harmonized reporting templates, cross-verification with donor reports, clear categorization of support types, time-bound reporting, use of unique identifiers for projects, and capacity-building and training, which will contribute to the transparency, accuracy and credibility of the climate support reporting of Armenia and help ensure compliance with UNFCCC requirements.

5.4 Information on financial support needed by developing country parties under Article 9 of the Paris Agreement.

As a developing country Party to the Paris Agreement, Armenia requires substantial financial support to implement its climate commitments, particularly those outlined in its NDC and NAP. Article 9 of the Paris Agreement emphasizes the responsibility of developed country Parties to provide financial resources to assist developing countries in both mitigation and adaptation efforts.

During the reporting period of 2021–2022, Armenia identified financial support needs across key sectors including renewable energy, EE, sustainable transport, climate-smart agriculture, water resource management, and DRR (IEA, 2022). These needs were determined through national planning processes, stakeholder consultations and sectoral assessments.

Financial support needed during this period was primarily sourced from multilateral climate finance mechanisms, such as the GCF, GEF and Adaptation Fund, as well as bilateral donors including the European Union and Japan. Support was delivered through grants, concessional loans, and blended finance arrangements and was used to

implement mitigation and adaptation projects, strengthen institutional capacity and improve climate data systems. Sometimes support was provided in tranches where portions of projects are funded and completed while others are at different stages of financing and implementation.

To address these challenges, Armenia is working to improve its climate finance readiness, enhance coordination among stakeholders and engage with emerging financing mechanisms such as Article 6 carbon markets and climate bonds. Continued international support is essential for Armenia to meet its climate goals and contribute to global efforts under the Paris Agreement.

As a developing country Party to the Paris Agreement, Armenia has identified several priority sectors and activities for international climate finance (World Bank-CCDR, 2025) such as:

Table 5-6. Prioritized sectors and activities for international climate finance

Ser. No.	Priority Sector	Activities
1	Renewable Energy	Solar and wind energy projects to reduce dependence on fossil fuels (IEA, 2022)
2	Energy Efficiency	Upgrading infrastructure, Buildings and Industrial Processes to lower energy consumption
3	Sustainable Transport	Promoting EVs and improving public transport systems
4	Waste Management	Enhancing recycling, composting and CH_4 capture from landfills
5	Climate-smart Agriculture	Supporting resilient farming practices and water-efficient irrigation
6	Forestry and Land-Use	Reforestation and sustainable land management to enhance carbon sinks

Sources: Publications on the web

According to the recent WB report, Armenia faces significant barriers in attracting finance for climate action. The country has a limited domestic co-financing capacity to provide matching funds to unlock larger international grants or loans. This factor is linked to the small size of economy which reduces the interest of investors to participate in climate-related projects. Also, insufficient institutional capacity for the preparation of bankable projects and navigating complex donor requirements makes it difficult to convince the donor agencies to provide non-concessional loans or business-oriented finance. This situation is aggravated due to the poor coordination between different stakeholders like ministries and agencies working on climate action.

Armenian NDCs and LT LEDS outline its commitment to reduce greenhouse gas emissions and adapt to climate change conditional on international support.

In alignment with Long-Term Goals of the Paris Agreement, Armenia targets to achieve carbon neutrality by 2050 with international support, by reducing its emissions and balancing the remaining emissions through carbon sequestration by forests. (RA Government, 2023). As per the World Bank report, Armenia needs an estimated $8 billion

for green investments on climate adaptation and mitigation during 2025–60 to achieve net zero emissions. [77]

As a developing country Party to the Paris Agreement, Armenia requires substantial financial support to implement its climate commitments, particularly those outlined in its NDC (RA Government, 2021) and NAP. Main areas where Armenia needs support is shown in Table 5-7 below.

Table 5-7. Support needed for climate action

Ser. No.	Category of Climate response	Support needed for
1.	Mitigation	Scaling up renewable energy storge facilities and energy efficiency, and transformation to electrified transport modes to reduce emissions from energy and transport sectors.
2.	Adaptation	Building resilience in agriculture, water management and DRR areas
3.	Capacity-Building	Strengthening institutions, data systems and policy frameworks for improved MRV and transparency.
4.	Technology Transfer	Accessing advanced technologies which would support low-carbon development across different sectors.
5.	Carbon Markets	Participating in carbon markets, potentially transferring unused emission reductions to other countries under the mechanisms of Article 6.

