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IKI INTERNATIONAL CLIMATE INITIATIVE

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SUSTAINABLE ENERGY AND CLIMATE ACTION PLAN OF THE AKUNK COMMUNITY OF KOTAYK REGION

AKUNK 2026

The document was developed by experts from Nexus Intellect Research NGO and Sky Net LLC within the framework of the regional project " Decarbonization and Climate Resilience in the Eastern Partnership Countries" (EU4ClimateResilience), co-financed by the European Union and the Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) of the Federal Republic of Germany and jointly implemented by the German International Cooperation Agency (GIZ) and the Organization for Economic Cooperation and Development (OECD).

ANNEX 1 Decision No. 14 of the Council of Elders of the Akunk Community, dated 14 February 2023, on granting consent to join the Covenant of Mayors for Climate and Energy initiative

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ
ԱԿՈՒՆՔ ՀԱՄԱՅՆՔԻ ԱՎԱԳԱՆԻ

Հայաստանի Հանրապետության Կոտայքի մարզի Ակունք համայնք
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14 ՓԵՏՐՎԱՐԻ 2023թվականի N 14

ԵՎՐՈՊԱԿԱՆ ՄԻՈՒԹՅԱՆ ԿՈՂՄԻՑ ԻՐԱԿԱՆԱՑՎՈՂ «ՔԱՂԱՔԱՊԵՏԵՐԻ ԴԱՇՆԱԳԻՐ ՀԱՆՈՒՆ ԿԼԻՄԱՅԻ ԵՎ ԷՆԵՐԳԻԱՅԻ» ՀԱՄԱՅՆՔՆԵՐԻ ԿԱՅՈՒՆ ԶԱՐԳԱՑՄԱՆՆ ՈՒՂՂՎԱԾ ՆԱԽԱՁԵՌՆՈՒԹՅԱՆԸ ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ ԱԿՈՒՆՔ ՀԱՄԱՅՆՔԻ ՄԻԱՆԱԼԸ ՀԱՍՏԱՏԵԼՈՒ ՄԱՍԻՆ

Ղեկավարվելով«Տեղական ինքնակառավարման մասին» օրենքի 18-րդ հոդվածի 1-ին մասի 42-րդ կետով,առաջնորդվելով Եվրոպական միության կողմից իրականացվող «Քաղաքապետերի դաշնագիր հանուն կլիմայի և էներգիայի» նախաձեռնության դրույթներով՝ համայնքի ավագանին որոշում է՝

1.Հաստատել Հայաստանի Հանրապետության Կոտայքի մարզի Ակունք համայնքի միանալը Եվրոպական միության կողմից նախաձեռնված և իրականացվող «Քաղաքապետերի դաշնագիր հանուն կլիմայի և էներգիայի»նախաձեռնությանը:

2.Սույն որոշման ուժի մեջ մտնելու պահից երկու տարվա ընթացքում, Եվրոպական Հանձնաժողովի «Քաղաքապետերի դաշնագիր՝ Արևելք» տարածաշրջանային ծրագրի և այլ գործընկերների աջակցությամբ, Դաշնագրի շրջանակներում մշակել Հայաստանի Հանրապետության Կոտայքի մարզի Ակունք համայնքի Կայուն էներգետիկ զարգացման և կլիմայի պահպանության գործողությունների ծրագիրը (Sustainable Energy and Climate Action Plan), որում կամփոփվեն մինչև 2030թ. համայնքի թիրախային բնագավառներում ջերմոցային գազերի արտանետումներն առնվազն 35%-ով նվազեցման, ինչպես նաև համայնքի կլիմայի փոփոխության հանդեպ դիմակայունության բարձրացմանն ուղղված գործողությունները և միջոցառումները:

3.Մինչև 2024թվականը նշանակել Հայաստանի Հանրապետության Կոտայքի մարզի Ակունք համայնքի Կայուն էներգետիկ զարգացման և կլիմայի պահպանության գործողությունների ծրագրի մշակման պատասխանատու էներգետիկ կառավարիչ:

4. Սույն որոշումն ուժի մեջ է մտնում ընդունման օրվանից:

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ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ Հ. ՌՈՒԲԵՆՅԱՆ

List of Abbreviations Used

Abbreviation	Explanation
CNG Refuelling Station	Compressed Natural Gas Refuelling Station
BEI	Baseline Emission Inventory
NSS	National Statistical Service
PH	Private House
MAB	Multi-Apartment Building
GDB	Gasification and Gas Supply Branch
GEF	Global Environment Facility
EC	European Commission
EU	European Union
RES	Renewable Energy Sources
SECAP	Sustainable Energy and Climate Action Plan
IPCC	Intergovernmental Panel on Climate Change
LED	Light Emitting Diode (LED Lamps)
RA	Republic of Armenia
LPG	Liquefied Petroleum Gas
SNCO	State Non-Commercial Organization
UNDP	United Nations Development Programme
UN	United Nations
YCC	Youth Creative Centre
PEI	Pre-school Educational Institution
SB	State Budget (including subvention programmes)
LSG	Local Self-Government Bodies
HH	Household
GHG	Greenhouse Gases
CNG	Compressed Natural Gas
LLC	Limited Liability Company
EBRD	European Bank for Reconstruction and Development
R2E2 Fund	Renewable Resources and Energy Efficiency Fund of the Republic of Armenia
HPP	Hydropower Plant
CRVA	Climate Risk and Vulnerability Assessment
CJSC	Closed Joint-Stock Company
CoM	Covenant of Mayors
MP	Municipality / Municipal Budget
PV	Photovoltaic

Units of Measurement Used

Unit	Explanation
kWh	Kilowatt-hour, 1 kWh = 3,600 kJ
MWh	Megawatt-hour, 1 MWh = 1,000 kWh
MWh(g)	Megawatt-hour (natural gas)
MWh(e)	Megawatt-hour (electricity)
GWh	Gigawatt-hour, 1 GWh = 1,000 MWh = 1,000,000 kWh
kcal	Kilocalorie, 1 kcal = 1/860 kWh = 4.1868 kJ
ha	Hectare, 1 ha = 10,000 m^2
hPa	Hectopascal
m^3	Standard cubic metre
t CO_2	Tonnes of carbon dioxide

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Introduction

The "Covenant of Mayors for Climate and Energy" initiative is a broad, community-based movement that brings together local self-government bodies and territorial authorities that voluntarily commit to implementing the climate and energy targets set by the European Union. The initiative was launched by the European Commission in 2008 to promote the achievement of climate and energy objectives. Within the framework of the Covenant, communities commit to reducing CO_2 emissions by at least 40% by 2030 (30–35% for Eastern Partnership countries), implementing climate change adaptation programmes, and combating energy poverty by ensuring safe, sustainable, and affordable energy for all.

By joining the Covenant of Mayors, Akunk Community undertakes to develop and implement a Sustainable Energy and Climate Action Plan (SECAP), which shall serve as the community's long-term strategic document. The SECAP is aimed at achieving three main objectives:

- improving the level of energy efficiency and expanding the use of renewable energy sources,
- decarbonising the community territory and reducing greenhouse gas emissions,
- increasing the community's resilience to climate risks.

This document has been developed upon the instruction of the Head of Akunk Community within the framework of the programme "Decarbonisation and Climate Resilience in the Eastern Partnership Countries", co-financed by the European Union and the Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety of the Federal Republic of Germany, with technical support from the German Agency for International Cooperation (GIZ) and the Organisation for Economic Co-operation and Development (OECD).

The SECAP of the Akunk Community is based on EU and Covenant of Mayors methodologies, as well as on the community's own data, national strategic documents, and results of local-level consultations.

Sustainable Energy and Climate Action Plan

In accordance with the Covenant procedures, the SECAP includes a number of components that are of key importance for effective climate policy and action planning:

- A questionnaire was developed and submitted to the municipality, after which various departments provided the necessary information. During the development of the SECAP for the Akunk Community, continuous communication with the municipal staff was ensured, and training meetings were organised on data collection and monitoring for the SECAP.
- A preliminary assessment of community energy consumption was carried out, which served as a baseline for subsequent measurements and reductions.
- The calculation of greenhouse gas emissions was conducted using the "top-down assessment" method based on energy consumption data, enabling comparison of the community's carbon footprint with indicators recorded in the baseline year.
- A preliminary analysis of the community's vulnerability to climate change impacts was conducted, resulting in the identification of the main risks and possible adaptation measures.
- Strategies and measures for reducing greenhouse gas emissions and achieving sustainable energy targets were defined. These will be further elaborated and supplemented, depending on the community's political will, additional data, and stakeholder engagement.
- An implementation plan was developed, presenting the sequence of measures, responsible entities, and preliminary timelines for execution.

The document also includes a primary package of actions to ensure both emission reductions and improvements in the quality of the community's energy services. These measures were developed with

the participation of partners and stakeholders, and their implementation is planned to be reviewed periodically and adjusted based on new data and local priorities.
The SECAP serves as a strategic guideline for the development of the Akunk Community, promoting energy sustainability and climate resilience while aligning with the policies of the Republic of Armenia and international initiatives.

Akunk Community's Accession to the Covenant
Akunk Community joined the European Union–initiated and implemented "Covenant of Mayors for Climate and Energy" initiative on 14 February 2023 by Council Decision No. 14 (Annex 1).
By joining the Covenant, the Akunk Community voluntarily undertook to:

- Within two years from the entry into force of the decision, with the support of the European Commission's "Covenant of Mayors – East" regional programme and other partners, develop the SECAP of Akunk Community of Kotayk Marz of the Republic of Armenia within the framework of the Covenant, which will summarise the actions and measures aimed at reducing greenhouse gas emissions in the community's target sectors by at least 35% by 2030, as well as increasing the community's resilience to climate change.
- Appoint a responsible Energy Manager for the development of the Sustainable Energy and Climate Action Plan (SECAP) of Akunk Community.

Programmes Implemented in Akunk Community in Recent Years

- In 2022, within the framework of the "Local Development Social Investments" programme financed by the Territorial Development Fund of Armenia, with 5% co-financing from the community, photovoltaic plants with a total capacity of approximately 133 kW were installed on the roofs of 4 community-owned structures.
- Within a programme financed by the United Nations, a 32 kW solar panel system was installed on the roof of the Akunk Community administrative building.
- Within the framework of the "Solid Waste Management in Kotayk and Gegharkunik Marzes" programme, the community has been cooperating with the Territorial Development Fund of Armenia since 2020; however, it still lacks a service provision contract. The preliminary specific locations for the construction of 24 two-container waste collection platforms have been provided.
- Since 2018, the old street lighting fixtures in the Akunk Community have been replaced with new, energy-efficient LED luminaires, and the process is ongoing.
- Since 2018, the community has developed the "Akunk Community Disaster Risk Management Plan", which was revised in 2020 and will be approved in the coming days for 2025–2026.

In addition to the above, issues related to the creation of green zones and artificial forests, mechanisms for soil moisture conservation, efficient use of water resources, and steps to implement them are frequently discussed in the community.

Chapter 1. Foundations for the Development of the SECAP of Akunk Community

1.1 Objectives of the Action Plan and Sectors Considered

The objective of the SECAP is to define long-term economic, technical, technological, and innovative steps to promote energy efficiency improvements and the use of renewable energy resources in the Akunk Community. As a result of implementing these steps, the community can ensure a significant increase in local energy production, promote the rational and efficient use of energy resources, enhance the community's energy security, improve living conditions, and the environment by reducing greenhouse gas emissions. At the same time, the programme aims to strengthen the community's resilience to the

impacts of climate change through the systematic implementation and continuous application of adaptation measures.
The main sectors considered within the framework of the programme are municipal, public, and private transport; external street lighting systems; residential and public buildings; community-owned structures; and organisations operating under community subordination.
In order to achieve the objectives set in the SECAP of Akunk Community, it is necessary to:

1. Promote the use of renewable energy resources and the introduction of modern technologies;
2. Implement comprehensive energy-saving and energy efficiency programmes through the application of modern “green” technologies;
3. Reduce energy consumption of community-subordinated structures and residential buildings by introducing effective management tools and a “green procurement” policy;
4. Establish a community energy management system and ensure data monitoring and control to maintain target indicators;
5. Assess climate hazards and vulnerabilities specific to the Akunk Community, periodically review adaptation measures, and cooperate with scientific and professional institutions;
6. Promote public awareness regarding energy efficiency, renewable energy, and climate change mitigation measures;
7. Develop programme management capacities, attract international and local investments, and promote effective cooperation with donor organisations and stakeholders.

1.2 Legal and methodological foundations of project development

The Akunk community's SECAP is based on a number of national and international documents of a normative, strategic, informational, and methodological nature. The combination of these documents forms the energy and climate policy framework, and their study includes international commitments, national strategies, and local and regional programs, which predetermine the structure, priorities, and implementation mechanisms of the SECAP.

1. **The RA Law "On Energy"** (07.03.2001), which defines the general foundations of management and regulation of the energy sector.
2. **The RA Law "On Energy Saving and Renewable Energy"** (09.11.2004), which stipulates the obligations of local self-government bodies to implement energy saving measures and promote the use of renewable energy technologies.
3. **The RA Law "On Environmental Impact Assessment and Expertise"** (21.06.2014), which requires that energy efficiency and climate sustainability requirements be taken into account when designing new buildings and infrastructure.
4. **The Strategic Energy Development Program of the Republic of Armenia until 2040 (** 2021), which aims to achieve by 2030 in total electricity production to provide at least 15% of RE share (without large hydroelectric power plants) and 26 % by 2040.
5. **Long-term Strategy for Low-Greenhouse Gas Emissions Development of the Republic of Armenia (until 2050)** (2023) **,** which sets a per capita emissions reduction target of: up to 2.07 t CO_2 / year.
6. **RA Energy Efficiency and Renewable Energy Program (2022–2030)** , which defines measures to promote energy efficiency and renewable energy in the sectors of buildings, transport, agriculture and industry.
7. **"Procedure for Inventorying Greenhouse Gas Emissions"** (Resolution 54-N of the Government of the Republic of Armenia, 11.01.2024), which regulates the procedures for recording emissions and preparing reports.
8. **Akunk community 2023–2027. Five-Year Development Program (2022)**

9. **Armenia-EU Comprehensive and Enhanced Partnership Agreement (2017)**, which sets out commitments to implement key EU directives on energy efficiency, renewable energy, and energy performance of buildings.
10. **Nationally Determined Contributions (NDCs, 2021–2030)** to which Armenia commits by 2030 reduce emissions by 40% (based on the 1990 level).
11. **Paris Agreement** (2015) and commitments adopted by the Republic of Armenia in the field of greenhouse gas emission reduction and adaptation.
12. **The UN Framework Convention on Climate Change** and its requirements for national reporting and emission inventories.
13. **The UN Sustainable Development Goals (SDGs, 2030)** , in particular SDG 7 (affordable and clean energy) and SDG 13 (climate action).
14. **Guide**: "How to develop a sustainable energy and climate action plan in the Eastern Partnership countries."
15. "Reporting Guidelines", Office of the Prosecutor General (2020).

These comprehensive legal and methodological foundations ensure that the Akunk community's SECAP is consistent with RA and EU policies, fulfills international obligations, and, at the same time, aims to develop practical, feasible actions at the community level.

1.3 Possible financing options for project implementation

To ensure the effective and coordinated implementation of the measures in the SECAP, the local government prioritizes allocating appropriate funding in the community's annual budget. They should be provided, taking into account the programs' priorities, expected results, and implementation periods.

It should be noted that the implementation of the project generally requires significant investment funds, which cannot be fully provided from the community budget. For this reason, the Akunk community municipality will take steps to attract additional financial resources, studying both the programs and subsidy opportunities available at the state level, as well as the loan and grant instruments provided by international financial institutions and donor organizations. Private sector investments can also play a significant role in this process.

A community revolving fund can be considered a sustainable financing tool for implementing energy-efficiency and renewable-energy development initiatives.

The targeted distribution of financial flows is also important for increasing the efficiency of financing. The need is to develop direct expense mechanisms from financing to savings encouragement. Below are the main financing options for SECAP activities that the community can use during implementation.

- Financing from the community budget

The community budget is one of the main financial sources for the implementation of the Akunk community's 2023–2027 five-year development plan[1], and the intended allocations are for energy infrastructure and street lighting modernization. In particular, around **AMD 12 million** has been allocated to improve energy infrastructure, and about **AMD 7 million to** modernize street lighting systems. Such an approach makes it possible to ensure the coherent implementation of the SECAP activities, as well as creates preconditions for attracting additional funds through co-financing from state subsidy programs, international financial institutions, and donor organizations, which often consider community participation as a mandatory condition.

- Government subsidies

[1] https://kotayk-akunk.am/Pages/DocFlow/Def.aspx?a=v&g=af9112a2-fe72-4c45-b290-e6b95621d647

The subsidy program aimed at developing economic and social infrastructure in communities, implemented by the Government of the Republic of Armenia, serves as an effective model for community-state partnership. The program's logic is that capital investment projects submitted by communities, if approved by the government, receive co-financing from the state budget. The share of co-financing is determined depending on the nature of the project, sectoral characteristics, and socio-economic impact, and can be from 10% to 80% of the total cost. If the project also involves third-party co-financing of at least 20%, the share of state co-financing can be increased by an additional 5%.
Subsidy programs have been in effect since 2018 and cover 19 areas, including increasing energy efficiency, construction and renovation of street lighting, installation of solar photovoltaic plants, construction or reconstruction of kindergartens and public buildings, as well as modernization of common shared property in apartment buildings.
In addition, within the framework of subsidy programs, communities are given the opportunity to benefit from technical assistance provided by international and donor institutions. For example, through the UNDP-CEC "Reducing Risks of Investments in Energy-Efficient Modernization of Buildings" program, co-financing was provided for the thermal modernization of more than 140 buildings during 2020–2023.
According to regulations that came into effect in 2022, households participating in subsidy programs are required to provide at least a 10% investment, but in programs with an energy efficiency component, this requirement can be reduced to 5%. In addition, in 2022, within the framework of the "State Support Program for Energy-Efficient Renovation of Apartments and Individual Residential Houses", approved by the decision of the Government of the Republic of Armenia No. N 520-L[2], it is planned to compensate for the interest rates on loans taken for the purpose of energy-efficient renovation of apartments and houses.

- Financial resources of the population

In the Akunk community, as well as in other small and medium-sized communities, large energy-consuming sectors (for example, industry or centralized heat supply systems) are practically absent. Under these conditions, the main energy-consuming and GHG-emitting sector is "Residential Buildings", which also has the greatest potential for energy savings and emissions reductions. According to the Baseline Emission Inventory (BEI) calculations, the main consumer of energy carriers in Akunk is the population. This circumstance shows that without the active participation of the population, tangible results cannot be achieved within the framework of the SECAP.
Therefore, the municipality should consistently work with the population, encouraging their participation and co-financing in the implementation of measures planned in the "Residential Buildings" sector. This will contribute to both reducing energy consumption in the residential sector and reducing GHG emissions.
For enterprising citizens, "green" and "soft" loans provided by commercial banks are available, as well as state support programs introduced by the Government of the Republic of Armenia, including loans provided for the energy-efficient renovation of apartments and individual houses. Partial co-financing by the population is also sufficient to make it possible to thermally insulate buildings, reduce heat losses, introduce efficient heating systems, and use renewable energy technologies through loan programs.

- Business or the private sector as a source of financing

Promoting sustainable energy development is also possible through the active involvement of the private sector. This participation can be expressed in various ways, for example, encouraging the production of energy-efficient materials, developing entrepreneurship, and introducing and applying new technologies. The involvement of the private sector can be achieved through advertising support, the inclusion of

[2] In particular, the Akunk community is classified as a rural settlement that is not a border settlement, in which case interest rate subsidy is implemented at a rate of 12%.

minimum energy-efficiency requirements in public procurement, and targeted orders. In addition, co-financing schemes, community-private partnership formats, and incentive mechanisms are applicable. The latter may include the provision of international credit funds, compensation or subsidy of loan interest rates by the state in order to ensure more affordable and "soft" lending conditions.

- Financial institutions, foundations, and programs

Important sources of funding for the implementation of the SECAP include not only state and community funds, but also financial institutions, foundations, and programs that include grant components and are aimed at climate change mitigation and adaptation. Their involvement enables communities to implement projects to increase energy efficiency, develop renewable energy, and strengthen climate stability.

The advantage of these structures is that they act as independent financial actors, providing not only direct grants or loans but also technical assistance and consulting. Through them, it is possible to finance communities that have limited opportunities with their own budgetary resources or cannot use classic credit mechanisms. In addition, such programs often also support the formation of investment packages and the use of energy service company models. Here we can mention the Renewable Energy and Energy Efficiency Fund of Armenia[3], the main mission of which is to promote the use of leading practices in sustainable energy, contributing to strengthening the country's energy security, ensuring energy independence and economic growth. R2E2 Fund has rich experience in financing and implementing energy efficiency and renewable energy projects in Armenian communities.

Among the financial structures and initiatives can be listed:

- ✓ Green for Growth Fund (GGF),
- ✓ The Green Climate Fund (GCF),
- ✓ Eastern European Partnership Energy Efficiency and Environment Fund (E5P),
- ✓ Municipal Project Support Facility,
- ✓ Nordic Environment Finance Corporation (NEFCO),
- ✓ Global Climate Partnership Fund,
- ✓ The United Nations Development Program Armenia Office (UNDP Armenia),
- ✓ The Covenant of Mayors - Demonstration Projects (CoM-DeP) program,
- ✓ as well as local financing initiatives."

The involvement of these structures will enable the provision of financial resources, technical assistance, and capacity building, supporting the effective implementation of the Akunk community's SECAP activities.

- Other funding mechanisms and sources

It is also possible to use non-traditional financing mechanisms and sources for the implementation of the SECAP, such as community, state, or donor funds. One of them **is a revolving fund**, a financial instrument aimed at ensuring the continuous financing of investment projects. At the initial stage, it can be replenished from various sources - loans, grants, or donations, and later become self-financing, due to savings from the first projects or revenues from local energy production[4].

Another possible mechanism is **leasing**, which is often more affordable than traditional credit, as lease payments are usually lower than the cost of loan repayment and servicing. For example, leasing can provide for the installation of solar photovoltaic systems.

In addition, communities can benefit **from commercial loans** provided by financial institutions to implement energy efficiency and renewable energy projects, either directly or through energy service companies (ESCOs). It is also possible to use **targeted credit lines**, i.e. " **soft** " government loans that

[3] https://www.r2e2.am/

[4] In accordance with the PSRC Resolution No. 374-N dated 01.11.2013 , a license for the production of electricity at a solar power plant is issued to community non-profit organizations and the Renewable Energy and Energy Saving Fund of Armenia for the production of electricity at plants with a installed (installed) capacity of up to 1 MW.

are transferred to financial institutions to provide more affordable loans to communities. Credit risks can be mitigated through guarantees and risk-sharing mechanisms when a donor organization or government insures part of the potential losses.
Alternative sources include **international technical assistance funds**, local environmental funds, targeted fundraising initiatives, and various types of government subsidies and special support measures. All of these tools enable communities to create a diversified funding base, ensure sustainable implementation of programs, and reduce dependence on the community budget alone.

1.4 Monitoring the progress of the project implementation

One of the key prerequisites for the effective implementation of the Akunk Community's SECAP is the establishment of a clear monitoring system. This system enables not only the supervision of the progress of measures and tracking of the achievement of established targets, but also the implementation of corrective actions when necessary. The monitoring function ensures the assessment of both qualitative and quantitative results of the programme, thereby contributing to increased transparency and strengthened management effectiveness.
Responsibility for coordinating the monitoring system lies with the municipality. It may be carried out either by a structural unit established for this purpose or by a specially authorised specialist – the Energy Manager. The presence of an Energy Manager is considered an important prerequisite for participation in the "Covenant of Mayors", as he/she ensures the development and supervision of the SECAP's implementation.
The main functions of the Energy Manager or the management unit are:

- Participation in the development of the SECAP and the target-setting process;
- Periodic collection and analysis of energy consumption data in all target sectors;
- Organisation of energy audits and studies;
- Introduction of energy management tools in municipal structures;
- Coordination of the work of various departments and subordinated organisations;
- Cooperation with organisations providing financial and technical support;
- Monitoring the implementation progress of the SECAP and preparation of reports.

Until an energy management unit is established or an appropriate specialist is engaged, monitoring of the programme may be carried out by a working group appointed by municipal staff.
The monitoring process includes:

- Development and application of a data collection methodology;
- Continuous collection and recording of energy consumption and GHG emission indicators;
- Identification of internal and external data sources (municipality financial department, utility services, "Electric Networks of Armenia", "Gazprom Armenia", etc.);
- Introduction of mechanisms for verification and validation of collected data;
- Determination of the frequency of data collection – annually or more frequently;
- Definition of indicators and comparative thresholds, for example, maximum allowable levels of energy consumption in buildings;
- Development of reporting formats and their approval by the municipality.

Reports will be prepared and submitted through the "MyCovenant" online platform in accordance with the established periodicity:

- A simplified report – qualitative description of implemented measures – every two years;
- A full report – including qualitative and quantitative data, update of the BEI, and assessment of emission reductions – every four years.

Akunk Municipality also plans to conduct more frequent monitoring, on an annual or semi-annual basis, to ensure a more detailed assessment of programme progress. This approach will allow a more objective analysis of both the actual energy savings achieved and the financial and environmental effectiveness.

Chapter 2. Brief description of the Akunk community

2.1 Historical overview

The multi-residential community of Akunk[5] was formed in accordance with the Law of the Republic of Armenia "On Administrative-Territorial Division of the Republic of Armenia" dated June 9, 2017, HO - 93-N, as a result of the unification of the settlements of Akunk, Nor Gyugh, Kotayk, Kaputan, Hatis, Zovashen, Zar and Sevaberd, the Akunk multi-residential community was formed. The center of the community is the village of Akunk. The center of the enlarged community is the village of Akunk.

The village of Akunk was previously part of the Yerevan province (sometimes the Nor Bayazet or Kotayk provinces). In 1946, it was renamed Akunk. It has clean, healthy air and is rich in springs. In the southern part of the village are the Forty Springs, from where the main water supply of Yerevan begins. The village was resettled in 1829 by Armenians resettled from Khoy, Salmast, and partly from Nor-Bayazet. The village is older than is generally believed, as evidenced by the ruins of a cyclopean fortress in the old village. 1 km east of the village is the V-VI century Poghos-Petros Church, which serves as a pilgrimage site, and the St. Karapet Church has been renovated and is operating in the village. There is also a memorial dedicated to the Great Patriotic War in the village. The community's population has access to 24-hour drinking water. Street lighting has been installed. A new standard building of the Akunk CJSC has been built. A spiritual cultural center has been built next to the church, where a spiritual music ensemble and several art groups hold classes. The main occupation of the population is farming, animal husbandry, and gardening.

Other settlements in the community also have a unique historical past. Nor Gyugh was founded in 1828, during the Russo-Persian War, by families who immigrated from Khoy. The name of the village of Kotayk is derived from the combination of the tribal name "Kot" and the place name "ayk"; it was previously known as Bardzabi or Yelghovan. Kaputan is an ancient settlement, the name of which is associated with the 7th century Kaptavank church and the surrounding blue stones. Hatis was founded in the 1920s by immigrants from Western Armenia and the Sevan basin. Zovashen was resettled in 1918–21 by Armenians from Mush and Alashkert, but the ruins of a church discovered in the area testify to the community's much earlier origins. Zar, located southeast of Hatis Mountain, has been inhabited since the Stone Age. And Sevaberd, formerly known as Karaghala, is famous for its dark fortress and evidence of ancient habitation.

Thus, the enlarged community of Akunk comprises eight villages with rich historical heritage, each with its own historical and cultural characteristics.

[5] https://kotayk-akunk.am/Pages/CustomPage/?CustomPageID=722b890c-cc0b-4c5d-bdf2-30fbebab4291

2.2 Geography

The enlarged community of Akunk is located in the central part of the Kotayk region of Armenia, at the southern foot of the Geghama mountain range. The average elevation of the community is about 1,700 meters above sea level, and the highest point, in the area of the village of Sevaberd, reaches about 2,080 meters.

Akunk community borders the communities of Charentsavan, Geghashen, Kamaris, Katnaghbyur, Aramus, Mayakovsky, Balahovit, Abovyan, Arzni, and Byureghavan. Brief information on the settlements within the community is presented below.

The administrative center of the community, the village of Akunk, is located at an altitude of 1445-1488 meters, at the southern foot of Mount Hatis, between the villages of Nor Gyugh and Zar.

The settlements of the community are located about 20 km northeast of Yerevan, about 42 km southwest of the regional center of Kotayk, and 5 to 11 km from the city of Abovyan, depending on the settlement. All settlements have convenient access to major highways and the capital, Yerevan, ensuring efficient transport connections and contributing to the development of local agricultural and economic activities. This geographical location provides favorable conditions for the development of agriculture and ecotourism, but requires special attention to infrastructure, water resources, and energy efficiency.

2.3 Population

From 1831 to the present day, population figures indicate that until 1842, the population was homogeneous, with only Armenian Christians, and then Kurds also lived there, some of whom, as well as a certain number of Yezidis, are still present in some villages.

The total population of the community has undergone significant fluctuations during 2018–2024, due to both low natural population growth and external migration.

According to data from the Statistical Committee of the Republic of Armenia (Figure 1), the population of the enlarged community of Akunk ranges from 8950 to 9650 inhabitants.

Since 2020, the population of the Akunk community has increased, with an average annual growth rate of 2.2%. The number of births registered annually in the community averages 110-120 children, and the average death rate is 51.

About 48% of the population is men. As of January 1, 2025, the number of households in the community is 2,185, including 101 vulnerable households, and the number of pensioners in the community is 836 6.

The average population density is relatively low due to the large area and mountainous terrain of the community. There are also a limited number of seasonal settlements in the area (for example, Sevaberd), and the population may temporarily increase during the summer months.

[6]Passport of the Akunk community of the Kotayk region of Armenia, https://kotayk-akunk.am/Pages/CustomPage/?CustomPageID=722b890c-cc0b-4c5d-bdf2-30fbebab4291

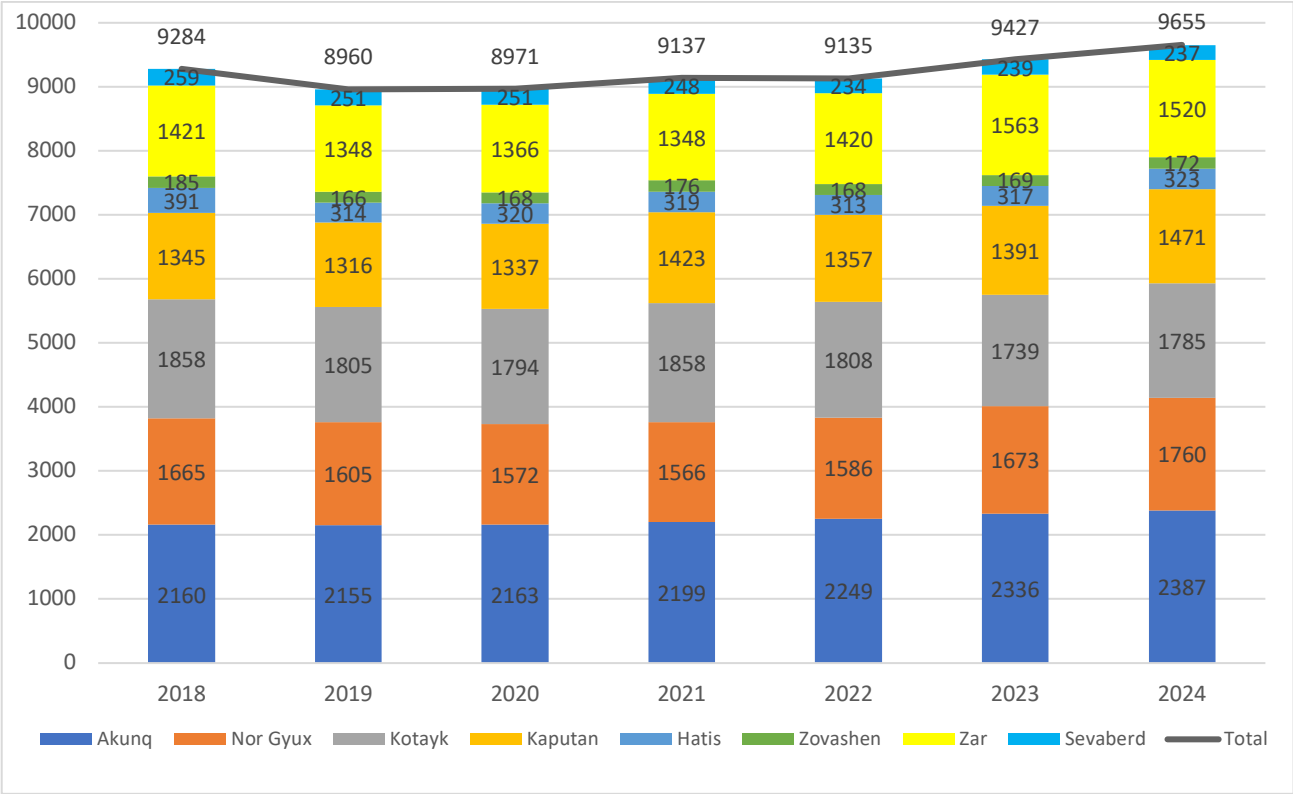


Figure 1. Population of Akunk community 2018-2024[7]

2.3.1. Gender sensitivity and energy poverty

An analysis of data from the Statistical Committee of the Republic of Armenia[8] and relevant sectoral strategic documents indicates that energy poverty remains a significant socio-economic challenge in regional communities of Armenia, including the Akunk community. High energy costs, limited household incomes, and the low energy performance of the residential building stock considerably restrict access to energy services and frequently result in underheating of dwellings.

According to the RA Energy Efficiency and Renewable Energy Programme for 2022–2030[9], approximately 58.6% of households in Armenia are unable to adequately heat their homes during the cold months and can therefore be classified as energy poor. At the same time, around 71% of rural households continue to rely on firewood as their primary heating source. Energy consumption levels are strongly correlated with the standard of living, resulting in Armenia's final energy consumption per capita being approximately two times lower than the EU average. These trends are also evident in the Akunk community, driven by income levels, the predominance of individual heating systems, and the low energy efficiency of the building stock. In the Akunk community, approximately 2,330 residents live below the poverty threshold, representing the primary group potentially exposed to energy affordability challenges. In addition, 73 residents receive state social support, indicating that a segment of the population is already identified as vulnerable in covering basic utility costs. Taken together, these groups provide a reasonable indication of the population potentially exposed to energy poverty within the community.

[7] Regions of the Republic of Armenia and the city of Yerevan in numbers, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024. https://armstat.am/file/article/marz_2017_30.pdf , https://armstat.am/file/article/marz_2018_30.pdf https://armstat.am/file/article/marz_2019_30.pdf , https://armstat.am/file/article/marz_2020_30.pdf , https://armstat.am/file/article/marz_2021_30.pdf , https://armstat.am/file/article/marz_2022_30.pdf , https://armstat.am/file/article/marz_2023_30.pdf , https://armstat.am/file/article/marz_2024_30.pdf

[8] https://armstat.am/am/?nid=82&id=2657

[9] https://www.arlis.am/hy/acts/161408

The main drivers of energy poverty include low household incomes, relatively high energy prices, insufficient thermal insulation in buildings, inefficient heating systems, and widespread reliance on firewood and other traditional fuels. Under such conditions, households are often compelled to limit energy consumption at the expense of basic needs, leading to a decline in quality of life and increased health risks. At the same time, with expected economic development and improvements in living standards in the coming years, energy demand is projected to increase, driven by a gradual reduction in underheating and improvements in living conditions.

Energy poverty is not gender-neutral and disproportionately affects women. In the Akunk community, women are often primarily responsible for managing household energy use and expenditures. As a result, limited access to energy services and high energy costs directly increase their social and time burden. Particularly vulnerable groups include female-headed households, elderly women living alone, and large families. Climate change-related risks, including potential disruptions in energy supply and instability of the energy system, may further increase the burden on women, exacerbating existing inequalities.

The most vulnerable groups in the Akunk community from an energy poverty perspective include low-income households, female-headed households, elderly residents, large families, rural households, and persons with disabilities. For these groups, limited access to affordable and reliable energy services results not only in economic challenges but also in significant social and health impacts.

Addressing energy poverty at the community level requires an integrated approach that includes improving the energy performance of residential and public buildings, promoting renewable energy solutions, introducing financial support mechanisms for vulnerable groups, and raising awareness of energy-efficient behaviors. Local self-government bodies play a crucial role in the planning, implementation, and monitoring of such measures, as also reflected in international practice.

The measures proposed under this SECAP aim not only to reduce greenhouse gas emissions but also to reduce energy poverty by improving energy affordability and lowering household energy expenditures. At the same time, low income levels and underheating in residential buildings may, in some cases, reduce the financial and economic viability of energy efficiency and renewable energy projects, as well as their expected climate mitigation impact.

The Gender Strategy of the Republic of Armenia for 2025–2028[10] defines national priorities for promoting gender equality and emphasizes the need to develop gender-sensitive and gender-responsive approaches to climate change. In line with national policies, the Akunk SECAP integrates gender considerations into its proposed measures, promotes equal participation of women and men in decision-making processes, and strengthens women's role as key stakeholders and agents of change in energy- and climate-related actions.

In conclusion, addressing energy poverty and promoting gender equality are closely interlinked objectives. Their effective integration will contribute to enhanced social inclusion, economic resilience, and climate sustainability in the Akunk community.

2.4 Housing stock

The residential fund of the enlarged community of Akunk consists exclusively of individual residential houses. All 8 settlements in the community are rural. As of January 1, 2025, there are 2185 residential houses (detached houses) in the community of Akunk with a total area of 3.03 million m2.

The majority of the community housing stock is used as a primary residence. The exceptions are the settlements of Sevaberd and Zovashen, where some houses are used for seasonal or secondary residence (e.g., summer cottages).

The community's housing stock was largely built in the 1970s–1990s, with some apartments dating to the 1960s. A significant portion of the residential buildings is worn out both structurally and in

[10] https://www.arlis.am/hy/acts/206364

engineering terms. Stone or basalt buildings without modern thermal insulation systems are especially common.