Information collected from publicly available documents on financial support needed under Article 9 of the Paris Agreement are presented in CTF table 6.

5.5 Information on financial support received by developing country parties under Article 9 of the Paris Agreement.

During the period 2021–2022, Armenia received significant climate finance from international donors, multilateral climate funds and bilateral partners. These funds supported mitigation and adaptation efforts aligned with Armenian NDC and the transparency requirements under the Paris Agreement. The financial support was directed towards energy efficiency, climate governance, institutional capacity-building and climate-resilient infrastructure. In addition to mitigation and adaptation benefits, these measures had direct and indirect benefits towards the SDGs. In particular, measures in Agriculture and water supply sectors have benefited women, children and rural communities with better finances, and improved living and health conditions.

Table 5-9 below summarizes the major climate finance projects implemented in Armenia.

[77] https://www.worldbank.org/en/publication/country-climate-development-reports

Table 5-8. Major climate finance projects and their contributions

Project name	Total Funds received	Donors	Targeted areas
GCF- De-Risking and Scaling-up Investment in Energy Efficient Building Retrofits Project	USD 116 mln.	GCF: USD 20 mln. EIB: USD 86.25 mln. UNDP: USD 1.42 mln. Yerevan Municipality: USD 8 mln. Government of Armenia: USD 400,000	Multi-apartment residential and public buildings across 19 communities, implementing measures such as: Thermal insulation of walls, roofs and basements Replacement of windows and doors Installation of solar PV and water heating systems Modernization of lighting and HVAC systems
Adaptation Fund supported projects	USD 4.2 mln.	Adaptation Fund	Enhancing resilience in Agriculture and water management Developing NAP of Armenia Strengthening institutional frameworks for adaptation
Climate policy development in Armenia, NDC implementation and MRV system enhancement	EUR 930,365	The EU4Climate initiative, funded by the European Union and implemented by UNDP	Updating the NDC of Armenia for 2021–2030 Developing climate legislation and transparency frameworks Capacity-building for sectoral integration of climate actions
Support for Investments in Armenia to Achieve Resilience to Climate Risks	USD 950,000	Japan: USD 900,000 UNDP: USD 50,000	Support to achieve resilience to climate risks
Development Objectives Grant Agreement	USD 120 Mn	USAID	Climate-related governance, transparency, and sustainable development
Irrigation System Enhancement Project	USD 32 mln. loan	WB	Improving irrigation efficiency, reduction of water loss, boosting productivity across 9,500+ ha
Vedi Reservoir project (Under construction)	€75 mln. loan €15 mln. Co-financing	AFD loan RA Government	Improving water availability for agriculture through modern irrigation systems
GEF Small Grants Programme	USD 4.7 mln. USD 5 mln. co-finance USD 1.85 mln. in kind	GEF grants	Reforestation, Soil restoration, and Sustainable land-use practices
EU-GAIA and SIGMA projects	€13 mln.	EU, Austria	Promoting organic farming, green technologies, and inclusive value-chain development

Project name	Total Funds received	Donors	Targeted areas
Strengthening Land-Based Adaptation Capacity in Communities Adjacent to Protected Areas	USD 2.5 mln.	Adaptation Fund	Community-based climate-smart agriculture initiatives, Installing 13 km of new irrigation lines, Reducing water loss by 30 per cent, Rehabilitating over 1,000 hectares of degraded land Construction of 3,000 m^2 of greenhouses, Distribution of 77,000 climate-resistant seedlings
German– Armenian (GAF-AF) programme	Total commitment EUR 30 mln. New financing EUR 20 mln.	KfW, IFC and EBRD	Disbursing over 23,500 loans, Supporting irrigation, organic farming, and cooperative investment, channelling credit through local banks to support green investments
Horticulture project	USD 32 mln.	ADB	Supporting the development of climate-controlled greenhouses with efficient irrigation systems

Sources: Publications of the donors

Information collected from publicly available documents on financial support received under Article 9 of the Paris Agreement are presented in CTF table 7.

While Armenia has made progress in mobilizing climate finance, some challenges still remain to be overcome. Further exploring co-financing sources, improving the feedback mechanisms, educating the beneficiaries and other stakeholders, together with the use of signage, and certificates showcasing achievements for convenience in follow-up and comparison, are possible avenues for improvement. These concerns highlight the need for improved project communication, transparency and community engagement.

5.6 Information on technology development and transfer support needed by developing country parties under Article 10 of the Paris Agreement

Support needs are identified from the TNA[78], NDC Implementation Plan and the NAP which outline sector-specific priorities and barriers to technology adoption.