All settlements in the community, except for the Sevaberd settlement, are gasified and heated by individual heating systems, mainly based on natural gas. Some households continue to use wood or manure. This not only increases energy costs but also contributes to atmospheric pollution, especially in the winter months.

2.5 Economy

The economy of the Akunk enlarged community is characterized by an agricultural orientation. The climatic conditions and natural resources of the area contribute especially to the development of field farming, animal husbandry, and horticulture.

There are 2,082 farms operating in the community, engaged in the cultivation of cereals, potatoes, legumes, and other vegetables.

In the field of livestock breeding, the community specializes mainly in cattle breeding; as of January 1, 2025, the community had 7,371 cattle. For comparison, let us note that the number of small cattle is 5,265, and the number of pigs is 20,133.

In recent years, attempts have been made to develop greenhouse farms and beekeeping in some villages of the community, although they have not yet reached large scales.

Of the total land area of 30.3 thousand ha of the administrative territory of the community, about 95% or 28.7 thousand ha are agricultural lands, but a significant part of them, on average 30-35%, are not cultivated, as drought years are frequent, which pose a high risk to farming. Recently, severe hail has become more frequent, causing significant damage to agricultural crops.

In the southwestern part of the village of Sevaberd, an artificial water reservoir was built in 1972, which can irrigate only 10 percent of the community's lands; it is mainly used by other, lower-lying settlements.

There is 1 drinking water bottling plant, 3 restaurant complexes, 1 mineral water company, and 1 milk processing company operating in the community. There are also small retail stores, car service stations, repair shops, and other service facilities in the villages. Table 1 presents the main industrial enterprises operating in the Akunk community.

Table 1. Main industrial enterprises operating in Akunk community

1	LLC	36	<<ANTENOR>> LLC <<MULTI AQUAMARINE>> LLC <<AM-ESKA>> LLC <<BIOTECH>> LLC <<AAVA >> LLC <<M.N.A.S>> LLC <<GOLDEN ROSES>> LLC <<BYURAK RESTAURANT >> LLC << ZOVAGHBYUR >> LLC <<EAR HEAVEN>> LLC <<SHEM>> LLC << HIGH HILL TOWER>> LLC <<A.K.A. 2023>> LLC <<ROSE M PAIR>> LLC <<MANY ROSE >> LLC <<TESTY BERRY>> LLC <<ANNIE FLOWERS>> LLC STEEL CONCERN LLC <<SCIENTIFIC CENTER FOR FOOD SAFETY RISK ASSESSMENT AND ANALYSIS>> LLC KRAG LLC <<NORGEO>> LLC <<ADVANCE PARA>> LLC <<G.M.V.>> LLC

			<<GOOD STAR>> LLC <<PAHEST 8>> LLC "SOFIA CAT" LLC "LEYMANS MINING" LLC "TONUS-LES" LLC "EMART GROUP" LLC "HADIS AGRO" LLC "ANSTAR" LLC LE PHÉNICIEN LLC "ROLLER" LLC "GMV" LLC <<RAFAEL SAHAKYAN FELIX>> PRIVATE LIMITED
2	CJSC, OJSC, PPJSC	6	"HRACH AND GAS" CJSC "BLACK AGRO VILLAGE INDUSTRY" CJSC "DOUBLE V CONSTRUCT" CJSC "BERRY HOUSE" CJSC "SCIENTIFIC CENTER FOR FOOD SAFETY RISK ASSESSMENT AND ANALYSIS" CJSC "CARD AGROSERVICE" CJSC
3	Individual entrepreneurs	33	MARIA KHACHATRYAN TIGRAN NIKOGHOSYAN LUSINE MURADYAN ARAYIIK ARUSTAMYAN ZOHRAB ASTVATSATURYAN <<ELMIRA KHACHATRYAN SOSINI>> <<GEGHAM HAMBARDZUMYAN>> << ARMEN YEGHIAZARYAN MARTOUNI >> Private Enterprise <<TATEVIK MANUKYAN ARMENI>>Private Enterprise << VARAZDAT HAKOBI GASPARYAN >> Private Limited Company <<ARMAN PETRIK GENNADY>>Private limited liability company <<MARINE MELIKYAN YURIKI>>Private Limited Liability Company <<KAREN GABRIELIAN KORYUNI>> PE <<VALENTINA KHACHATRYAN>>Private Enterprise <<NAREK MNATSAKANYAN>>Private Enterprise << SEDA YEGHIAZARYAN>>Private Enterprise ANDRANIK HAKOBYAN PRIVATE ENTERPRISE <<LILIT GRIGORYAN GARNIK>> PRIVATE ENTERPRISE <<ARMEN MNATSAKANIAN GAGIKI>> PE <<MARIAM KHLGHATYAN>> PE <<TAMAR TADEVOSYAN GEGHAMI>>Private Limited Liability Company VALOD MKHITARYAN NORAYRI PRIVATE LIMITED <<SIRANUSH VARDANIAN RUDIKI>>Private Enterprise <<MARETA KHACHATRYAN ARTASHI>>Private Enterprise <<ARMINE GEVORGYAN ARARATI>> PE <<AVAG AVAGYAN>>Private Enterprise <<GOHAR GRIGORYAN>>Private Enterprise <<ZARA HAKOBYAN>> Private Enterprise <<MARINE MKRTCHYAN>> Private Enterprise <<GRIGOR GRIGORYAN>> Private Enterprise <<GRETA SAGHATELYAN AGHASU>>Private Limited Liability Company <<RUBEN NIKLOLYAN ARTHUR>> LLC <<ARKADI VARDANIAN ARMENIAN>>
4	Construction companies	5	"DOUBLE V CONSTRUCT" LLC "VARDANYANSHIN" LLC "MASIS" PRODUCTION COOPERATIVE <<GAS DUTY>> LLC "STEP GROUP" LLC

2.6 Climate

The expanded community of Akunk is located in the central part of Armenia, in the mountainous and plateau zone of the Kotayk province.

The area is characterized by a mountainous continental climate, with cold, snowy winters and cool, short summers. High temperature fluctuations occur day-to-day and from day to night.

The average annual temperature is around +5.5°C – +6.5°C, depending on the altitude of the settlement. The average summer temperature is +16°C – +25°C, and in winter -5°C – -10°C. On extremely cold days, temperatures as low as -25°C can be recorded.

The average annual precipitation is 450–900 mm, with most falling in spring and autumn. In winter, there is stable snow cover in the higher elevations, with snow thickness reaching 40–60 cm in some settlements. Figure 2 shows the climate of the Akunk community by month.

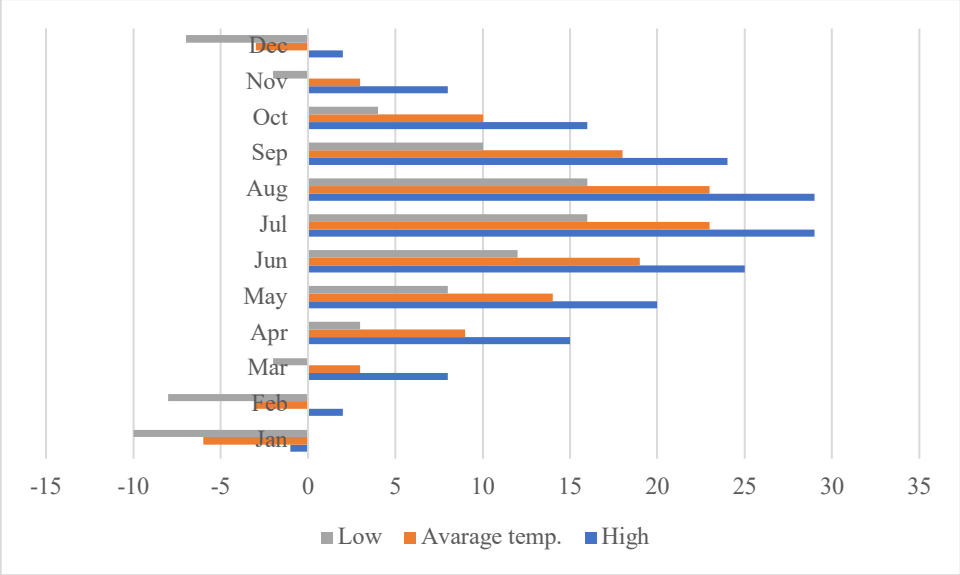


Figure 2. Climate of the Akunk community by month[11]

In recent years, climate change trends have been observed, including disturbances in the frequency and distribution of precipitation and prolonged summer droughts. Short-term, heavy precipitation, such as hail, increases the risk of soil erosion and landslides.

Winds in the area mainly come from the northeast and west. Strong winds are recorded in some parts of the area, especially in spring.

These climatic conditions create certain risks for agriculture on the one hand, and, on the other hand, opportunities for the development of renewable energy, particularly solar and wind energy, as the community is located in a zone of medium-to-high solar radiation.

2.7 Tourist attraction

The enlarged Akunk community lacks a developed, functioning tourism infrastructure, but it has **significant potential for the development of nature, culture, and rural tourism.** The community's mountainous and forested landscape, clean air, and traditional rural environment can be transformed into an attractive tourism destination, especially within the framework of ecotourism and hiking tourism.

[11] https://weatherspark.com/y/103425/Average-Weather-in-Akunk%E2%80%99-Armenia-Year-Round#google_vignette

The community's territory is rich in mineral springs, which are especially attractive to tourists and hikers. The village **of Sevaberd** is distinguished by its elevated location and picturesque views.
Seasonal summer-cottage areas have already been established here, which can serve as the basis for tourism development.
A number of **medieval khachkars and village churches have been preserved in the community**, representing the historical and cultural heritage of the Kotayk region. Thus, the 5th-6th century Poghos-Petros Church in the village of Akunk serves as a pilgrimage site (the picture shows the Poghos-Petros Church in the settlement of Akunk).
In addition, the St. Karapet Church in the Akunk settlement has been renovated and is operating. A 19th-century church in Nor Gyugh has been preserved, renovated, and is in operation. The village of Kotayk has a church, St. Hovhannes, built in the first half of the 19th century and now renovated and in operation.
In Kaputan, the Tukh Manuk karablur, located northwest of Kaptavank (built in the 7th century), is considered sacred, as is the cave called "Suluzagha"/water spring. Of great interest are the blue stone fields, quartz fields, remains of Cyclopean fortresses, and numerous rock paintings, located 2 km north of the village.
Hatis village preserves late medieval khachkars. Zar village has 91 monuments, 73 of which are of national significance, including fortresses, Stone Age sites, petroglyphs, khachkars, and churches that can be restored and included in tourist routes.
Taking into account the favorable climatic conditions and the landscape features of the region, the Akunk enlarged community can become **one of the development points of rural-ecotourism in the Kotayk region**, if appropriate strategic steps are implemented and private investments are attracted.

2.8 Local government body

The Akunk enlarged community was formed in 2017 as part of the administrative-territorial reforms of the Republic of Armenia, uniting eight settlements: Akunk, Nor Gyugh, Kotayk, Kaputan, Hatis, Zovashen, Zar, and Sevaberd. The community is **one of the enlarged rural communities of Armenia**, managed by the local self-government body, the Akunk Community Municipality.
Community governance is based on the provisions **of the RA Law "On Local Self-Government"**. The local government system includes: **the community head**, who is elected by the community residents by direct vote and is the body of executive power within the community, and **the community council**, which is elected by the community residents and is a representative body, exercising control and making decisions on issues of local importance.
The total number of employees of the community municipality is 53, of which 20 are community servants. The Akunk community council consists of 15 members.

Chapter 3. Energy consumption in the Akunk community[12]

In 2023, the energy costs for the Akunk Municipality totaled about 51 million AMD (about $133,000), of which 37% went toward electricity bills. Electricity consumption was almost equally distributed between external street lighting, internal lighting, and equipment of community buildings. About 12.5% were gas costs, mainly for heating public and administrative buildings, and the remaining 50.5% were fuel costs for official transport under the community's jurisdiction.[13]

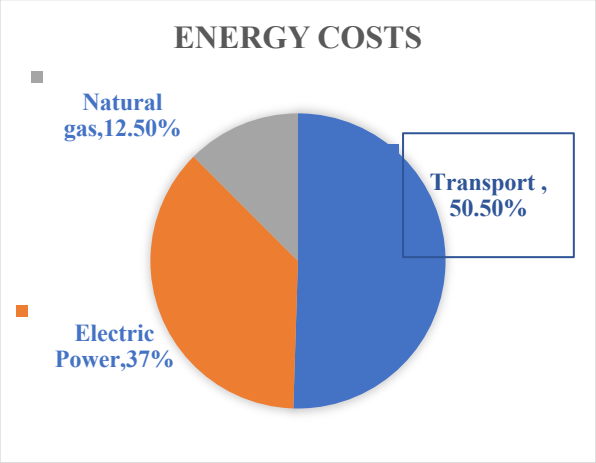


Figure 3. Energy expenditures of Akunk Community (2023)

The energy consumption structure of the Akunk community is formed mainly at the expense of the following energy carriers:

- ✓ electrical energy,
- ✓ natural gas,
- ✓ firewood,
- ✓ manure,
- ✓ motor fuels: gasoline and diesel.

Taking into account the data provided by the municipality and the analyses carried out, it is assumed that other energy carriers do not play a significant role in the community's energy balance. Thus, the mentioned energy carriers form the main structure of the Akunk community's energy consumption and serve as the basis for calculating the baseline emissions inventory.

The main reliable and verifiable data sources on the community's energy consumption were the indicators for 2022–2024. The selection of the baseline year for the community's emissions inventory was made from this period, in accordance with the methodological requirements of the Covenant of Mayors[14]. As a result, 2023 has been defined as the baseline year against which the emission-reduction results planned for subsequent target years will be compared. Figure 4 presents the overall structure of energy carrier consumption in the Akunk community in the baseline year. 2023 was selected as the baseline year because the data for that year are relatively complete and accessible, provided by the municipality, sectoral organizations, and open sources. In

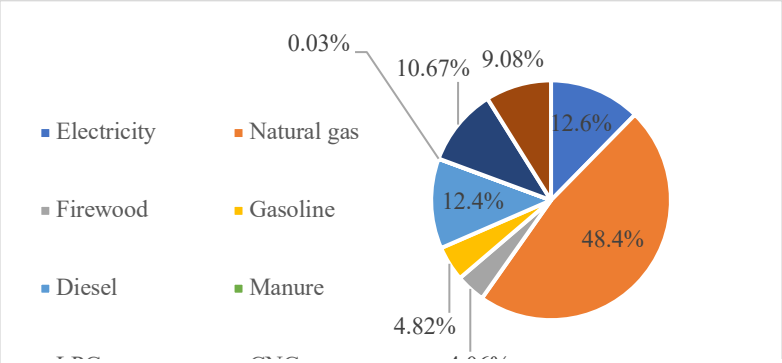


Figure 4. Structure of energy carrier consumption in Akunk Community in the baseline year (2023)

[12] The information, statistical data, calculations based on them, and expert assessments included in this chapter refer to the years 2022–2024. These are the data for the period that were used to compile the community's energy balance and baseline emissions inventory (BEI). The calculations and assessments refer exclusively to the administrative boundaries of the Akunk community and reflect the situation at that time, which may differ somewhat from current realities.

[13] Source: Akunk Municipality

[14] https://publications.jrc.ec.europa.eu/repository/handle/JRC142148 ; *How to develop a Sustainable Energy and Climate Action Plan (SECAP) Covenant of Mayors Guidebook | 2025;* Baseline year – the year against which the emission reduction target is compared. Energy and emissions data for that year are compiled in the form of a baseline emission inventory (BEI) and become the main basis for further monitoring and assessment of progress.

addition, during this period, the structure of energy consumption and emissions is considered stable and comparable, providing a reliable basis for long-term calculations and monitoring.
The total energy consumption of the Akunk community for 2022–2024 by energy carriers and sectors is presented in Table 2.

Table 2. Total energy consumption of Akunk community in 2022-2024 by energy carriers and sectors

Energetic	Residential sector (MWh / year)			Community facilities (MWh / year)			Transport (MWh / year)			Lighting (MWh / year)			Total consumption (MWh / year)		
	2022	2023	2024	2022	2023	2024	2022	2023	2024	2022	2023	2024	2022	2023	2024
Electricity	6,576.700	6,858.945	7,487.400	304.683	391.228	259.997	-	-	-	141.700	147.018	158.034	7,023.083	7,397.191	7,905.431
Natural gas	25,430.138	26,785.770	31,009.415	362.745	391.363	414.762	-	-	-	-	-	-	25,792.883	27,177.063	31,424.177
CNG	-	-	-	-	-	-	4,420.618	5,994.134	8,310.324	-	-	-	4,420.618	5,994.134	8,310.324
LPG	-	-	-	-	-	-	4,185.893	5,505.842	8,556.513	-	-	-	4,185.893	5,505.842	8,556.513
Firewood	2,376.960	2,376.960	2,376.960	-	-	-	-	-	-	-	-	-	2,376.960	2,376.960	2,376.960
Gasoline	-	-	-	-	-	-	2,076.118	2,821.732	4,262.866	-	-	-	2,076.118	2,821.732	4,262.866
Diesel	-	-	-	-	-	-	4,083.300	7,273.200	8,063.400	-	-	-	4,083.300	7,273.200	8,063.400
Manure	15.206	15.206	15.206										15.206	15.206	15.206
Total	**34,399.004**	**36,036.881**	**40,888.981**	**667.428**	**782.591**	**674.759**	**14,765.929**	**21,594.908**	**29,193.103**	**141.700**	**147.018**	**158.034**	**49,974.061**	**58,561.328**	**70,914.877**

The supply of electricity and natural gas is organized centrally by the Electric Networks of Armenia (ENA) CJSC and Gazprom Armenia CJSC. The mentioned companies operate in a regulated market, and the tariffs for the services they provide are set by the decisions of the Public Services Regulatory Commission of the Republic of Armenia (PSRC).
Electricity tariffs are set by time of day and vary according to applicable thresholds (e.g., RA PSRC Decision No. 478-N of December 29, 2021; see Table 3).

Table 3. Tariffs for electricity sold to consumers by "Electric Networks of Armenia" CJSC *(PSRC Decision No. 478-N of 29.12.2021, as amended by PSRC Decision No. 450-N of 30.12.2024; tariffs entered into force on 1 February 2022, with the exception of the table)*[15]

№	Final consumer groups	Unit of measurement	Tariff rate
1	Socially vulnerable families in accordance with RA Government Decision No. 1122-N of 03.11.2016		
a.	Day tariff	AMD/kWh	29.99
b.	Night tariff	AMD/kWh	19.99
2	Residential consumers supplied at 0.38 kV with monthly consumption up to 200 kWh, except for consumers defined in Point 1		
a.	Day tariff	AMD/kWh	46.48
b.	Night tariff	AMD/kWh	36.48
c.	Tariff applicable in cases defined by the Electricity Market Rules, including resumption of electricity supply to the consumer, as well as in cases where the consumer does not obtain the status of a qualified consumer within the timeframes and procedures defined by the Electricity Market Rules and the Electricity Supply Rules, or does not select another electricity supplier	AMD/kWh	54.61
3	Residential consumers supplied at 0.38 kV with monthly consumption from 200 kWh to 400 kWh, except for consumers defined in Point 1		
a.	Day tariff	AMD/kWh	48.48
b.	Night tariff	AMD/kWh	38.48
c.	Tariff applicable in cases defined by the Electricity Market Rules, including resumption of electricity supply to the consumer, as well as in cases where the consumer does not obtain the status of a qualified consumer within the timeframes and procedures defined by the Electricity Market Rules and the Electricity Supply Rules, or does not select another electricity supplier	AMD/kWh	54.61
4	Residential consumers supplied at 0.38 kV with monthly consumption above 400 kWh, except for consumers defined in Point 1		
a.	Day tariff	AMD/kWh	53.48
b.	Night tariff	AMD/kWh	43.48
c.	Tariff applicable in cases defined by the Electricity Market Rules, including resumption of electricity supply to the consumer, as well as in cases where the consumer does not obtain the status of a qualified consumer within the timeframes and procedures defined by the Electricity Market Rules and the Electricity Supply Rules, or does not select another electricity supplier	AMD/kWh	54.61
5	Other consumers supplied at 0.38 kV (except residential consumers)		
a.	Day tariff	AMD/kWh	53.48
b.	Night tariff	AMD/kWh	43.48
c.	Tariff applicable in cases defined by the Electricity Market Rules, including resumption of electricity supply to the consumer, as well as in cases where the consumer does not obtain the status of a qualified consumer within the timeframes and procedures defined by the Electricity Market Rules and the Electricity Supply Rules, or does not select another electricity supplier	AMD/kWh	54.61
6	Consumers supplied at 6 (10) kV		
a.	Day tariff	AMD/kWh	50.48
b.	Night tariff	AMD/kWh	40.48
c.	Tariff applicable in cases defined by the Electricity Market Rules, including resumption of electricity supply to the consumer, as well as in cases where the consumer does not obtain the status of a qualified consumer within the timeframes and procedures defined by the Electricity Market Rules and the Electricity Supply Rules, or does not select another electricity supplier	AMD/kWh	54.61
7	Consumers supplied at 35 kV		
a.	Day tariff	AMD/kWh	44.48

[15] Source: Official website of the Public Services Regulatory Commission of the Republic of Armenia.

b.	Night tariff	AMD/kWh	40.48
c.	Tariff applicable in cases defined by the Electricity Market Rules, including resumption of electricity supply to the consumer, as well as in cases where the consumer does not obtain the status of a qualified consumer within the timeframes and procedures defined by the Electricity Market Rules and the Electricity Supply Rules, or does not select another electricity supplier	AMD/kWh	54.61
8	Consumers supplied at 110 kV		
a.	Day tariff	AMD/kWh	41.98
b.	Night tariff	AMD/kWh	37.98
c.	Tariff applicable in cases defined by the Electricity Market Rules, including resumption of electricity supply to the consumer, as well as in cases where the consumer does not obtain the status of a qualified consumer within the timeframes and procedures defined by the Electricity Market Rules and the Electricity Supply Rules, or does not select another electricity supplier	AMD/kWh	54.61

Natural gas supply tariffs are also approved by the same regulator, in accordance with current regulations (see Table 4).

Table 4. Natural gas tariffs sold to consumers by "Gazprom Armenia" CJSC

(PSRC Decision No. 83-N of 01.03.2022, as amended by PSRC Decision No. 451-N of 30.12.2024)

No.	Consumer Groups	Unit	Natural Gas Tariff (Excl. VAT)	Natural Gas Tariff (Incl. VAT)	Effective Date
1	Socially vulnerable families (according to RA Government Decision No. 12-N of 03.11.2016)				From April 1, 2022
1.1	For annual consumption up to 600 m³ of natural gas	AMD / thousand m³	83,333.33	100,000.00	
1.2	For annual consumption exceeding 600 m³ of natural gas	AMD / thousand m³	119,750.00	143,700.00	
2	Greenhouse farms operating in the agricultural sector				
2.1	For the period from November 1 to March 31 (inclusive)	USD / thousand m³	194.92	233.9	
2.2	For the period from April 1 to October 31 (inclusive), per each month				
a	For consumption up to 10,000 m³ per month	AMD / thousand m³	119,750.00	143,700.00	
b	For consumption exceeding 10,000 m³ per month	USD / thousand m³	221.51	265.81	
3	Agricultural processing entities (canning, beverages, dairy production)	USD / thousand m³	194.92	233.9	
4	Thermal power plants (TPPs) with installed capacity ≥ 30 MW				From February 1, 2025
4.1	Natural gas required for electricity supply under the annual forecast balance	USD / thousand m³	38.92	46.7	
4.2	Natural gas required for electricity supplied beyond the forecast balance	USD / thousand m³	221.51	265.81	
5	Other consumers not covered in Groups 1–4 (per month)				From April 1, 2022
5.1	For consumption up to 10,000 m³ per month	AMD / thousand m³	119,750.00	143,700.00	
5.2	For consumption exceeding 10,000 m³ per month	USD / thousand m³	221.51	265.81	

It should be noted that the input indicators used to compile the Energy Balance and Baseline Emissions Inventory of the Akunk community were obtained not only from relevant service providers but were also developed based on information provided by the municipality and data available from open sources.

Due to the lack of institutional memory and reliable statistical data, a number of indicators, in particular, the consumption volumes of firewood, charcoal, and liquid fuel, were calculated through expert assessment, drawing on data from the municipality, the results of sectoral research, and other information sources.

The dynamics of population change also enable the calculation of specific energy consumption indicators per capita across various sectors. These data make it possible to assess the potential for increasing energy efficiency more objectively and identify the sectors where investment funds should be prioritized.

For recalculations and comparability, the physical quantities of energy carriers used by the community were expressed in energy units. For this purpose, the conversion factors published in the guidelines developed by the EC's Energy and Transport Institute, as well as the official normative indicators used in the RA, were used. This approach makes it possible to obtain not only comparable, but also methodologically consistent data that can be used for further analyses, scenarios and forecasts. The full list of factors is presented in Table 5, which serves as the main basis for the transparency and reproducibility of the calculations.

Table 5. Energy conversion factors and indicators

Energy carrier	Value	Unit	Comment
Natural Gas	9.41	kWh/Nm³	Corresponds to the lower heating value of gas equal to 8,100 kcal/m³
Diesel Fuel	10	kWh/l	or 11.9 kWh/kg (density assumed as 0.84 kg/l)
Gasoline	9.2	kWh/l	or 12.3 kWh/kg (density assumed as 0.75 kg/l)
Firewood	2.476	MWh/m³	Corresponds to the lower heating value of firewood equal to 3,000 kcal/kg. The bulk density of firewood is assumed to be 710 kg/m³
LPG	7.3	kWh/l	or 13.1 kWh/kg (density assumed as 0.536 kg/l)
Manure	3.2	kWh/kg	Corresponds to the lower heating value of manure equal to 2,771 kcal/kg

Chapter 4 . Energy consumption of community-owned structures

As of the baseline year (2023), a total of 14 institutions operate under the subordination of Akunk Municipality and are financed from the municipal budget (Akunk Kindergarten, Kaputan Pumping Station, Zar Daily Regulating Reservoir (DRR), "Kaptavank" Church, "Surb Astvatsatsin" Church, Akunk Parking Facility, as well as the administrative offices of the settlements of Akunk, Nor Gyugh, Kotayk, Kaputan, Hatis, Zovashen, Zar, and Sevaberd). These include the municipal administration,

administrative subordination offices, preschool educational institutions, and other cultural and public-purpose facilities.
All of the above-mentioned facilities are consumers of electricity, and a significant portion of them are also subscribers to natural gas. At the same time, there are institutions that do not use natural gas (for example, the administrative office of the Sevaberd settlement and the "Kaptavank" Church).
The energy consumption volumes of these institutions constitute a key component of the community's energy balance and, within the framework of the SECAP, are considered priority sectors for energy-efficiency improvement and emission-reduction measures.

4.1. Electricity and natural gas consumption in budgetary institutions

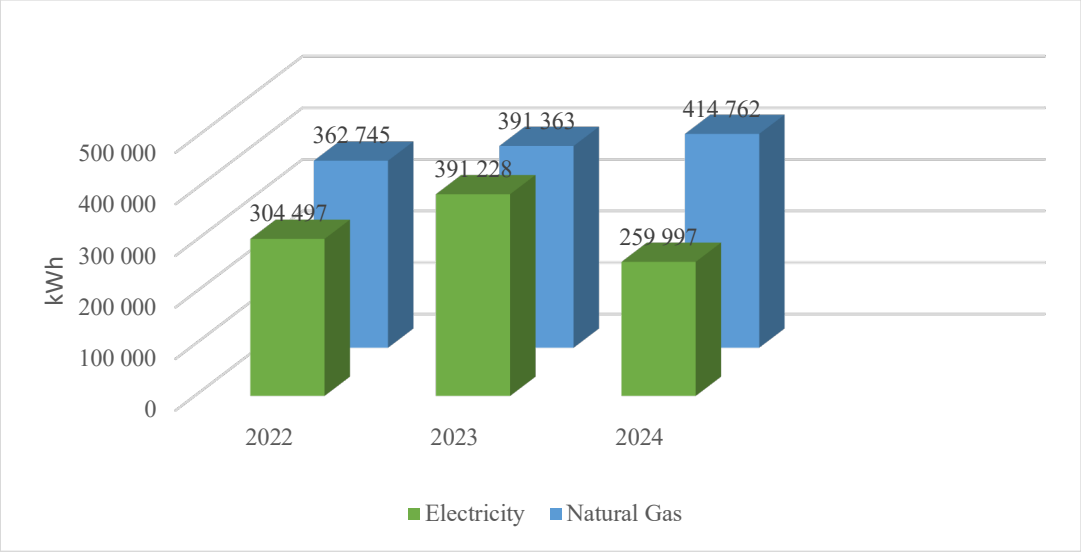


Figure 5. Energy consumption of community-owned institutions in 2022-2024

As already noted, the main energy carriers used in the institutions of the Akunk Community are electricity and natural gas. Certain facilities, for example, the Kaputan Pumping Station, "Kaptavank" Church, and other buildings, meet their heating demand exclusively through electricity, whereas other institutions primarily use natural gas.
The quantitative indicators of energy carrier consumption are recorded based on final consumption, i.e., excluding physical losses occurring during production, transmission, and distribution.
The annual consumption data of the main energy carriers, electricity and natural gas, used by a total of 14 administrative, educational, cultural, and infrastructure institutions operating under municipal budget financing, as well as by the municipality administration, are presented in Table 6.

Table 6. Annual electricity and natural gas consumption rates by community finance institutions

No.	Institution name	Electrical energy, kWh/year			Natural gas, m ^{3}/year[16]		
		2022	2023	2024	2022	2023	2024
1	Akunk Kindergarten	7,519	1,975	223	10,452	11,259	10,148
2	Kaputan pumping station	-	29,000	24,066	-	-	-

[16] The conversion of natural gas consumption volumes from physical units to energy units can be done based on the lower heat of combustion of natural gas of 9.42 kWh/m3, which corresponds to a calorific value of 8100 kcal/m3.

3	Zar DRR	210,209	235,922	135,129	-	-	-
4	"Kaptavank" Church	458	1,088	1,874	-	-	-
5	"Holy Mother of God " Church	-	2,473	2,257	1,319	989	1,210
6	Akunk parking lot	-	-	4335	-	-	-
Total		218186	218186	270,458	167,884	11,771	12,248
7	Akunk settlement administrative office	39,419	67,450	43,289	8,824	9,933	11,766
8	Nor Gyugh settlement administrative office	4,266	5,460	3,628	3,364	3,585	4,427
9	Kotayk of residence administrative office	12,712	17,879	12,160	4,519	5,007	5,580
10	Administrative office of Kaputan settlement	14,020	17,510	15,109	2,948	3,056	3,175
11	Hatis settlement administrative office	8,291	6,688	8,898	3,108	3,396	3,500
12	Zovashen settlement administrative office	3,201	1,763	4,338	2,105	2,326	2,715
13	Administrative office of the settlement of Zar	3,195	3,150	3,403	1,869	1,995	520
14	Sevaberd settlement administrative office	1,393	870	1,288	-	-	-
Total		86,497	86,497	120,770	92,113	26,737	29,298
Grand Total		**304, 683**	**304, 683**	**391,228**	**259,997**	**38,508**	**41,546**

The analysis of the data presented in the tables shows fluctuations in electricity consumption across budgetary institutions and organizations. If we compare 2023 with 2022, we see a 28% increase in electricity consumption, because in 2022, the Kaputan pumping station, the "Holy Mother of God" church, and the Akunk parking lot were closed. did not have energy consumption, and in 2023, some rooms of the Akunk administrative office began to be used for various educational groups for children. And the 34% decrease in consumption in 2024 compared to the baseline year is due to energy-efficiency improvement measures implemented in some institutions. In particular, windows and interior doors were changed, and old light fixtures were replaced with new LED light fixtures.

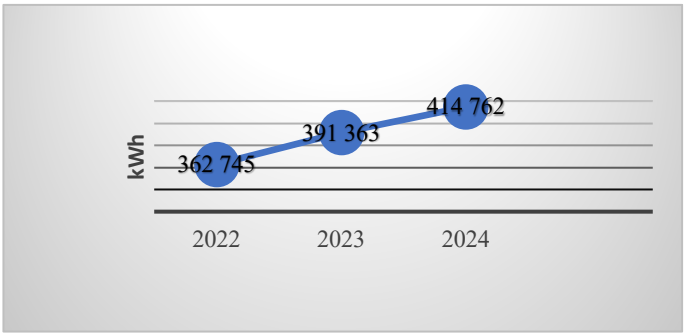


Figure 6. Natural gas consumption in municipal institutions

Figure 6 shows a steady annual increase in natural gas consumption, particularly during the transition period from 2023 to 2024. Overall, the consumption dynamics for 2022–2024 are characterised by an increase of approximately 14%. These trends are mainly associated with the shift from electricity to natural gas to meet heating demand. The analysis of energy carrier consumption data for 2022–2024 provided by Akunk Municipality indicates that among the major consumers within municipally financed institutions are the Zar DRR and the Kaputan Pumping Station. The Akunk Administrative Office is also among the consistently high consumers, with electricity consumption amounting to 43,289 kWh in 2024 and natural gas consumption reaching 11,766 cubic meters. The remaining administrative offices, although individually having relatively small volumes, together account for approximately one-third of total consumption, thus constituting a significant component of the community's energy balance.

The analysis of energy consumption structure shows that the main demand is met at the expense of natural gas and electricity. In total, electric energy and natural gas are used equally. Natural gas is mainly used for heating, and electricity is mainly used to power lighting and household appliances, except in structures without natural gas. The steady growth in annual consumption in these structures indicates a trend towards increasing heating comfort and improving overall living conditions.
Interior lighting in community institutions is mainly provided by energy-saving LED lamps.
Based on the above analyses, we conclude that insufficient thermal insulation of buildings, heat losses, and low levels of heating and ventilation lead to excessive energy consumption and additional costs. Thus, the main direction for energy savings should be the modernization of heating and ventilation systems, as well as reducing heat losses through building envelopes.

Chapter 5 . Residential and public sector energy consumption

The residential fund of the enlarged community of Akunk is entirely composed of individual houses[17]. The community includes eight rural settlements. As of January 1, 2025, there are 2,185 residential houses in the community.
The main building stock dates to the 1970s–1990s, with some earlier buildings.
A significant part of the housing stock today is worn out in both its structural and engineering systems. Stone and basalt houses are very common and often lack modern thermal insulation.
Heating is primarily provided by individual natural-gas systems. At the same time, some households continue to use firewood and manure, leading to higher energy costs and increased air pollution, especially in the winter.

5.1 Electricity consumption by the population and public facilities

Electricity consumption of private homes and public facilities in the Akunk community for 2022-2024 is presented in Table 7.

Table 7. Annual electricity consumption for 2022-2024

Residential buildings type	Unit of measure	Electricity consumption figures			Notes
		2022	2023	2024	
Apartment Buildings	MWh/year	5,785.8	6,190.8	6,618.5	
Specific Consumption of Apartment Buildings	kWh/year	2,192.4	2,240.6	2,308.5	Per apartment
Private Houses	MWh/year	790.977	668.145	868.645	
Specific Consumption of Private House	kWh/year	3,766.5	2,683.3	3,102.3	Per private house
Total	MWh/ year	6,576.7	6,858.9	7,487.4	

All data on electricity consumption was provided by the Geghama branch of ENA CJSC. Analysis of this data shows that electricity consumption by the population is increasing year by year: in 2023, it

[17] Currently, two apartment buildings are being constructed in the community, with a construction deadline of 2027.

increased by 4% compared to 2022, and in 2024, by 9% compared to 2023. These dynamics are also evident in Figure 7.

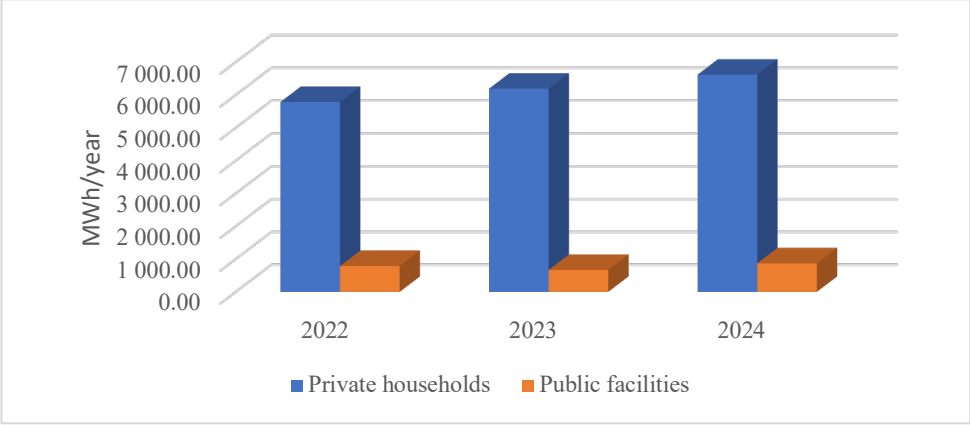


Figure 7. Electricity consumption by residential and public sectors

5.2 Consumption of natural gas, firewood, and biofuels by the population

All settlements in the Akunk community, except for Sevaberd, are gasified. As with electricity, gas consumption volumes are also increasing in 2022-2024: in 2023, they increased by 5% compared to 2022, and in 2024 by 15% compared to 2023. Gas consumption indicators are presented in Table 8.

Table 8. Natural gas consumption by the population

Type of buildings	Unit of measurement	Annual consumption, thousand m ^{3}/year			Annual consumption, MWh/year		
		2022	2023	2024	2022	2023	2024
Houses	MWh	2,699.59	2,843.5	3,291.87	25,430.138	26,785,770	31,009.415
Total		2,699.59	2,843.5	3,291.87	25,430.138	26,785,770	31,009.415

The same analysis cannot be performed to estimate the consumption volumes of firewood and biofuel, since data on consumption volumes for 2022 and 2024 are missing, and instead, the indicators for 2023, provided by the relevant department of the municipality, were used in the calculations. The indicators of firewood and biofuel consumption are presented in Table 9.