Support for mitigation

Renewable energy based on solar and hydro will remain the most prioritized technologies due to high solar potential and existing hydro infrastructure of Armenia (IEA, 2022). Therefore, support on selection, procurement, installation, commissioning and maintenance of solar installations is needed. However, as the higher percentage of variable renewable sources like solar energy can affect the stability of the power grid, support is needed on energy storage using technologies like batteries, pumped storage

[78] https://tech-action.unepccc.org/wp-content/uploads/sites/2/2017/06/tap-report-adaptation-armenia-eng-edited.pdf

and hydrogen. Further support in establishing a new nuclear plant will be necessary to support the base load requirements and improve system inertia and stability.

Energy efficiency efforts are based on large-scale retrofitting of residential, public and MABs with advanced insulation, efficient heating/cooling, and smart controls. Key technologies where technical support is needed include thermal insulation, high-efficiency boilers, efficient cooling systems, LED lighting and building energy management systems.

Priority initiatives identified in the transport sector are electrification of public transport, development of EV charging infrastructure, and route optimization for urban fleets. Support is needed with installation and maintenance of equipment, and the use of optimization software for route planning, live tracking of public transport, managing EV charging slots etc.

Technology needs in the Waste sector include landfill gas capture, integrated solid waste management and recycling technologies. In the forestry and land-use sector, technological support on the sustainable management of forests, afforestation and monitoring are prioritized.

Support for adaptation

The NAP, TNA and sectoral strategies have identified technological needs. Advanced technologies in the use and conservation of water resources like drip and sprinkler irrigation, and climate-resilient infrastructure like water storage reservoirs, and solar pumping stations are the main priorities. The NAP highlights the need for digital water monitoring, early warning systems for floods/droughts, and wastewater treatment upgrades as well.

Technologies to improve resilience in the agriculture sector include climate-smart agriculture, drought-resistant crops, agriculture insurance, greenhouse and hydroponic systems and improved extension services. TNA prioritizes local melioration, diversification and circulatory water systems for resilience. Technologies for climate-proofing health infrastructure and early warning for climate-sensitive diseases are the main priorities in the health sector. The technological support identified to avoid or reduce disaster risk includes the expansion of meteorological and hydrological monitoring networks, automated early warning systems, and risk-mapping tools.

Support for cross-cutting and enabling technologies

Support in establishing and maintaining efficient MRV (Monitoring, Reporting, Verification) systems for both mitigation and adaptation, climate risk databases, and climate budget tagging are needed to ensure availability of data for effective decision-making and improving transparency (UNDP, 2024).

Capacity-building support is needed in the preparation of training modules for government and technical staff, and guidelines for integrating climate technologies into sectoral and regional planning.

It must be noted here that there are several key barriers identified in the TNA and NAP which include limited access to finance for technology adoption, gaps in technical capacity and local manufacturing, and the need for enabling policy frameworks and incentives.

Technology development and transfer related needs for the enhancement of endogenous capacities and technologies

Armenia has identified the enhancement of endogenous technological capacities as a strategic priority to ensure long-term sustainability and self-reliance in climate action. The country's needs span across institutional strengthening, R&D, local innovation and manufacturing capabilities. Main areas where support is needed are:

- *Research and Development (R&D) Capacity:* scientific and academic institutions of Armenia require targeted support to expand their role in climate-related technology development in the fields of applied research in renewable energy, agriculture, and water management; Integration of climate science into national innovation systems; and access to international research networks and funding (IEA, 2022).
- *Local Innovation and Entrepreneurship:* Armenia has a growing tech ecosystem, but climate technology innovation is still nascent. Some support has been received for startups developing climate solutions in Agriculture, Energy, and water (EIF, n.d.). However, scaling these innovations requires expanded incubation and acceleration programmes, access to seed and venture capital, and technical mentorship and commercialization support.

The United Nations Economic Commission for Europe (UNECE) Innovation for Sustainable Development Review highlights the need pf Armenia to diffuse innovation beyond Information and Communication Technology and into traditional sectors like Agriculture and Construction.