Table 9. Consumption of firewood and biofuels by the population

Type of residential buildings	Firewood consumption, m ^{3}			Firewood consumption, MWh		
	2022	2023	2024	2022	2023	2024
Apartment Buildings	-	-	-	-	-	-
Private Houses	960	960		2,376.96	2,376.96	
Total	960	960		2,376.96	2,376.96	
Type of residential buildings	Manure consumption, t			Manure consumption, MWh		
	2022	2023	2024	2022	2023	2024
Apartment Buildings	-	-	-	-	-	-
Private Houses	4,752	4,752	4,752	15,206	15,206	15,206

Total	4,752	4,752	4,752	15,206	15,206	15,206

Chapter 6 . Energy consumption in the transport sector

The transport system in the Akunk community mainly includes community and private transport. Public transport functions are actually provided by private entities. Such a picture is typical of small and medium-sized communities in Armenia and reflects the general features of their transport structure. The main energy carriers used are CNG, LPG, gasoline, and diesel fuel.
To convert the consumption volumes of motor fuels used by vehicles into energy units, the European Commission's professional structures developed guidelines that define conversion factors for different fuel types[18].

6.1 Energy consumption of community vehicles.

The vehicles under the jurisdiction of the Akunk community did not undergo any quantitative changes during the period 2022–2024, and their operating modes remained relatively stable. Taking this into account, Table 10 presents data for one year, based on the energy consumption volumes of community vehicles.

Table 10. Composition of Municipal Transport and Operational Indicators [19]

Type of Vehicles and Machinery	Model	Quantity, units	Average Annual Mileage, km	Engine Fuel Consumption		Type of engine fuel
				L km m³ / 100 km	litres/year, m³/year	
Passenger cars	LADA NIVA TRAVEL 212300	1	15000	12.1	1700	gasoline
	KIA SPORTAGE 2.5	1	22000	11.2	2300	gasoline
	VAZ 21214-121-40	1	4500	12.1	480	Gasoline
	KIA CERATO 1.6	1	5500	9	480	gasoline
	HYUNDAI SONATA 2.4	1	16800	11	1840	Gasoline
Combined	MAZ KO-806-20(MAZ5340C2-585-000)	1	6300	50	3000	Diesel fuel
Car tower	GAZ 3302 VIPO-12-01	1	10000	12.1	1500	Gasoline
Self-destructive	KAMAZ 53605-6010-48	1	12000	24	2800	diesel fuel
Side	UAZ 390945-552	1	4500	20	900	Gasoline
Garbage trucks	MAZ 4901C0-030	1	25500	26	6600	diesel fuel
	MAZ 5904C2-012	1	18000	24	4200	Diesel fuel
Excavator	ELAZ-BL880	1	4000	11 l/h	9440	diesel
Backhoe loader	JCB 9CX	1	2000	10l/h	6000	diesel

[18] https://publications.jrc.ec.europa.eu/repository/handle/JRC142148 ; *How to develop a Sustainable Energy and Climate Action Plan (SECAP) Covenant of Mayors Guidebook | 2025;*
[19] Source: Akunk Municipality.

Tractor	Belarus 82.1	5	27000	7.7 l/h	10000	diesel
Generator	TSS SGG 1000 EHA	1	-	4.9 l/h	240	diesel
Total		8			9,080	gasoline
		12			42,240	diesel fuel
		-			5,600	CNG

There are no registered vehicles running on CNG in the Akunk Municipality's autopark. At the same time, the Municipality is implementing an alternative mechanism as an operational solution. In particular, handouts are being distributed to employees with CNG coupons provided by the municipality. This week gives the latter the option to use their own cars for official purposes, ensuring the fulfillment of official travel and other work duties.
This approach makes it possible to reduce the community's financial costs of acquiring new vehicles, ensure more efficient use of existing human and material resources, and contribute to the continuity of services and flexibility in work organization.
Based on the data presented in the table, the physical volumes of motor fuels have been converted into energy units using the conversion factors mentioned above. This approach allows the consumption of different fuels to be expressed in comparable units and included in a single overall balance sheet. Based on the results obtained, Table 11 of the summary indicators for energy consumption of Akunk community vehicles and construction machinery has been developed, enabling a more precise assessment of total energy costs and their role in the community's energy system.

Table 11. Energy consumption structure of public transport

Motor fuel type	Number of cars	Energy Carrier Consumption		Consumption structure, %
		litres/year or m^3/year	MWh/year	
Gasoline	8	9080	83,536	15.0
Diesel fuel	1 2	42,240	422.4	75.6
CNG	-	5,600	52,752	9.4
Total	20	56,920	558,688	100

In summary, it is evident that the energy consumption structure of Akunk’s municipal transport is heavily dependent on diesel fuel, which increases both emissions volume and environmental risks. This situation requires a systematic policy to reduce emissions and gradually introduce clean, energy-efficient, and sustainable solutions in municipal transport.

6.2 Energy consumption of private and commercial transport

The assessment of energy consumption for private and commercial vehicles in Akunk was conducted based on limited data provided by the municipality. The data's incompleteness was addressed by using average indicators published by the Statistical Committee of the Republic of Armenia for the region, which were then compared with the community's population. The structure of the private and commercial transport fleets in Akunk, and the main parameters of their annual operations, are presented in Table 12, where the distribution by vehicle type reflects approximate estimates.

Table 12. Characteristics of the Private and Commercial Transport Fleet

Type of Vehicles	Type of Fuel	Average Annual Mileage, km	Fuel Consumption		Number of Vehicles			Energy Carrier Consumption
			liters or m³ per 100 km	liters per year, m³ per year	2022	2023	2024	MWh/year
Passenger cars	gasoline	9000	12,3	210,330	155	190	325	1,935.036
	diesel fuel	9000	6,5	37,440	50	64	100	374.4
	CNG	12000	6	360,000	440	500	810	3,391.200
	LPG	11000	8,5	481,525	466	515	935	3,515.132
Total passenger cars					1101	1269	2170	9,215 . 768
Trucks	gasoline	6000	15	87,300	50	97	105	803.160
	diesel fuel	6000	14	647,640	401	771	840	6,476.400
	CNG	3000	12	270,720	408	752	815	2,550.182
	LPG	5000	18	272,700	153	303	331	1,990.71
Total trucks					1012	1923	2091	11,820.452

The analysis of Table 12 enables assessment of the fuel structure of the private and commercial vehicle fleets of the Akunk Community and the resulting energy consumption trends. The data indicate that in the baseline year, the majority of passenger vehicles operated on CNG and LPG, with their combined share at approximately 75%. Specifically, the share of CNG reached 37%, while LPG accounted for 38%. The number of gasoline-powered passenger vehicles is relatively small.

In the structure of freight vehicles, diesel fuel is the dominant fuel type, accounting for approximately 56%. This is обусловԼшð both by the energy requirements of freight vehicles and by the availability and operational convenience of this fuel type.

Nevertheless, CNG and LPG also represent a significant share in freight transport, together accounting for 37%. It should be noted that although the use of LPG in freight transport is traditionally considered less common, its share (16%) indicates the technical feasibility and effective application of incentive mechanisms. This dynamic highlights local development trends aimed at diversifying the energy structure.

A comprehensive analysis of the data is presented in Table 13, and the overall distribution is reflected in Figure 8. These data enable a complete picture of the community's transport fleet energy consumption, identify the dominant fuel mix, and assess prospects for improving energy efficiency.

Table 13. Characteristics of private and commercial transport fleets

Fuel type	Passenger cars		Trucks		Total subsector	
	MWh	%	MWh	%	MWh	%
Gasoline	1,935.036	21.0	803,160	7.0	2,738.196	13.0
Diesel fuel	374.4	4.1	6,476.400	56.2	6,850.800	32.6
CNG	3,391.200	36.8	2,550.182	19.5	5,941.382	28.2
LPG	3,515.132	38.1	1,990.71	17.3	5,505.842	26.2
Total	**9,215.768**	**100.0**	**11,820.452**	**100.0**	**21,036.220**	**100.0**

The analysis shows that the Akunk transport sector is undergoing an energy transition. The high share of gaseous fuels, in particular CNG and LPG, indicates the adaptability and transformation potential of the local driving sector. This is not only an economically viable solution but also an environmentally preferable choice in the context of low-carbon emissions.

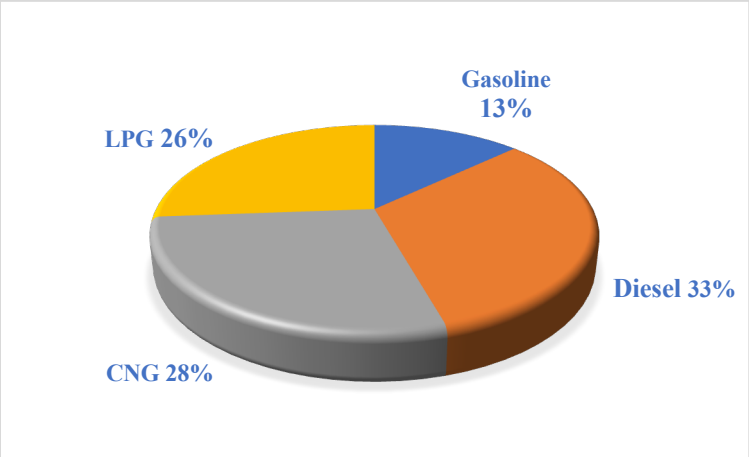


Figure 8. General characteristics of the private and commercial transport fleet

This dynamic is an important starting point for the Akunk community to develop and target sustainable mobility strategies and policies.

Chapter 7. Street lighting system technical specifications, characteristics and power consumption

The energy consumption of lighting in the Akunk community accounts for about 1/3 of the community's budget for financing structures[20]. The analysis includes only the electricity consumption indicators of the external street lighting system. They do not include the electricity volumes consumed by advertising, information, and other lighting installed in public areas. This circumstance implies that the presented data do not reflect the full energy budget of the lighting sector and may somewhat underestimate its actual share in the community's overall energy consumption structure.
In recent years, some progress has been observed in the street lighting system in the Akunk community, both in expanding the illuminated areas and modernizing the lamps. The community's street lighting consumption indicators are presented in Table 14.

Table 14. Street lighting consumption indicators in the Akunk community

No.	Institution name	Electrical energy, kWh /year		
		2022	2023	2024
1	Street lighting in Akunk settlement	36,686	34,999	34,337
2	Street lighting in the Nor Gyux settlement	46,655	42,904	57,994
3	Street lighting in Kotayk settlement	26,041	21,524	31,766
4	Street lighting in the Kaputan settlement	6,919	13,538	7,050
5	Street lighting in Hatis settlement	4,886	2,307	3,666

[20] The lighting system electricity costs include only external (street) lighting data, without taking into account the electricity consumption by advertising, information and other lighting systems or installations of this nature.

6	Street lighting in Zovashen settlement	3,267	2,902	4,530
7	Street lighting in the Zar settlement	15,780	27,001	14,009
8	Street lighting in the Sevaberd settlement	1,466	1,843	4,682
Total		141,700	147,018	158,034

During 2022–2024, Akunk recorded significant progress in both the extent of illuminated areas and the quality of lighting fixtures. In particular, the number of lighting units in the community was 1,404 in 2023 and increased to 1,527 in 2024. During the same period, the number of lighting units equipped with LED technology increased from 1,241 to 1,427. All lamps have a power of 120 W. The length of illuminated streets also increased, reaching 60 km in 2022, 65 km in 2023, and 77 km in 2024.
The community provides lighting for an average of 10 hours per day during the summer (215 days) and 7–8 hours per day during the winter (150 days). This indicates an ongoing process of introducing LED technologies to improve energy efficiency. The total length of illuminated streets amounted to approximately 60 km in 2022, 65 km in 2023, and 77 km in 2024. The indicators of the street lighting system of the Akunk community are presented in Table 15.
Despite the progress achieved, the lighting system of Akunk still faces certain challenges. In particular, in some areas, lighting is absent or outdated lighting systems are still in operation, for example, in the Sevaberd and Nor Gyugh administrative districts."

Table 15. Technical indicators of the street lighting system of the Akunk community

Indicator name	Unit of measurement	Value of the indicator			Notes
		2022	**2023**	**2024**	
Number of poles	piece		1404	1527	
Number of luminaires	piece		1404	1527	
LED lamps	piece		1241	1427	
	Watt	120	120	120	
	piece				
	Watt				
Total installed capacity	kW		168.5	183.2	calculated value
Annual electricity consumption	MWh/t		498.9	573.6	
Electricity consumption index	%		100	115	calculated value
Number of annual operating hours	hours/year	3200- 3350	3200- 3350	3200- 3350	calculated value
Total length of illuminated streets	km	60	65	77	
Average summer operating hours	hour/day	10/215	10/215	10/215	
Average winter operating hours	hour/day	7-8 /1 50	7-8 /1 50	7-8 /1 50	

However, it is fair to note that the introduction of light-emitting diode (LED) technologies and the expansion of illuminated areas are evidence of the community's consistent, strategic approach to improving energy efficiency and reducing its overall carbon footprint.

Chapter 8. Collection and storage of household waste

According to information provided by the community, during the period 2022–2024, the average annual amount of waste transported to the landfill was 448 tons.
In the Akunk Community, the municipal solid waste management system is managed by the municipality. Waste collection and transportation are mainly organised through municipal resources, using the available коммунal equipment. Waste collection activities are carried out regularly; however, their volume and frequency may vary across settlements depending on population size, spatial characteristics, and accessibility conditions.
Waste collection points are installed in the community's settlements as metal or plastic containers, from which household waste is periodically transported to the community's landfill. The waste collection and transportation process is primarily carried out by a municipal truck serving both Akunk settlement and the other villages under its administrative jurisdiction – Nor Gyugh, Kaputan, Kotayk, Zar, Zovashen, Hatis, and Sevaberd.
The main waste streams are generated by households, administrative buildings, commercial outlets, and educational institutions. A certain increase in waste volumes is particularly observed during the summer months due to the intensification of agricultural activities.
Currently, separate waste collection and recycling are not implemented in the Akunk Community, and the existing landfills do not comply with modern environmental standards. Most of the waste is accumulated in open areas without prior sorting or processing. This poses risks to soil, water, and air pollution, as well as the generation of greenhouse gas emissions, particularly methane.
Considering the above, it is necessary to develop and implement a waste management improvement programme, which should include:

- Optimisation of waste collection schedules and frequency.
- Renewal or expansion of waste collection vehicles and containers.
- Rehabilitation of the landfill and introduction of a monitoring system.
- Pilot introduction of separate waste collection, starting with municipal institutions and schools.
- Implementation of public awareness and educational programmes to foster a culture of waste reduction and recycling.

In the context of climate change, the municipal solid waste sector is considered a potential source of methane emissions; therefore, within the framework of the SECAP, the impact of this sub-sector on the community's overall emissions balance should be assessed. In the future, where feasible, it is advisable to implement a pilot project to collect and utilise landfill biogas for small-scale local energy production.

Chapter 9. Development of the Baseline Emission Inventory

As noted, for the purpose of developing the SECAP of the Akunk Community, 2023 has been selected as the baseline year, as the information for that period is more complete, reliable, and consistent with the methodological requirements of the "Covenant of Mayors". During 2022–2024, data collection and processing were carried out for the energy balance and the BEI. The selected time period allows for a more objective presentation of the current structure of the community's energy consumption and greenhouse gas emissions, as well as the socio-economic factors influencing them.
The selection of the baseline year is justified by the following considerations:

- The completeness and reliability of energy consumption and emission data are provided by Akunk Community.

- Compliance with the EU "Covenant of Mayors" (CoM) guidelines, which stipulate that the baseline year should be the most representative and reliable period in terms of data availability.

Thus, the year 2023 is established as the baseline year for calculating the energy consumption and greenhouse gas emissions of the Akunk Community, against which future comparisons will be made to assess progress towards achieving at least a 30% reduction in emissions by 2030.

9.1 Main sources of greenhouse gas emissions

According to the methodological guidelines of the "Covenant of Mayors for Climate and Energy", the BEI must cover at least three of the four priority sectors defined by the Covenant, while greenhouse gas emission reduction actions must be developed within at least two of the selected sectors.
This principle aims to ensure a comprehensive analysis and a balanced approach to the community's energy and climate systems. It enables the identification of effective intervention areas, enhances the coherence and impact of programme actions, and contributes to the community's sustainable development and the achievement of its climate objectives.
This requirement is important because it ensures a comprehensive assessment of the community's energy and climate system, covering both the main sources of energy consumption and the principal emission sectors. Such an approach enables comprehensive analysis of the structure of community energy consumption, identification of the main emission sources, and development of more effective policies for sustainable energy development, emissions reduction, and climate change mitigation.
Within the framework of the Covenant, the four main sectors for assessment and planning are:

🏠 **Buildings (public, residential, and commercial)** – including all energy consumption systems such as heating, cooling, ventilation, lighting, and household electricity use.
🚗 **Transport** – including energy consumption by municipal, public, private, and commercial vehicles.
💡 **External (street) lighting** – including energy consumption of municipal infrastructure, such as street lighting, traffic lights, and other external systems.
🗑️ **Waste management system** – including collection, transportation, processing of municipal, industrial, and other types of waste, as well as emissions generated during thermal and organic decomposition.
These sectors encompass the main energy-consuming infrastructure and the community's principal emission sources, ensuring a comprehensive and systematic structure for the SECAP.
The Baseline Emission Inventory quantitatively assesses CO_2 or CO_2-equivalent greenhouse gas emissions resulting from energy consumption within the community territory for the selected baseline year. It enables the identification of the main anthropogenic emission sources and the formulation of targeted mitigation measures.
GHG emissions by sector have been calculated using the following general formula:

Carbon dioxide emissions (t CO_2) =
Energy consumption (MWh) × CO_2 emission factor (t CO_2/MWh)

During the calculations, two types of coefficients were applied:

- Conversion factors to convert the consumption volumes of different energy carriers into energy units are presented in Table 5;
- CO_2 emission factors for assessing greenhouse gas emissions are presented in Table 16.

Table 16. CO_2 emission factors for estimating greenhouse gas emissions[21]

Energy carrier	Emission factor
Electricity	0.241 t CO_2 /MWh
Natural gas	0.202 t CO_2 /MWh
Automobile gasoline	0.249 t CO_2 /MWh
Diesel fuel	0.267 t CO_2 /MWh
Liquefied petroleum gases	0 . 227 t CO_2 /MWh
Firewood (non-sustainable)[22]	0.403 t CO_2 /MWh
Firewood (sustainable)[23]	0 t CO_2 /MWh
Firewood (actual)	0.121 t CO_2 /MWh In this CEPAP, firewood The emission factor was calculated sustainable and unsustainable forest management defined for approaches by combining emission factors, resulting in 0.121 t CO2 / MWh coefficient.
Livestock biomass	0 t CO_2 /MWh

Among the existing greenhouse gases, methane (CH_4), nitrous oxide (N_2O), and carbon dioxide (CO_2), only the latter is accounted for in this program

9.2 Baseline GHG emissions inventory

The absolute energy consumption indicators of the Akunk community for the baseline year are presented by sector. The data include energy consumption for community structures, the residential sector, transport, and street lighting, reflecting the community's overall energy picture. Thus, the data presented in Table 17 serve as a basis for assessing the community's energy structure and planning further mitigation steps.