- *Manufacturing and Deployment Capacity:* Reliance of Armenia on imported climate technologies limits its ability to scale up implementation. The TNA identifies barriers such as the absence of certification and QA systems, lack of, efficient boilers and insulation materials; limited technical skills for installation and maintenance. Support is needed to establish local manufacturing hubs for climate technologies, develop vocational training programmes for technicians and engineers, and create standards and testing facilities for climate-related equipment.
- *Institutional and Policy Support:* Endogenous capacity enhancement also requires enabling policies. The NAP and mitigation plans of Armenia call for integration of climate technology into sectoral strategies, development of guidelines for local governments and sectoral ministries, and strengthening of climate-related data systems and MRV frameworks. Support is also needed in the development of such policies, guidelines, data systems and frameworks.
- *Education and Public Awareness:* Building endogenous capacity also involves climate education in universities and vocational schools, public awareness campaigns on climate technologies, and training for local government officials and community leaders. Many stakeholders including private sector and NGOs can extend support for such education and awareness programmes through the development and distribution of education material, organizing seminars and workshops etc.

Information collected from publicly available documents on technology development and transfer support needed under Article 10 of the Paris Agreement are presented in CTF table 8

5.7 Information on technology development and transfer support received by developing country Parties under Article 10 of the Paris Agreement

Armenia received support across multiple stages of the climate technology cycle. These interventions contributed to both the early and mature phases of technology development and transfer, with varying degrees of depth and scale.

Support for R&D was primarily directed towards academic institutions and national research centres in areas such as:

- *Climate modelling and emissions analysis:* Funding from international partners such as UNDP and GEF enabled the development of localized climate models and emissions scenarios, tailored to geography and socioeconomic conditions of Armenia.
- *Agricultural innovation:* Research into drought-resistant crop varieties and soil health improvement was supported through collaboration with FAO and local universities.
- *Renewable Energy Potential Studies:* Technical assistance facilitated feasibility studies on solar and wind energy potential, laying the groundwork for future investments.

While R&D support was relatively modest, it laid a foundation for context-specific innovation and informed national policy development.

Demonstration projects were a key component of the technology strategy of Armenia, for expansion of public awareness and capacity-building through practical exposure. Main areas of demonstration includes:

- *Pilot Projects in Agriculture*: Climate-resilient irrigation systems and crop trials were implemented in selected regions, showcasing the viability of adaptation technologies.
- *Energy Efficiency in Buildings*: Demonstration of passive design principles and retrofitting techniques in public and residential buildings helped raise awareness and build technical capacity.
- *Waste Management Technologies:* Small-scale pilots explored composting and recycling technologies in urban settings, supported by European Union and UNEP programmes.

These projects served as proof-of-concept initiatives, helping to build stakeholder confidence and inform scaling strategies.

Deployment efforts focused on scaling up proven technologies where there was a reasonable public awareness, funding availability and willingness to participate. Deployment activities were often linked to national development priorities and supported through blended finance mechanisms.

Main areas of deployment include:

- *Solar Energy Systems:* With support from the GCF and bilateral donors, Armenia expanded the deployment of rooftop solar PV systems, particularly in rural and peri-urban areas.
- *Energy-Efficient Appliances:* Incentive programmes promoted the adoption of efficient lighting and heating systems, supported by awareness campaigns and subsidies.
- *Climate Information Systems:* Deployment of automated weather stations and early warning systems improved climate risk management capabilities.

Technology diffusion was facilitated through capacity-building and knowledge-sharing platforms such as Training and Extension Services: Agricultural extension services were strengthened to promote the uptake of climate-smart practices among farmers, Public Awareness Campaigns: Media and outreach programmes helped disseminate information on renewable energy and energy efficiency technologies, and Regional Collaboration: Armenia participated in regional forums and technical exchanges, contributing to the diffusion of best practices and lessons learned.

Diffusion efforts helped bridge the gap between demonstration and widespread adoption, though challenges remain in reaching remote and underserved communities.

Technology transfer was supported with international cooperation and partnerships with many stakeholders such as:

- *Bilateral and Multilateral Agreements:* Armenia engaged with donors and technology providers to access climate technologies, often bundled with technical assistance and training.
- *Capacity-Building for Technology Management:* Institutional support enabled Armenia to better manage technology transfer processes, including procurement, adaptation, and maintenance.
- *Private Sector Engagement:* Partnerships with private firms facilitated the transfer of clean energy technologies and services, particularly in the solar and EE sectors.

Technology transfer efforts were most successful when accompanied by capacity-building and tailored to specific needs and capabilities of Armenia.

Support received from multilateral and bilateral partners facilitated the introduction and adaptation of climate technologies in key sectors such as:

- *Energy Sector:* Technical assistance from the EU4Climate initiative and UNDP enabled Armenia to update its NDC and integrate low-carbon technologies, such as solar PV systems and energy-efficient building designs.
- *Agriculture and water management:* Pilot projects introduced climate-resilient irrigation systems and drought-tolerant crop varieties, supported by FAO and GEF. These technologies were adapted to local conditions, improving productivity and resilience.
- *Waste Management and Circular Economy:* Support from the European Union and UNEP helped initiate feasibility studies for waste-to-energy technologies and circular economy models in urban areas.

These interventions not only introduced new technologies but also promoted knowledge exchange and local adaptation, ensuring relevance to socioeconomic and environmental context of Armenia.

Support also contributed to the strengthening of endogenous capacities through capacity-building efforts focused on institutional development, technical training, and stakeholder engagement as follows:

- *Institutional Capacity:* The MoE and affiliated agencies received training on climate data management, MRV systems and transparency reporting. This improved the ability of Armenia to independently prepare its BTR and GHG inventories.
- *Human Capital Development:* Workshops, online courses and regional exchanges trained over 200 professionals in climate modelling, emissions accounting and climate finance tracking.
- *Academic and Research Integration:* Partnerships with local universities and research institutions fostered climate-related research and curriculum development, enhancing long-term capacity for innovation and technology adaptation.

Support activities also contributed to the development of local expertise and innovation ecosystems through:

- *Knowledge Platforms:* Armenia launched national climate portals and databases that consolidate climate-related data, tools and methodologies, accessible to policymakers, researchers, and civil society.
- *Private Sector Engagement:* Capacity-building programmes targeted SMEs and startups, encouraging the development of green technologies and services. This included mentoring, access to climate finance, and participation in regional innovation hubs.
- *Community-Based Approaches:* Local NGOs and community groups were engaged in technology deployment and monitoring, ensuring that solutions were culturally appropriate and locally maintained.

Following case-studies provide valuable learning experiences to inform future actions for better effectiveness:

Case Study 1: Technology transfer for climate adaptation in Agriculture (mixed outcome)

Overview:

Armenia initiated pilot projects to introduce climate-resilient agricultural technologies, including drought-resistant crop varieties and improved irrigation systems.

Successes:

- Positive uptake in selected rural communities.
- Demonstrated reduction in water usage and improved crop yields.

Limitations:

- Limited scalability due to funding constraints.
- Inadequate extension services to support widespread adoption.

Recommendations:

- Strengthen partnerships with international donors and research institutions.
- Expand pilot programs into national adaptation planning.

Case Study 2: Energy access for SMEs – GEFF Armenia

Implemented by EBRD with CIF support, this initiative incentivized SMEs to adopt clean energy technologies. It provided:

- Cash-back incentives for renewable energy investments.
- Gender-responsive capacity-building for women entrepreneurs (CIF, 2025).

Success Factors:

- Innovative financial mechanisms.
- Targeted outreach to underserved groups.

Challenges:

- Limited awareness among SMEs.
- High upfront costs despite incentives.

Technology development and transfer support received under Article 10 of the Paris Agreement are presented in CTF table 9.

5.8 Information on capacity-building support received by developing country Parties under Article 11 of the Paris Agreement

Armenian approach to capacity-building under Article 11 of the Paris Agreement is guided by the principles of country ownership, inclusivity and sustainability. The country aims to strengthen institutional, technical and human capacities to implement climate actions effectively, particularly in the areas of transparency, climate finance, technology transfer, and adaptation and mitigation planning.[79] [80]

Armenia supports the extension of the Paris Committee on Capacity-Building (PCCB) and emphasizes the importance of coherence and coordination among capacity-building efforts under and outside the Convention. The country also advocates for the PCCB to expand its focus to include adaptation, Article 6 mechanisms and loss and damage, reflecting evolving climate priorities of Armenia.[81]

Armenia has identified several persistent and emerging country specific capacity-building needs through national assessments and stakeholder consultations. These include:

- *Institutional gaps:* Limited coordination among ministries and agencies hampers integrated climate policy implementation. There is a need for formalized roles and responsibilities within a national transparency framework.[82]
- *Technical capacity deficits:* Armenia requires enhanced technical training to build expertise on: solar deployment, grid integration, storage systems, and

[79] https://www.worldbank.org/en/country/armenia/publication/the-country-climate-and-development-report-for-armenia
[80] https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202404191712---Republic%20of%20Armenia%20%281%29.pdf
[81] https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202404191712---Republic%20of%20Armenia%20%281%29.pdf
[82] https://climate-transparency-platform.org/sites/default/files/project_document_file/ceo-endorsement-armenia.pdf

management of variable renewables; energy audits and performance benchmarking; methane capture and energy recovery from urban landfills; design of circulatory water systems, compact water treatment, and hybrid natural treatment systems; water efficiency, expanded drip irrigation, and hydrological risk forecasting; strengthening agricultural resilience; and early warning systems and multi-hazard risk assessment.