Table 17. Energy consumption volumes for the baseline year 2023

Energy Carrier	**Residential Sector (MWh/year)**	**Municipal Facilities (MWh/year)**	**Transport (MWh/year)**	**Lighting (MWh/year)**	**Total Consumption (MWh/year)**
Electricity	6,858.945	391,228	-	147,018	7,397.191
Natural gas	26,785.77	391,363	-	-	27,177.133
Compressed natural gas (CNG)	-	-	5,994.134	-	5,994.134

[21] Covenant of Mayors for Climate and Energy. Greenhouse gas emission factors for local emission inventories, Covenant of Mayors collection - 2024 datasets (Bastos, J., Monforti-Ferrario, F. and Melica, G.)

[22] Firewood resulting from unsustainable forest management (when deforestation rates exceed natural forest growth rates), which is a non-renewable resource and whose combustion results in carbon dioxide emissions.

[23] Fuelwood generated from natural growth of timber, which qualifies as a renewable resource resulting from sustainable forest management (when, on average, forest growth equals or exceeds the volume of deforestation). In calculations, emissions from the combustion of wood classified in this group are considered zero, in accordance with the requirements of the Covenant's methodological guidelines.

Liquefied petroleum gas (LPG)	-	-	5,505.842	-	5,505.842
Firewood	2,376,960	-	-	-	2,376,960
Gasoline	-	-	2,821,732	-	2,821,732
Diesel fuel	-	-	7,273,200	-	7,273,200
Manure	15.206	-	-	-	15.206
Total	**36,036.881**	**782,591**	**21,594.908**	**147,018**	**58,561.328**
Total %	**61.54**	**1.34**	**36.87**	**0.25**	**100**

The analysis of the data presented in Table 17 shows that a significant share of the Akunk Community's energy consumption structure belongs to the residential sector, which accounts for approximately 61.5% of the community's total energy consumption in the baseline year. The main sources of energy consumption in the residential sector are natural gas (74.3%), electricity (19%), firewood (6.5%), and manure (0.04%).

These data indicate that the majority of household energy needs in Akunk are met by natural gas and electricity, while the use of biomass (firewood, manure) is relatively limited and mainly supplementary, particularly among low-income households.

The transport sector follows the residential sector, accounting for a significant 36.8% share of the community's total energy consumption. In this sector, the dominance of gaseous fuels is evident: CNG (10.2%) and LPG (9.4%) remain the most widely used energy carriers, owing to their availability and accessibility. At the same time, diesel fuel (12.4%) continues to play an important role, particularly in freight transport operations.

Energy consumption of municipal buildings accounts for approximately 1.3%, while street lighting systems account for only 0.25%, which is typical for small and medium-sized settlements where the energy burden of public infrastructure is relatively limited.

The energy consumption structure of the sectors included in the BEI is presented in Figure 9.

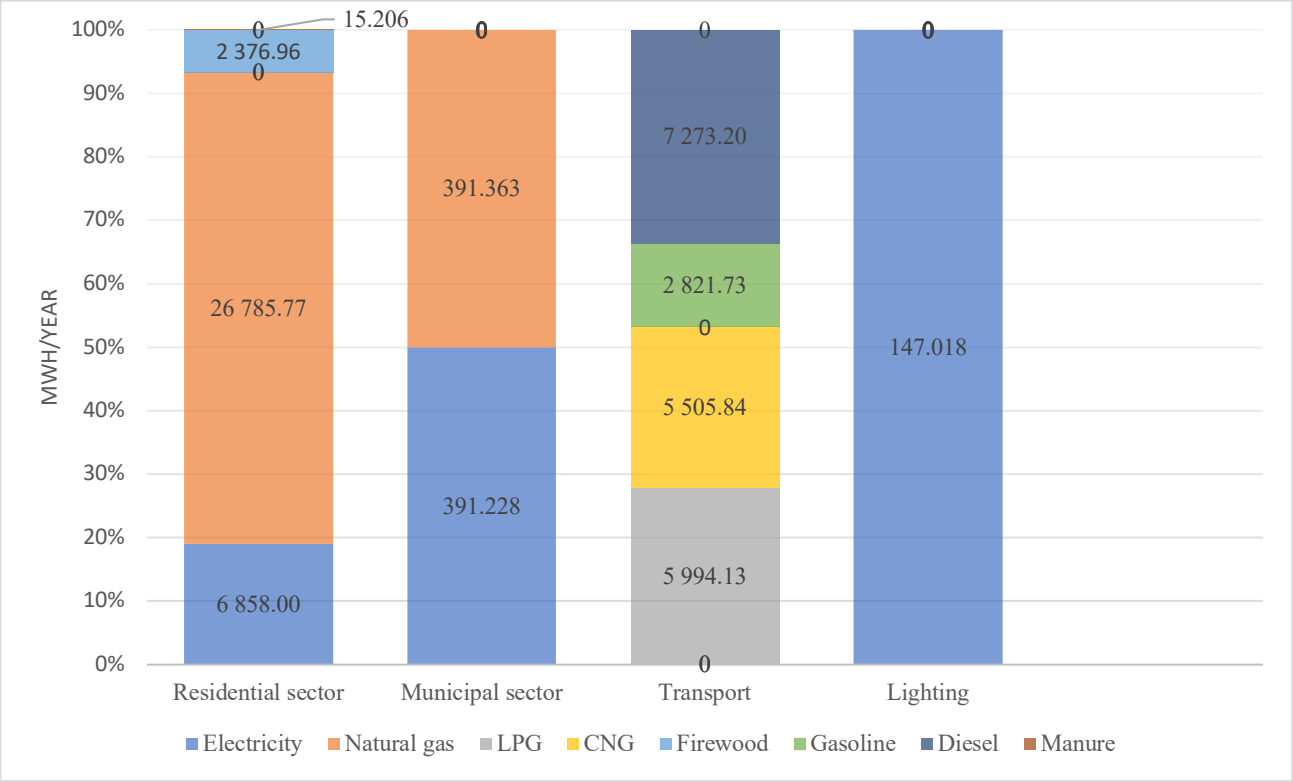


Figure 9. Energy consumption indicators by sector in the Akunk community in 2023

As noted, greenhouse gas emissions for the baseline year are calculated by multiplying the absolute consumption data of energy carriers presented in Table 16 by the corresponding CO_2 emission factors provided in Table 15.

For carbon dioxide (CO_2) emissions from the use of firewood, a specific approach is applied. According to the methodological guidelines of the Covenant of Mayors and the IPCC 2006 calculation principles, if firewood is obtained under conditions of sustainable forest management, with annual forest growth equal to or exceeding harvesting volumes, it is considered a renewable energy resource. In such cases, the CO_2 emitted from the combustion of firewood is regarded as carbon neutral, as its amount corresponds to the carbon absorbed from the atmosphere during plant growth. Consequently, CO_2 emissions resulting from the combustion of such firewood are assessed as zero (0 t CO_2/MWh), reflecting the balance of the natural carbon cycle.

At the same time, if firewood is sourced from unsustainable forest exploitation, where harvesting volumes exceed the regeneration capacity of forests, it is considered a non-renewable resource, and an emission factor of 0.403 t CO_2/MWh is applied for its combustion.

In the Akunk Community, it is not possible to accurately assess the origin and supply sources of firewood, particularly given the time elapsed since procurement. The community's geographical location, local characteristics of forest resource use, and limitations of official statistical data do not allow a clear distinction between firewood obtained from sustainable and non-sustainable sources.

Nevertheless, based on expert assessment, it is assumed that a portion of the firewood used is derived from natural forest growth, i.e., within the framework of sustainable management. The remaining portion may originate from non-sustainable sources because harvesting volumes exceed regeneration capacity.

Taking the above into account, an average emission factor of 0.121 t CO_2/MWh is used to calculate greenhouse gas emissions for the Akunk Community, reflecting the combined effect of firewood sourced from both sustainable (carbon-neutral) and non-sustainable origins.

The calculated results of CO_2 emissions arising from the use of energy carriers included in the BEI are presented in Table 18.

Table 18. Akunk Community BEI: GHG Emissions Volumes in the Baseline Year (2023)

Energy Carrier	Carbon Dioxide Emissions, t CO_2/year				Methane Emissions (tCH_4/year) (tCO_2/year)	Total Emissions (tCO_2/year)
	Residential Sector	Municipal Facilities	Transport	Lighting	tCH4/year (tCO_2 year)	
Electricity	1,653,006	94,286		35,431	-	1,782,723
Natural gas	5,410,726	79,055	-	-	-	5,489.781
CNG	-		1,210,815	-	-	1,210,815
LPG	-		1,249,826	-	-	1,249,826
Firewood	287,612		-	-	-	287,612
Gasoline	-		702,611	-	-	702,611
Diesel	-		1,941,944	-	-	1,941,944
Manure	0			-	-	0
Landfill				-	10.13 (283.64)	283.64
***Total* , tCO ₂ h**	***7,351,344***	***173,341***	***5,105,196***	***35,431***	**283.64**	***12,948.952***
Total , %	**56.77**	**1.34**	**39.43**	**0.27**	**2.19**	**100**

The analysis of the data presented in Table 18 shows that the leading contributors to the structure of greenhouse gas emissions in Akunk Community are the residential and transport sectors, which together account for the majority of total emissions.

In the baseline year, the activities of the population, the economy, and the transport system of Akunk Community resulted in total greenhouse gas emissions of approximately 12,948.9 tons of CO_2 equivalent (tCO_2).

This figure serves as the baseline for assessing the community's target commitments under the Covenant of Mayors framework and for evaluating emission-reduction scenarios up to 2030.

9.3 Target Volume of GHG Emission Reduction by 2030

According to the procedures of the Covenant of Mayors, local self-government bodies in Eastern Partnership countries are entitled to independently define their approach to greenhouse gas emission reduction targets, based on one of the two scenarios proposed by the European Commission.

1. **Baseline Year Scenario**, under which the emission reduction target for 2030 is determined on the basis of the emissions calculated for the baseline year.
2. **Business-as-Usual (BAU) Scenario**, under which the 2030 emission reduction target is defined taking into account projected population growth, expansion of economic activity, development of transport and infrastructure, as well as the resulting expected natural increase in emissions.

Under the first scenario, the volume of GHG emissions reductions by 2030 is set at 35% of baseline-year emissions (the community's primary commitment within the Covenant of Mayors framework). Accordingly, it amounts to:

$$12{,}948.9 \times 0.35 = \mathbf{4{,}532.1\ tons\ CO_2/year}$$

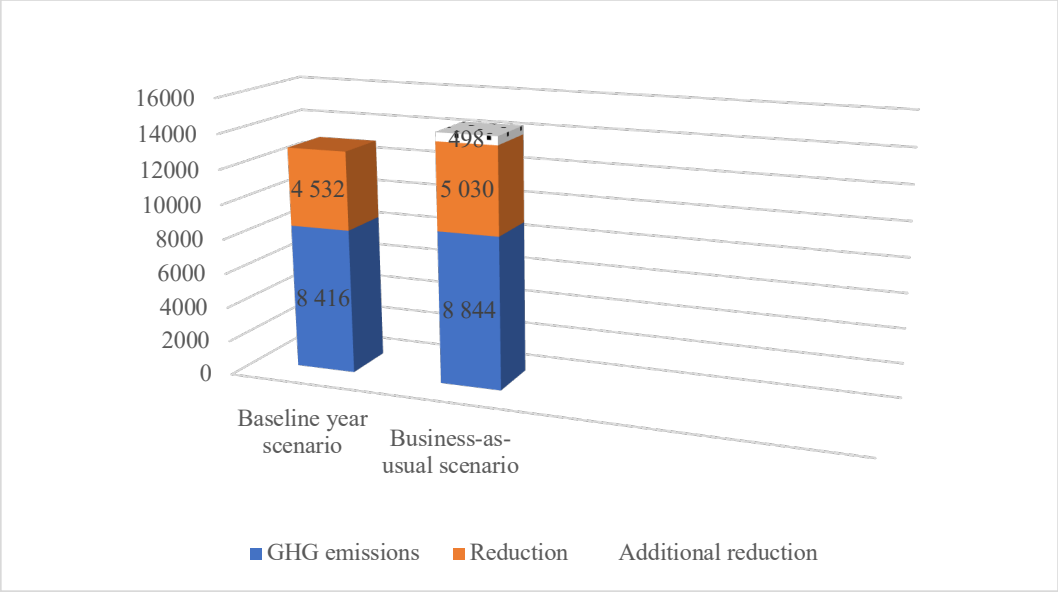
Under the second, Business-as-Usual, scenario, the target volume of greenhouse gas emission reductions by 2030 is calculated not on the basis of the baseline year value, but on the projected community emission level. This approach assumes that, up to 2030, socio-economic development, population growth, the expansion of transport systems, and energy infrastructure will inevitably lead to a certain natural increase in emissions.

To properly assess this growth, an economic development coefficient greater than 1 is applied to reflect the community's economic and demographic dynamics. For Armenia, the average growth coefficient proposed by the Joint Research Centre for 2023 is 1.11, characterising a moderate but steady development scenario.

Thus, under this scenario, the volume of GHG emission reduction in Akunk Community by 2030 will amount to:

$$12{,}948.9 \times 1.11 \times 0.35 = \mathbf{5{,}030.6\ tons\ CO_2/year}$$

This results in **498.5 tons CO_2 more** compared to the baseline year scenario.



The analysis of the data collected during the development of this document (Table 19) shows that, during 2022-2024, energy consumption in the Akunk community exhibited a significant positive trend.

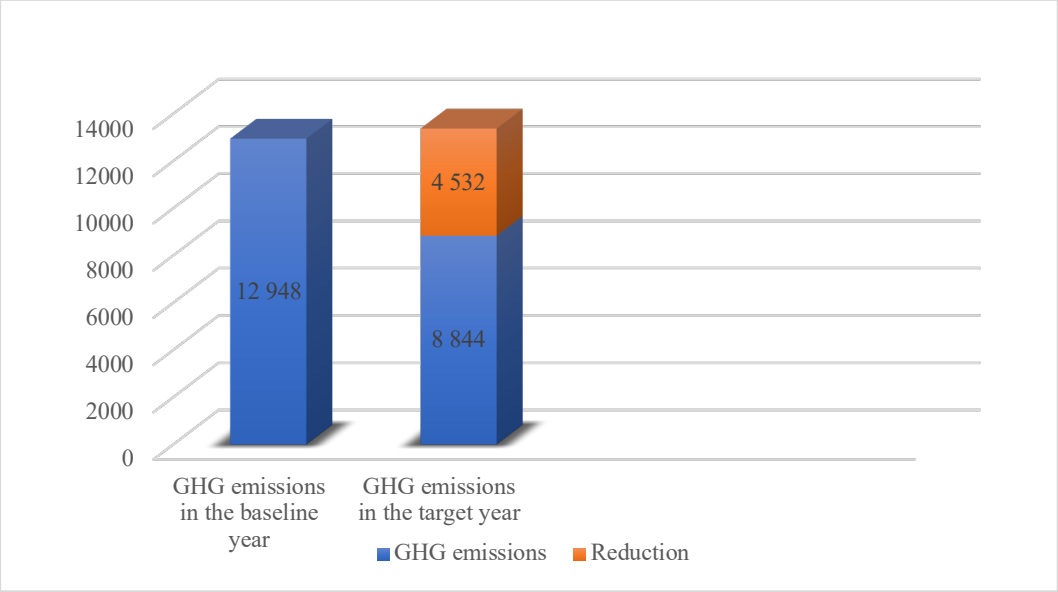
Table 19. Energy Consumption Indicators by Energy Carriers in Akunk Community in Energy Units (MWh) and GHG Emission Volumes

Type of energy carriers	Energy consumption, MWh/year			GHG emissions, tons of CO2 / year		
	2022	2023	2024	2022	2023	2024
Electrical Energy	7,023,083	7,397.191	7,905.431	1,657,447	1,745,737	1,865,681
Natural gas	25,792.883	27,177.063	31,424.177	5,210.162	5,489,766	6,347.683
CNG	4,420,618	5,994.134	8,310,324	892,964	1,210,815	1,678,685
LPG	4,185,893	5,505,842	8,556.513	950,197	1,249,826	1,942,328
Firewood	2,376,960	2,376,961	2,376,962	287,612	287,612	287,612
Manure	15,206	15,206	15,206	0	0	0
Gasoline	2,076,118	2,821,732	4,262,866	516,953	702,611	1,061,453
Diesel fuel	4,083,300	7,273,200	8,063,400	1,090,241	1,941,944	2,152,927
Total	49,974.061	58,561.328	70,914.877	10,605.579	12,628.312	15,336.373

The greenhouse gas emission volumes presented in Table 19 have been calculated using the emission factors established by the European Commission's JRC for different energy carriers, as well as localised normative values adapted for Armenia, presented in Table 5. This approach to calculation ensures the comparability of emission data with European standards while reflecting national specificities and the local structure of energy consumption.

As previously noted, under the Business-as-Usual scenario, Akunk Community's greenhouse gas emission reduction obligations by 2030 increase by approximately 498.5 tons compared to the baseline scenario. As the calculations show, achieving such an additional reduction may be realistically difficult for the community, as it would require significant financial, technical, and managerial resources, including infrastructure improvements, transport system modernisation, and large-scale energy-efficiency investments.

Taking the above into account, it is advisable that the 2030 greenhouse gas emission-reduction target volumes for the Akunk Community be calculated using the 2023 baseline inventory data and the Baseline Year Scenario approach.



Thus, under the selected option, the target volume of greenhouse gas (CO_2) emission reductions in the Akunk Community by 2030 amounts to:

$$12{,}948.9 \times 0.35 = \textbf{4,532.1 tons } \textbf{CO}_2\textbf{/year}$$

This calculation implies that by 2030, the Akunk Community must ensure an annual reduction of at least 4,532.1 tons of CO_2-equivalent emissions, enabling a 35% reduction compared to the baseline year, in line with the requirements of the Covenant of Mayors and Armenia's climate commitments. This target will serve as the primary benchmark for planning energy-efficiency improvements, renewable energy development, and emissions-mitigation measures within the community.

Chapter 10. Climate Change Mitigation Actions

By joining the Covenant of Mayors, the Akunk Community has committed to reducing community-wide greenhouse gas emissions by at least 35% by 2030. To ensure the fulfilment of this commitment, the present SECAP has been developed, comprising a comprehensive package of measures, including investment-intensive "hard" measures and organisational, non-investment "soft" measures. The planned actions are presented in detail in this chapter, structured into "hard" and "soft" emission-reduction steps.

The comprehensive implementation of the planned measures by 2030 will enable the Akunk Community to reduce annual CO_2 emissions by at least 4,532 tons, exceeding the Covenant-defined reduction target by approximately 190.5 tons. At the same time, the proposed measures are aligned with Armenia's national energy and climate strategic documents and sectoral legal requirements, as well as decisions and development programmes adopted at national and local levels.

The proposed measures in the field of renewable energy are also consistent with the provisions of the RA Laws "On Energy" and "On Energy Saving and Renewable Energy", as well as with the regulations established by the Public Services Regulatory Commission regarding electricity production and consumption (in particular, grid-connected PV systems and autonomous energy producers).

It is noteworthy that the programme takes into account recent trends in the development of "green" technologies in the Republic of Armenia, including the widespread deployment of solar photovoltaic systems and the annual growth in electric-vehicle imports under favourable tax-incentive schemes.

Within this supportive policy and regulatory environment, the community can more effectively implement energy-efficiency and renewable-energy programmes, reducing emissions and enhancing resilience to climate change.