- *Human resource constraints:* There is a shortage of trained professionals in climate science, policy analysis and data management. Continuous professional development and climate education are essential to address this gap.
- *Communication barriers:* Armenia faces challenges in articulating its capacity-building needs in a structured and timely manner. This is partly due to fragmented data systems and limited institutional memory. [83]
- *Local level engagement:* Capacity gaps are particularly acute at the subnational level, where local governments and communities lack the tools and knowledge to participate in climate planning and implementation.[84]

Targeted capacity-building support would expedite the adoption of new and improved technologies to ensure meeting Armenian climate commitments as planned, and improve its resilience against the effects of climate related disasters while supporting the achievement of sustainable development goals and ensuring public support and ownership.

Armenia recognizes that public engagement is central to effective capacity-building. The country has initiated several processes to enhance awareness and participation through processes such as:

- *Climate education:* Armenia is integrating climate change into school curricula and vocational training programmes. A 2021 study by UNICEF revealed that 90 per cent of adolescents are eager to learn more about climate change, with schools being their preferred source of information.[85]
- *Empowerment*: Projects such as "Empowering communities Through Participation and Awareness in Climate Policy Implementation" aim to strengthen civil society involvement in climate decision-making. These initiatives include roundtables, awareness campaigns, and policy monitoring.[86]
- *Digital access to information:* Armenia is developing online portals to disseminate climate data and policy updates. These platforms will support transparency and facilitate stakeholder engagement at all levels.[87]

[83] https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202404191712---Republic%20of%20Armenia%20%281%29.pdf
[84] https://ge.boell.org/en/2024/10/03/empowering-communities-through-participation-and-awareness-climate-policy-implementation
[85]https://www.unicef.org/armenia/media/13511/file/Knowledge,%20Attitudes,%20Practice,%20and%20Behaviour%20Study%20on%20Climate%20Change%20and%20Adolescent%20Participation%20in%20Armenia.pdf
[86] https://ge.boell.org/en/2024/10/03/empowering-communities-through-participation-and-awareness-climate-policy-implementation
[87] https://climate-transparency-platform.org/sites/default/files/project_document_file/ceo-endorsement-armenia.pdf

- *Youth and gender inclusion:* Armenia promotes inclusive capacity-building by supporting youth-led climate initiatives and ensuring gender-sensitive approaches in training and policy development.[88]
- *Public-private partnerships:* The government encourages collaboration with the private sector to scale up climate technologies and innovations. SMEs and startups are being supported through incubators and funding schemes to contribute to climate resilience.[89]

Information collected from publicly available documents on capacity building support needed under Article 11 of the Paris Agreement are presented in CTF table 10.

Armenia is committed to establishing a comprehensive M&E framework to assess the effectiveness of capacity-building activities. This includes activities such as developing indicators to measure progress in institutional strengthening, technical capacity and stakeholder engagement, conducting periodic reviews to identify gaps and adjust strategies accordingly, and reporting outcomes through national and international platforms, including the UNFCCC transparency framework.

The country also supports the PCCB's efforts to develop toolkits and e-booklets that help Parties assess capacity gaps and share best practices[90].

5.9 Information on capacity-building support received by developing country Parties under Article 11 of the Paris Agreement

Armenia has received substantial capacity-building support through bilateral, multilateral and regional cooperation mechanisms. These efforts have focused on enhancing institutional frameworks, technical capabilities and stakeholder engagement to meet the transparency, mitigation, and adaptation requirements of the Paris Agreement. Key sources of support include EU4Climate Project, implemented by UNDP and funded by the European Union, GCF Readiness Programme, NDC Partnership and UNDP technical assistance and regional cooperation through the Eastern Partnership and South Caucasus platforms.

Capacity-building support has been delivered through various modalities such as Technical Assistance: training, workshops, and expert consultations, Institutional Support: for the development of NAP, TNA and LEDS, Financial Support: grants and co-financing for transparency and adaptation projects, and Knowledge Products: toolkits, e-booklets, and guidelines developed by the PCCB and partners.

Armenia has been working towards securing national and subnational support for capacity-building. The successful efforts include: National level: Armenian MoE has led coordination of capacity-building efforts, supported by UNDP, GEF and the European Union. Local governments and civil society have been engaged through awareness campaigns and training sessions, Sub-national level: Armenia has participated in South Caucasus climate dialogues, sharing experiences with other countries in the region. Joint workshops on adaptation planning have fostered regional learning, and Settlement level:

[88] https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202404191712---Republic%20of%20Armenia%20%281%29.pdf
[89] https://www.worldbank.org/en/country/armenia/publication/the-country-climate-and-development-report-for-armenia
[90] https://www4.unfccc.int/sites/SubmissionsStaging/Documents/202404191712---Republic%20of%20Armenia%20%281%29.pdf

Through the Covenant of Mayors programme, and the Eastern Partnership, Armenia has accessed technical expertise and funding from the European Union. Regional platforms have facilitated peer learning and harmonization of climate reporting standards.

Armenia has prioritized inclusive stakeholder engagement in capacity-building efforts through several measures.

Ministries of Environment, Economy, Territorial Administration and infrastructure have played key roles in climate-related capacity-building. Civil Society and Academia also play a vital role. NGOs and universities have contributed to climate education and research. Private Sector SMEs and start-ups have also been supported to develop climate technologies. Special programmes have targeted youth leadership and gender equality in climate action.[91]

Stakeholder involvement has been facilitated through national consultations for NDC updates, roundtables and forums on climate finance and transparency and, public access to climate data via online portals.

Throughout the process of climate-related capacity-building, Armenia has identified the need for country ownership and alignment with national priorities as critical areas of capacity-building. for success. Also, capacity-building must be continuous and adaptive to evolving needs. The country also highlights the need to incorporate digital tools to enhance transparency and stakeholder engagement.

Through actions like the inclusion of climate change in school curriculum, children's awareness has been improved which lays the foundation for building their capacity to participate in climate action.

The country needs to sustain and scale successful initiatives like CBIT and EU4Climate. Capacity-building needs to be expanded to support subnational actors and vulnerable communities. Strong regional cooperation is essential for shared learning and resource optimization.

Following case study demonstrate successes and challenges faced in capacity-building activities. Such information can be used to inform future activities to be more productive.

Case Study: EU4Climate – Legislative alignment and MRV enhancement

The EU4Climate project supported Armenia in aligning its climate legislation with EU standards and enhancing its MRV system. Activities included:

- Gap analysis of climate-related laws.
- Development of roadmaps for MRV system improvement.
- Stakeholder workshops involving 30+ institutions Success Factors:
- High-level political support and inter-ministerial collaboration.
- Integration of EU best practices.

Challenges:

- Complexity in harmonizing EU acquis with local regulations.
- Need for sustained funding beyond project cycles.

[91] https://www.cif.org/resource-collections/climate-delivery-case-study-series/energy-access-armenia-incentivizing-move.

Information collected from publicly available documents on capacity building support received under Article 11 of the Paris Agreement are presented in CTF table 11.

5.10 Information on support needed and received by developing country Parties for the implementation of Article 13 of the Paris Agreement and transparency-related activities

Armenia has received targeted support to meet the enhanced transparency requirements under Article 13 of the Paris Agreement. The most significant initiative is the UNDP-GEF CBIT project titled "Building Armenia's National Transparency Framework under the Paris Agreement", launched in May 2021.

This project provided:

- *Institutional Support:* Establishment of national arrangements for climate reporting, including an inter-agency working group coordinated by the MoE.
- *Technical Capacity:* Development of a national MRV system for continuous data collection and reporting on GHG emissions, mitigation and adaptation measures and support received.
- *Human Resource Development:* Training of government officials, technical experts, and stakeholders on transparency-related methodologies and reporting formats; and
- *Digital infrastructure:* Creation of data portals and templates for sectoral GHG inventory reporting, aligned with IPCC guidelines.

The CBIT project enabled Armenia to transition from ad hoc reporting to a continuous MRV process, improving the quality and consistency of its BTRs and NIRs.

Additional support was received through:

- *UNDP Technical Assistance:* Expert consultations and workshops on ETF implementation.
- *GEF Funding:* Financial support for the preparation of BTRs and related transparency documents.
- *Regional Platforms:* Participation in Eastern Partnership and South Caucasus transparency workshops.