The total investment required to implement energy-efficiency, energy-saving, and renewable-energy promotion measures envisaged under the SECAP for climate change mitigation is estimated at approximately AMD 2.150 billion. Of this amount, approximately AMD 393 million (19%) is planned for allocation to renewable energy projects, underscoring the key role of solar and other renewable technologies in the community's energy transition strategy.

Chapter 11 of this SECAP defines a package of "hard" investment measures aimed at achieving significant energy savings and tangible CO_2 emissions reductions in the community. These measures cover key sectors: municipal (budgetary) buildings and infrastructure, external (street) lighting, the residential sector, and transport. Although these measures require financial investment, the expected results are considerably significant – compared to "soft" measures, the energy savings and emission reductions will be clearly measurable upon implementation.

Chapter 12 presents the "soft" measures, which comprise organisational, educational, and policy-enhancement actions that do not require substantial financial expenditure but significantly contribute to the programme's implementation and sustainability. These measures can be relatively easily implemented by the municipality in cooperation with stakeholders and are mainly aimed at raising public and professional awareness, strengthening institutional capacities, and creating favourable conditions for the effective implementation of "hard" investment measures.

Accordingly, quantitative CO_2 reduction estimates are not provided for the "soft" measures within the programme. They are considered supportive actions that do not have direct, calculable emission reduction impacts but create the necessary enabling environment and stimulate the achievement of the SECAP objectives.

Chapter 11. Investment "Hard" Measures for Greenhouse Gas Emission Reduction

To mitigate the adverse impacts of global climate change and fulfill the Akunk Community's commitment under the Covenant to reduce greenhouse gas emissions by at least 35%, this section presents investment-requiring measures. These measures ensure more tangible, sustainable, and long-term emission reductions.

Such measures are proposed for the main sectors included in the BEI of the SECAP, namely: municipal buildings, external lighting, residential buildings, and public and municipal transport.

The proposed actions are consistent with the provisions of the documents defining the energy and climate strategies/visions of the RA, as referenced in the SECAP, as well as with decisions and development programmes adopted at national and local levels.

The measures planned for community-owned and residential buildings and structures comply with the provisions of the RA Government Decision No. 1504-N of 25 December 2014 "On the application of measures aimed at increasing energy saving and energy efficiency in facilities constructed (reconstructed, renovated) at the expense of state funds". According to this decision, in order to reduce thermal and electrical energy consumption volumes in buildings, decrease operating costs, and ensure normative comfort conditions, the following measures are required:

- Application of cladding, plaster, waterproof, and heat-resistant paint mixtures to protect external wall surfaces;

- Application of volumetric and spatial planning solutions, ensuring the minimum possible surface area of enclosing structures;
- Thermal insulation of enclosing structures – external walls, entrances, roofs, and basements;
- Use of energy-efficient windows and entrance doors;
- Sealing of joints of openings, external walls, and roofing elements;
- Use of certified thermal insulation construction materials;
- Application of energy-saving heating, ventilation, air-conditioning, hot water supply, and lighting systems and equipment;
- Where cost-effectiveness is justified – application of alternative energy systems, including solar water heating systems, photovoltaic equipment, and heat pumps.

The measures proposed in the field of renewable energy resources are consistent with the provisions of the RA Law "On Energy", particularly regarding the establishment of conditions for the generation and consumption of electricity for own needs by autonomous producers and groups of autonomous producers using renewable energy resources.

According to the regulations defined by RA legislation and sectoral by-laws, individuals and legal entities may install autonomous solar power plants with a capacity of up to 150 kW to meet their own electricity needs and produce electricity, with the right to sell surplus electricity in the wholesale electricity market.

In recent years, the scale of introduction and application of the above-mentioned technology in the Republic of Armenia has been characterised by steady and rapid growth trends, indicating a favourable regulatory environment for the development of renewable energy resources.

At the same time, within the framework of tax and customs incentives established by the RA Government, since 2022, approximately 12,000–15,000 electric motor vehicles have been annually imported into the Republic, exempt from value-added tax and customs duties, contributing to emission reductions in the transport sector and promoting the use of electric mobility.

The above-mentioned trends and development pace in Armenia are also highly relevant for the development of the SECAP of the Akunk Community. The immediate objectives of the "Five-Year Development Programme of Akunk Community of Kotayk Marz of the RA for 2023–2027" have also been taken into account.

11.1 MEASURES IN BUDGETARY INSTITUTIONS AND MUNICIPAL OPERATIONS

As noted, within the framework of Armenia's policy promoting renewable energy production, a favourable legislative and regulatory framework has been established to enable individuals and legal entities to construct autonomous solar installations to meet their own energy needs.

Autonomous systems operate integrated with the distribution network, i.e., connected to the grid via a bidirectional commercial electricity meter, allowing surplus electricity generated by the installations to be supplied to the distribution network.

Local production of "green" energy will allow a significant reduction (or even full elimination) of greenhouse gas emissions in the "Municipal Buildings" sector (Chapter 4).

The responsible entity for implementing the measure is the municipality. Potential sources of financing may include the municipal budget, financial support provided from the state budget (SB) (for example, within the framework of subvention programmes or relevant funds), the Renewable Energy and Energy Efficiency Fund (R2E2 Fund), as well as funding provided by the European Union (EU).

The scope of works aimed at the energy-efficiency modernisation of municipally owned buildings and the application of renewable energy sources has been assessed based on technical information provided by municipal staff. The calculations and financial estimates carried out are preliminary (approximate) in nature.

MEASURE 1.1.1 Installation of a PV System for the Administrative Office of the Head of Nor Gyugh Settlement

The climatic conditions of the Akunk Community are characterised by high solar radiation; therefore, the utilisation of renewable energy resources is important for ensuring a reliable electricity supply and reducing emissions.
Taking the above into account, it is proposed to install a photovoltaic (PV) system with an installed capacity of 4 kW and an annual generation of approximately 6 MWh to supply electricity to the administrative office of the Head of the Nor Gyugh settlement.
The implementation of the measure will require approximately AMD 800,000.
The results of energy savings and greenhouse gas emission reductions are presented in the table below.

MEASURE 1.1.1 Installation of a PV System for the Administrative Office of the Head of Nor Gyugh Settlement				
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**	**CO_2 Reduction, t/year**	**Investment Year**
SB, R2E2, MP, EU	800.000	6.152	1.4770	2025-2030

MEASURE 1.1.2 Installation of PV Systems for the Administrative Offices of the Heads of Kotayk and Kaputan Settlements

According to the information provided by the Financial Department of Akunk Municipality of Kotayk Marz, in the baseline year, the electricity consumption of each of the administrative offices of the Heads of Kotayk and Kaputan settlements amounted to approximately 21.0 MWh.
Within the framework of the measure, it is proposed to install photovoltaic (PV) systems to supply electricity to the administrative offices, each with an installed capacity of 14 kW and an annual generation of approximately 21.5 MWh.
The implementation of the measure will require approximately AMD 5,600,000.

MEASURE 1.1.2 Installation of PV Systems for the Administrative Offices of the Heads of Kotayk and Kaputan Settlements				
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**	**CO_2 Reduction, t/year**	**Investment Year**
SB, R2E2, MP, EU	5,600.0	43,064	10.3450	2025-2030

MEASURE 1.1.3 Installation of a PV System for the Administrative Building of Akunk Settlement

Within the framework of a programme financed by the United Nations, a 32 kW solar panel system has been installed on the administrative building of Akunk Community. According to the information provided by the Financial Department of Akunk Municipality of Kotayk Marz, in the baseline year, the electricity consumption of the administrative building of Akunk settlement amounted to approximately 67.0 MWh.
Within the framework of this measure, it is proposed to install an additional photovoltaic (PV) system with an installed capacity of 45 kW and an annual generation of approximately 69.5 MWh on the administrative building, which will fully meet its electricity demand.
The implementation of the measure will require an additional investment of approximately AMD 9,000,000.

MEASURE 1.1.3 Installation of a PV System for the Administrative Building of Akunk Settlement				
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**	**CO_2 Reduction, t/year**	**Investment Year**
With 5% co-financing from the community under the "Local Development Social Investments" Programme of the Territorial Development Fund of Armenia.	9,000.0	69,210	29.7157 (total)	2022 and 2025-2030

MEASURE 1.1.4 Installation of PV Systems for the Administrative Offices of the Heads of Zar and Hatis Settlements, the Zar Pumping Station, and the Akunk Kindergarten

In 2022, with the financing of the "Social Investments for Local Development" program of the Territorial Development Fund of Armenia and a 5% investment by the community, in order to meet the electricity demand of community-owned structures, including the residences of the administrative heads of the Zar and Hatis settlements, the Zar settlement pumping station, as well as the Akunk kindergarten, with a rated capacity of 4.5 kW, 3.0 kW and 120.0 kW, 6.0 kW, respectively.

MEASURE 1.1.4 Installation of PV Systems for the Administrative Offices of the Heads of Zar and Hatis Settlements, the Zar Pumping Station, and the Akunk Kindergarten				
Residence	**Implementer**	**Energy savings/production MWh/year**	**CO_2 Reduction, t/year**	**Year of investment**
Zar	Under the "Local Development Social Investments" Programme of the Territorial Development Fund of Armenia, with 5% co-financing from the community.	6.825	1.6421	2022
Hatis	Under the "Local Development Social Investments" Programme of the Territorial Development Fund of Armenia, with 5% co-financing from the community.	4,900	1.1789	2022
Zar (Pumping Station)	Under the "Local Development Social Investments" Programme of the Territorial Development Fund of Armenia, with 5% co-financing from	162,000	38.9774	2022

	the community.			
Akunk	Under the "Local Development Social Investments" Programme of the Territorial Development Fund of Armenia, with 5% co-financing from the community.	7,650	1.8406	2022

MEASURE 1.1.5 Installation of a PV System for the Nor Gyugh Kindergarten

Since January 2025, a new kindergarten has been operating in the Nor Gyugh settlement. According to information provided by the Financial Department of Akunk Community, its electricity consumption for the period January–June 2025 amounted to approximately 6 MWh.
Therefore, it is proposed to install a PV system with an installed capacity of 8 kW, with an estimated annual electricity generation of approximately 12 MWh.

MEASURE 1.1.5 Installation of a PV System for the Nor Gyugh Kindergarten				
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**	**CO_2 Reduction, t/year**	**Investment Year**
SB, R2E2, MP, EU	1,600.0	12,304	2.9559	2025-2030

MEASURE 1.1.6 Installation of PV Systems for the Zar DRR and the Kaputan Pumping Station

To meet the electricity demand of the Zar settlement, the Daily Regulating Reservoir (Zar DRR), it is proposed to construct a PV plant with an installed capacity of 140 kW at an estimated cost of approximately AMD 28,000,000.
To meet the electricity demand of the Kaputan settlement Pumping Station, it is proposed to install a 15 kW PV system at an estimated cost of AMD 3,000,000.

MEASURE 1.1.6 Installation of PV Systems for the Zar DRR and the Kaputan Pumping Station					
Residence	**Implementer**	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**	**CO_2 Reduction t/year**	**Investment Year**
Zar	SB, R2E2, MP, EU	28,000.0	215,320	51.8063	2025-2030
Kaputan	SB, R2E2, MP, EU	3,000.0	23,070	5.5507	2025-2030

MEASURE 1.1.7 Improvement of Energy Efficiency in the Administrative Offices of the Heads of Hatis, Zovashen, and Sevaberd Settlements

Within the framework of the present measure, it is proposed to implement energy efficiency measures in the administrative offices of the Heads of Hatis, Zovashen, and Sevaberd settlements, whose combined baseline-year consumption amounted to 9.321 MWh of electricity and natural gas equivalent to 53.844 MWh.

The following energy efficiency measures are proposed:

- Thermal insulation of roofs, as necessary, using expanded perlite sand and gravel (200 mm thickness);
- Replacement of doors and windows with new energy-efficient units, as necessary (metal-plastic frames with four-chamber profiles and double glazing);
- Partial or complete thermal insulation of external walls using polystyrene foam boards or mineral wool panels (50–100 mm thickness);
- Thermal insulation of the basement ceiling, where a basement floor exists, using polystyrene foam boards or mineral wool panels (50 mm thickness);
- Installation of artificial lighting systems with LED luminaires;
- Improvement of the heat supply scheme.

Assuming that 10% of consumed electricity and approximately 80% of natural gas were used for heating purposes, and projecting that the implementation of the proposed measures will reduce building heat losses and consequently reduce heating demand by approximately 40%, the total annual energy savings for heating purposes after implementation of the measures will amount to 12,113.168 MWh/year (cumulative).

MEASURE 1.1.7 Improvement of Energy Efficiency in the Administrative Offices of the Heads of Hatis, Zovashen, and Sevaberd Settlements						
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**			**CO_2 Reduction, t/year**	**Investment Year**
Private	10,000.0	Electricity	Natural Gas	∑		
		0.932	43.075	44.01	1.144	2025-2030

During the implementation of the proposed measures, it is advisable to also plan additional capital expenditures for the renovation and strengthening (increasing seismic resistance) of these buildings, to clarify the scope of work within the framework of energy and technical audits.

11.2 LOCAL ELECTRICITY GENERATION

With the objective of enhancing the economic, environmental, and social sustainability of the enlarged Akunk Community, the municipality intends to cooperate with international donor organisations to develop an energy-efficient, low-emission development model, improve energy efficiency, and implement programmes to promote local energy production from renewable energy sources.

The Akunk Community plans to construct a 0.5 MW municipal commercial PV power plant. The electricity generated by the plant will be sold to the distribution network, and the resulting revenue will be accumulated in a municipal savings fund.

In accordance with regulatory requirements, the municipality must establish a municipal non-commercial organisation to construct and operate the power plant.

MEASURE 2.1.1 Construction of a Municipal Commercial PV Power Plant

Within the framework of this measure, during 2026–2030, it is planned to construct and operate a 0.5 MW municipal commercial PV power plant in Akunk, with an estimated annual electricity generation of approximately 770 MWh.

The implementation of the measure will require approximately 100 million AMD. The responsible entity for implementation is the municipality, and potential sources of financing may include the municipal budget, state financial support (for example, within the framework of subvention programmes or relevant funds), and financial support from international organisations.

The results of renewable energy generation and greenhouse gas emission reduction calculations are presented in the table below.

MEASURE 2.1.1 Construction of a Municipal Commercial PV Power Plant				
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**	**CO_2 Reduction, t/year**	**Investment Year**
MP, R2E2 Fund, SB, EU	100,000	770.0	185.2631	2025-2030

11.3 MEASURES IN THE RESIDENTIAL SECTOR

The residential sector is a major consumer of energy carriers, including electricity, natural gas, firewood, LPG, and manure. According to the Covenant of Mayors methodology, this sector is one of the four main sectors whose energy consumption and related greenhouse gas emissions may be included in the BEI calculation and in the list of emission reduction ("mitigation") measures.

MEASURE 3.1.1 Installation of PV Systems in Private Houses by Homeowners

Within the framework of this action, during 2026–2030, it is planned to install individual autonomous PV systems on the roofs of a portion of private houses or in adjacent household plots or other suitable areas, each with an installed peak capacity of 2.5 kW. Under the climatic conditions of Akunk, this capacity is sufficient to meet the annual energy demand of an average private house in the Republic of Armenia.

One of the key incentives for homeowners to implement this measure will be the demonstration projects involving the installation of PV systems on the roofs of nearly all municipally owned buildings.

It is assumed that by 2030, at least 30% of private homeowners in the community will have the financial capacity to participate in this measure and, on average, install autonomous PV systems with a peak capacity of 2.5 kW to meet, in whole or in part, their household electricity demand. Each system installation will require up to 20 m² of space. The total annual generation of the installed PV systems is estimated at approximately 1,679.496 MWh/year, resulting in a greenhouse gas emission reduction of 404.0893 tCO_2/year.

The estimated cost of programme implementation is approximately 218,400,000 AMD. The responsible entities for implementation are the private homeowners, and potential sources of financing may include household budgets, state support, and/or funding from donor organisations and international programmes.
The results of renewable energy generation and greenhouse gas emission reduction calculations are presented in the table below.

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MEASURE 3.1.1 Installation of PV Systems in Private Houses by Homeowners				
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**	**CO_2 Reduction, t/year**	**Investment Year**
Households	218,400.0	1679.496	404.0893	2025-2030

MEASURE 3.1.2 Improvement of Energy Efficiency in Private Houses of Akunk

Local self-government bodies lack direct mechanisms to influence residents' and property owners' decision-making on implementing energy-saving measures in the residential sector. Nevertheless, within the framework of this measure, it is expected that in the context of the gradual increase in energy prices, the growing availability of energy-efficient technologies, the existence of various financing mechanisms (including subsidies and soft-targeted loans), and increased public awareness, the number of energy efficiency improvement measures in the residential sector will gradually increase.
Within the framework of the proposed action, and with the aim of reducing energy consumption and related costs, as well as improving comfort levels, it is expected that a portion of private homeowners in the Akunk Community will implement the following measures:

- Replacement of roofing materials and thermal insulation of roofs (attics) using expanded perlite sand and gravel (200 mm thickness);
- Replacement of doors and windows with new energy-efficient units featuring metal-plastic four-chamber frames and double glazing;
- Partial or complete thermal insulation of external walls using polystyrene foam boards or mineral wool panels (50–100 mm thickness);
- Thermal insulation of the basement ceiling, where a basement floor exists, using polystyrene foam boards or mineral wool panels (50 mm thickness);
- Installation of artificial lighting systems with LED luminaires;
- Replacement of the heating system with a natural gas condensing boiler and improvement of the heat supply scheme.

In the baseline year, the residential sector of the Akunk Community consumed 6,858.9 MWh of electricity, 26,785.7 MWh of natural gas, and 2,376.96 MWh of firewood. Assuming that 10% of electricity, approximately 80% of natural gas, and 100% of firewood consumption were used for heating purposes, and projecting that the implementation of the proposed measures will reduce building heat losses and consequently heating demand by approximately 40%, the total annual energy savings for heating purposes after implementation of the measures will amount to 12,113.168 MWh/year.

MEASURE 3.1.2 Improvement of Energy Efficiency in Private Houses of Akunk							
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**				**CO_2 Reduction, t/year**	**Investment Year**
Private	1000,000.0	Electricity	Natural Gas	FW	∑		
		685.8	10,714.280	713.088	12,113.168	2,412.417	2025-2030

11.4 MEASURES IN THE TRANSPORT SECTOR

According to the BEI data for the Akunk Community, calculated for 2023, road transport is the second-largest sector in terms of energy consumption and the second-largest source of greenhouse gas emissions within the community territory.
In the Akunk Community, vehicles operating on the main motor fuels widely used in the RA are in circulation: CNG, LPG, gasoline, and diesel.
The main measure proposed in this sector is the gradual replacement of existing passenger vehicles operating on fossil fuels with electric vehicles. The conversion of gasoline-powered vehicles to CNG has not been considered as a separate measure within the framework of this programme.

MEASURE 4.1.1 Replacing municipal passenger and freight vehicles with electric vehicles

Taking into account the decreasing prices and increasing affordability of electric vehicles in the market, within the framework of this measure, it is envisaged that during 2026–2030 municipal vehicles will be gradually replaced with electric vehicles, and charging stations will be constructed.
In order to encourage the use of electric vehicles, the municipality, in cooperation with relevant stakeholders and partners, should undertake certain incentive actions, namely:

- Construction of municipal charging stations for electric vehicles (subject to financial capacity), or provision of land under preferential conditions for the installation of private charging stations;
- Organisation of preferential (free) parking spaces for electric vehicles in central urban areas;
- Establishment of the construction of electric vehicle charging stations as a prerequisite for the issuance of building permits, etc.