Some of the support received to meet the enhanced transparency requirements under Article 13 of the Paris Agreement are shown in the table 5-9.

Table 5-9. The support received to meet the enhanced transparency requirements under Article 13 of the Paris Agreement

Project name	Total Funds received	Donors	Targeted areas
Preparation of BUR3	USD 352,000	GEF	BUR 3 preparation
CBIT project	USD 990,000	GEF	Develop MRV systems Establish legal and institutional frameworks Launch online climate data portals

Following case-studies provide valuable learning experiences to inform future actions for better effectiveness:

Case Study 1: CBIT Project – Building Armenia's national transparency framework

The CBIT project, launched in 2021, aimed to establish institutional and technical capacities for enhanced transparency under Article 13. Key achievements include:

- Development of a national MRV system with integrated data portals.
- Formalization of institutional roles for climate reporting.
- Capacity building of 490 government officials and technical experts.

Success Factors:

- Strong coordination between the MoE, Statistical Committee and UNDP.
- Use of digital tools for data collection and reporting.

Challenges:

- Initial delays due to fragmented data systems.
- Limited technical capacity at subnational levels.

Case Study 2: Challenges in climate finance tracking and data integration (failure/challenge)

Overview:

Despite progress in institutional capacity building, Armenia faced difficulties in robustly tracking climate finance flows and integrating data across sectors.

Key Challenges:

- Fragmented data systems across ministries and agencies.
- Limited technical expertise in climate finance accounting.
- Inconsistent reporting formats and lack of standardized indicators.

Consequences:

These issues led to uncertainty in assessing support needs and utilization, particularly in sectors like Forestry and Agriculture. It also hindered the development of bankable climate projects and reduced the effectiveness of international reporting.

Lessons Learned:

- The need for a centralized climate finance tracking system.
- Importance of continuous training and technical support for data harmonization.
- Engagement of financial institutions and private sector actors in MRV processes.

Despite this progress, Armenia continues to face challenges in meeting the full scope of Article 13 reporting requirements. The country has identified support needs in:

- *Expansion of MRV Systems:* Armenia seeks additional resources to scale its MRV system to cover more sectors, including Land-use, Waste and Industrial Processes.
- *Data Quality Assurance:* Support is needed to develop and implement QA/QC procedures across all reporting sectors.
- *Legal and Regulatory Frameworks:* Armenia requires assistance in drafting and adopting legal mandates for transparency reporting, particularly for subnational entities.
- *Capacity for Adaptation Reporting:* Technical guidance and tools are needed to improve reporting on adaptation actions and their impacts.
- *Gender-Disaggregated Data:* Armenia aims to integrate gender-sensitive indicators into its transparency framework and requires methodological support.

Information collected from publicly available documents on support needed and received under Article 13 of the Paris Agreement are presented in CTF tables 12 and 13.

These needs have been communicated through national consultations and submissions to the UNFCCC, including input of Armenia to the second review of the PCCB.

Armenia has participated in technical expert reviews (TERs) of its BURs and BTRs. These reviews have identified areas for improvement, including:

- *Consistence in GHG Inventory Methodologies:* TERs recommended harmonization of sectoral approaches and use of standardized templates.
- *Tracking Progress on NDCs:* Armenia was advised to improve its indicators and methodologies for assessing mitigation outcomes.
- *Transparency in Support Received:* Review teams highlighted the need for more detailed and disaggregated reporting on financial, technical and capacity-building support.

In response, Armenia has adopted sectoral templates for GHG data collection. Also, NDC tracking system was improved through the CBIT-supported MRV platform. Further, the county enhanced its reporting on support received by integrating donor-specific data and aligning with CTFs recommended under decision 5/CMA.3.

However, further support is needed to address gaps in emissions estimates for smaller subsectors to develop methodologies for quantifying adaptation outcomes and to build capacity for implementing the full scope of TER recommendations, especially at the local level.

Armenia has made significant strides in implementing Article 13 of the Paris Agreement, thanks to targeted support from GEF, UNDP and regional partners. The country has transitioned to a more robust and continuous transparency framework, but additional support is essential to expand MRV coverage and improve data quality, institutionalize transparency reporting through legal reforms, address TER recommendations comprehensively and build capacity for adaptation and gender-responsive reporting.

Armenia remains committed to enhancing its transparency framework and welcomes continued collaboration with international partners to meet its climate reporting obligations and contribute effectively to the global stock take.

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