The results of the measure calculations are presented in the table below.

MEASURE 4.1.1 Replacement of Municipal Passenger and Freight Vehicles with Electric Vehicles						
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**			**CO_2 Reduction, t/year**	**Investment Year**
MP	60,000.0	Gasoline	Diesel	∑		
		83.536	422.40	505.936	133.5808	2025-2030

MEASURE 4.1.2 Replacement of 40% of Private and Commercial Passenger Vehicles with Electric Passenger Vehicles

Taking into account the trends in declining market prices for electric vehicles and their gradual increase in accessibility, within the framework of this measure, it is envisaged that, by 2030, approximately 40% of the private and commercial passenger vehicle fleet will be replaced with electric vehicles.
The results of the calculations obtained from implementing the measure are presented in the table below.

MEASURE 4.1.2 Replacement of 40% of Private and Commercial Passenger Vehicles with Electric Passenger Vehicles								
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**					**CO_2 Reduction, t/year**	**Investment Year**
Private	650,000.0	Gasoline	Diesel	CNG	LPG	∑		
		774.014	2,590.560	1,020.072	796.284	5,180.930	1,271,220	2025-2030

11.5 MEASURES IN STREET LIGHTING SYSTEM

MEASURE 5.1.1 Installation of PV Systems for Street Lighting in Three Settlements of the Community

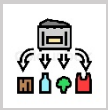
Based on actual annual energy consumption data for street lighting systems in settlements for the baseline year, this measure envisages supplying electricity to street lighting systems via small-capacity autonomous PV power plants to reduce greenhouse gas emissions.
The photovoltaic systems are planned to be installed in three settlements of the community, and their installed capacities as well as annual electricity generation volumes are presented in the table below.

Residence	**PV plant capacity, kW**	**Annual electricity production, kWh/year**
Akunk	20,0	3 0,760.000
Nor Gyux	25.0	38,450.000
Kotayk	15.0	23,070.000

The responsible entity for implementing this measure is the municipality. Potential sources of financing may include the municipal budget, state support (in particular, through subvention programmes and various funds), and international organisations and donor institutions.
The results of renewable energy generation and greenhouse gas emission reduction calculations are presented in the table below.

Measure 5.1.1 Installation of PV systems for street lighting in 3 settlements of the community				
Implementer	**Cost, thousand AMD**	**Energy Savings / Production, MWh/year**	**CO_2 Reduction, t/year**	**Investment Year**
MP, R2E2 Fund, SB, EU	12,000.0	92,280	22.2027	2025-2030

11.6 MEASURES IN THE MUNICIPAL SOLID WASTE MANAGEMENT SECTOR



MEASURE 6.1.1 Introduction of a Municipal Solid Waste Sorting System

Sorting of municipal solid waste (MSW) is a process in which waste is separated into components based on type and the feasibility of further processing. Sorting can be carried out both manually and automatically using sorting lines.

As part of this event, it is planned to install trash cans in different colors for different types of waste. The waste separated as a result of sorting and subject to recycling will be transferred to the appropriate licensed recycling companies.

The implementation of the event will help reduce the volume of waste sent to landfills, thereby reducing greenhouse gas emissions generated during decomposition. Analysis of the experience of different countries shows that as a result of the introduction of a waste sorting system, it is possible to ensure a reduction of about 50 percent in the volume of MSW placed in landfills.

The body responsible for implementing this event is the community municipality. Possible sources of funding may include the community budget, financial assistance provided by the state, support (in particular, subsidy programs), as well as international Financial support provided by organizations and donor institutions.

MEASURE 6.1.1 Introduction of a Municipal Solid Waste Sorting System				
Implementer	**Cost, thousand AMD**	**Waste reduction, t/year**	**CO_2 Reduction, t/year**	**Investment Year**
Municipal utility service	16,000.0	240.0	144.0	2026-2030

11.7 MEASURES AIMED AT INCREASING FOREST AREAS

MEASURE 7.1.1 Measures Aimed at Increasing Forested Areas

According to the IPCC 2006 Guidelines, within the “Forest Land” category, the following two subcategories are considered:

- Forest Land Remaining Forest Land (3B1a), where the land areas have not undergone land-use change for more than 20 years prior to the reporting year;
- Land Converted to Forest Land (3B1b), which is in a transitional phase and has been converted to forest land as a result of land-use change within the 20 years preceding the reporting year.

It is proposed to implement forest land expansion measures over the next five years, including, within this category, the greening of settlement areas. Although this approach differs somewhat from the above-mentioned classifications, it essentially reflects the final ecological outcome: carbon dioxide sequestration (CO_2 sequestration).

Using the ratios presented in table 4.64[24] of the National Greenhouse Gas Inventory Report of the Republic of Armenia for 1990–2019, an average sequestration factor of 0.493 t CO_2/ha is derived.
By planning the greening of an additional 10 hectares, it will be possible to ensure a reduction in carbon dioxide emissions calculated as follows:

$$10 \text{ ha} \times 0.493 \text{ t } CO_2/\text{ha} = 4.93 \text{ t } CO_2.$$

The responsible entity for implementing this measure is the municipality. Possible sources of financing may include the municipal budget and various grant programmes and external financing mechanisms.

Measure 7.1.1 Afforestation				
Implementer	**Cost, thousand AMD**	**CO_2 absorption , t/year**	**CO_2 Reduction, t/year**	**Investment Year**
Municipality services, public organizations	19,000.0	4.2	4.2	2026-2030

Chapter 12. Investment "soft" measures aimed at reducing GHG emissions

Since, in the case of low-cost, so-called "soft" measures, the quantitative assessment of greenhouse gas emissions largely depends on numerous external and behavioural factors and cannot ensure sufficient accuracy, such measures are presented in this document without a quantitative calculation of greenhouse gas emissions. They are considered as actions supporting, guiding, and promoting the implementation of the SECAP.

MEASURE 8.1.1 Participation in events organised by international organisations on climate and energy

A number of international organisations, including the GIZ, the World Bank, the UNDP, and other partner institutions, regularly organise events, workshops, and campaigns aimed at climate change mitigation and adaptation, improving energy efficiency, and promoting the use of renewable energy sources. The participation of municipal staff in such events is of key importance for professional capacity development, the exchange of experience, and the improvement of community policies.
As an example, the community's participation in the global "Earth Hour" initiative, organised by the World Wide Fund for Nature (WWF), may be highlighted. It is implemented annually (usually on the last Saturday of March) and calls on individuals, communities, and organisations to switch off non-essential electric lighting and energy-consuming devices for one hour, from 20:30 to 21:30, as a symbolic act of environmental responsibility and care for the planet.
Another example is the "EU Sustainable Energy Week" (EUSEW), organised by the European Commission, which is the largest annual event in Europe dedicated to promoting sustainable and renewable energy. Within the framework of EUSEW, "Energy Days" are organised in around 60 countries worldwide and in more than 10,000 communities that are signatories to the Covenant of

[24] https://drive.google.com/file/d/1T74FSFR2Hl8a0gHK8kRxX5H0NbkMri5z/view

Mayors. Their objective is to raise awareness among local populations and stakeholders about energy saving, the use of renewable energy resources, and energy-efficient technologies, as well as green development and climate change mitigation and adaptation.
During such events, workshops, exhibitions, open days, educational and cultural initiatives, competitions, and other public activities are typically organised. Their main purpose is to increase awareness among the population and stakeholders and to promote the rational consumption and saving of electricity, natural gas, and other energy carriers.

MEASURE 8.1.2 Engagement of youth in the community's sustainable energy development processes

As stated in this document, the effective implementation of the program's objectives is largely determined by the level of population involvement.
Within the framework of this event, it is planned to disseminate information and educational materials on energy saving and energy efficiency among youth, particularly schoolchildren. It is expected that as a result of the active dissemination of green and sustainable development ideas by the schoolchildren involved in this process, a certain segment of the community population, particularly the families of schoolchildren, will undertake and implement energy-saving measures in their apartments and private houses.
The measures mentioned may include, in particular, the installation of PV panels, the purchase of electric vehicles and energy-saving household appliances, and the implementation of energy-efficient renovation works.
In order to ensure the effective implementation of the event, daily, consistent and coordinated work is expected from the employees responsible for the energy management sector of the municipality and all staff.

MEASURE 8.1.3 Development of an energy management system in the Municipality

In the Akunk Community, it is planned to introduce a Municipal Energy Management System (MEMS), through which systematic and continuous monitoring and management of energy flow parameters within the community, technological, economic, social, and environmental, will be carried out, starting from energy procurement and production processes to its transformation and final consumption.
Within the system framework, an inventory of municipally owned buildings will be conducted, a database of their thermal-technical and energy performance indicators will be established, and the buildings will be classified according to predefined criteria.
The main objective of introducing MEMS is to ensure the sustainability of the community's energy management, minimise the negative environmental impact of existing systems, and deliver significant economic benefits through more rational and efficient management of the municipal budget.
For the purpose of introducing and further improving the system, the following actions are planned in the Municipality:

- ✓ to define a clear list of tasks and targets for the energy management unit or responsible person, as well as to plan practical steps for their achievement,
- ✓ to develop, regularly analyse, and improve the MEMS operational programmes,

- ✓ to establish criteria and mechanisms for selecting buildings subject to modernisation from an energy-saving perspective,
- ✓ to organise energy audits and monitoring of municipally owned public buildings for the purpose of identifying and controlling key energy performance indicators,
- ✓ to ensure the calculation and analysis of key thermal-technical and energy efficiency indicators of buildings, including baseline energy consumption, specific energy consumption, comfort level, and other indicators,
- ✓ to assess the required investments for buildings subject to modernisation, energy-saving potential, greenhouse gas emission reductions, as well as other energy and financial-economic indicators,
- ✓ to ensure the participation of the responsible staff of all MEMS units in capacity-building and training programmes, including courses organised by international organisations,
- ✓ to ensure the reliability and accessibility of data on energy savings and GHG emission reductions achieved through various international, energy efficiency, and climate mitigation programmes implemented in the community,
- ✓ to organise and conduct, as necessary, internal discussions, seminars, workshops, and study visits with the participation of all units involved in MEMS activities, including members of the coordinating committee, the energy manager, and responsible persons of municipally owned public buildings,
- ✓ to undertake effective steps towards the establishment and operation of a Revolving Fund for the targeted use of financial resources generated from expected energy savings.

It is expected that, as a result of the introduction of the Municipal Energy Management System, greenhouse gas emissions in municipally owned facilities will be reduced by approximately 5–15 per cent.

Chapter 13. Summary of measures aimed at reducing GHG emissions

Within the framework of the Akunk Community SECAP, the package of measures aimed at reducing GHG emissions by 2030 includes both non-cost (“soft”) measures and investment-intensive (“hard”) measures.

Overall, the comprehensive implementation of the planned measures, which requires approximately 2.160 billion AMD in investments, makes it possible to ensure the fulfillment of the quantitative commitments undertaken by Akunk Community under the Covenant, namely a reduction of at least 35 per cent of the BEI volume calculated for the baseline year by 2030.

The table below presents greenhouse gas emissions across the main sectors included in the BEI, for both the baseline year 2023 and the target year, reflecting the expected changes resulting from the implementation of the planned measures.

Table 20. GHG emissions in 2023 and 2030 by target sectors

	Greenhouse gas emissions , t CO2/ year				
	Community institutions	Residential sector	Transportation	Lighting	Waste management and landscaping
BEI: **2023**	408.23	6,474.72	5,723.14	22.20	
Reductions resulting from the measures	331.89	2,816.50	1,366.21	22.20	148.2

Emissions Targeted year - 2030.	76.34	3,658.22	4,356.93	0	-148.2
Reduction **(%)**	81.3	43.5	23.87	100	

Figures 10 and 11 present the shares of the main sectors in the total volume of greenhouse gas emissions calculated in the BEI, as well as each sector's contribution to the reduction of those emissions.

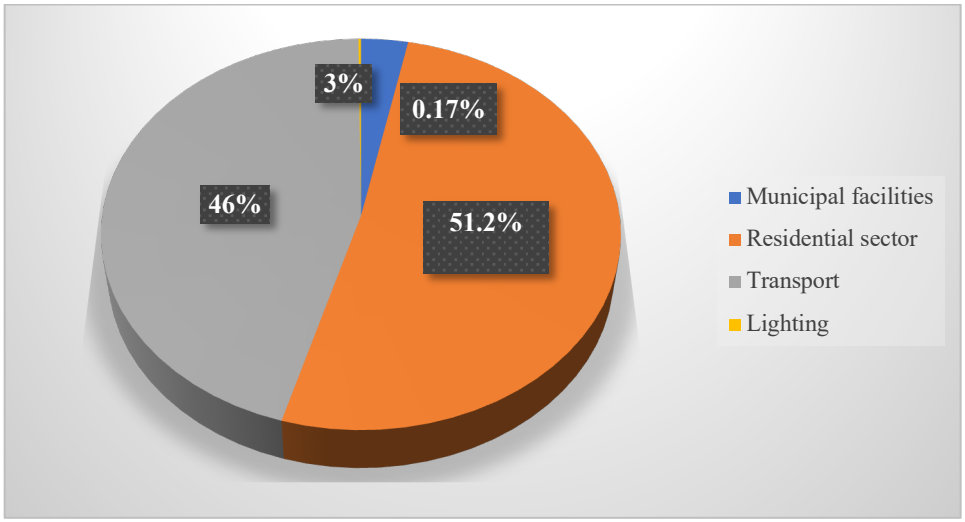


Figure 10. Share of main sectors in the BEI in 2023

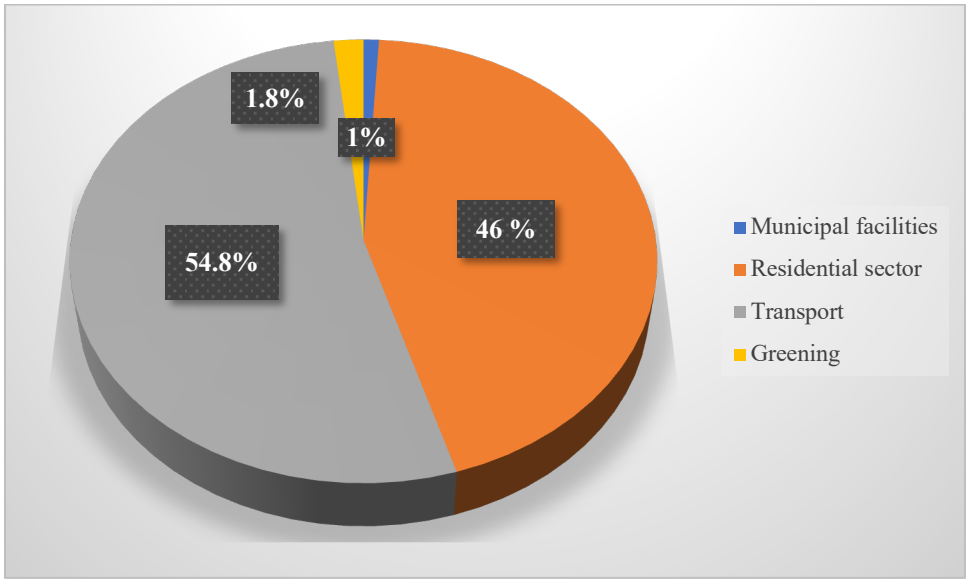


Figure 11. Share of key sectors in GHG reductions by 2030

The comparison of GHG emissions between the baseline and target years, by sector and energy carrier, is presented in Figure 12.

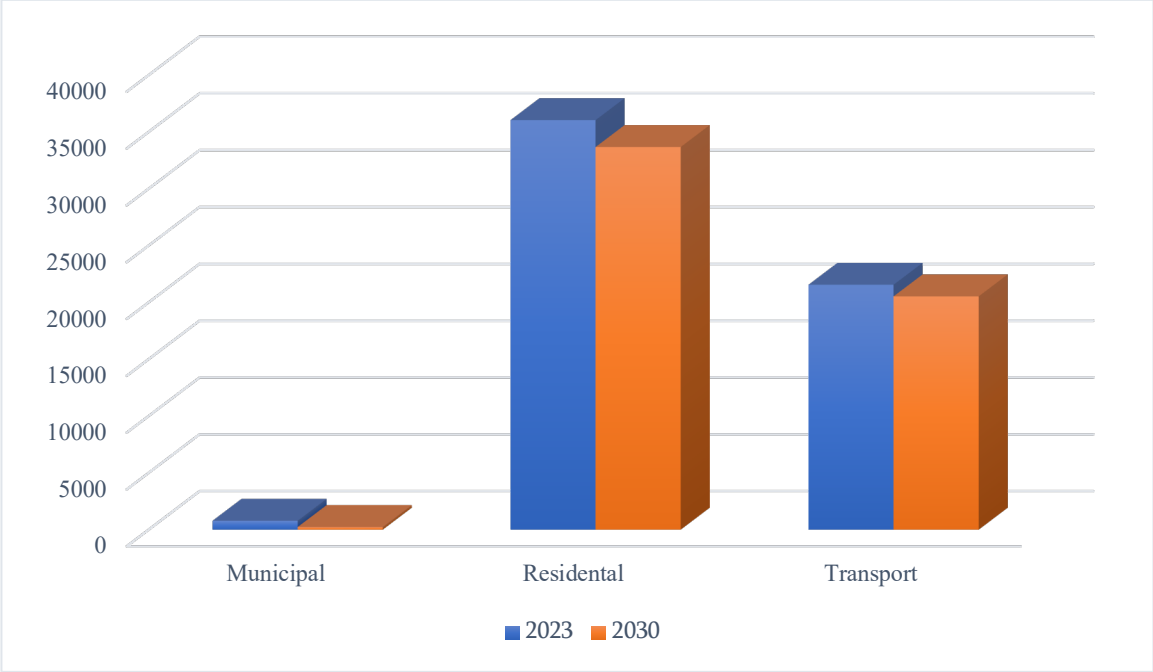


Figure 12. Comparison of GHG emissions in 2023 and 2030 by sectors and energy carriers.

The distribution of the financing required for the implementation of the proposed measures by the main sectors is presented below.

Table 21. Financial investments and specific GHG emissions required for the implementation of mitigation measures

Sector	**Investments**		**Specific cost of reducing 1 t CO_2 (thousand AMD / t CO_2)**
	thousand AMD	**%**	
Municipal buildings	84.700	3.92	577.6
Local energy production	100.000	4.63	539.7
Residential sector	1,218.400	56.41	432.5
Transport	710.000	32.87	519.6
Public lighting	12.000	0.56	540.4
Municipal solid waste management	16.000	0.74	111.1
Afforestation	19.000	0.88	4,523.8
Total	**2,160.000**	**100 %**	**7,245**

According to the table, investments totaling 2.160 billion AMD are required to reduce CO_2 emissions by 4,685 tons through the implementation of the SECAP.
Based on the table, the average cost of reducing 1 ton of CO_2 is 7,245 AMD thousand.
The highest unit mitigation costs are recorded in the afforestation sector, amounting to approximately 111.1 AMD thousand per kg of CO_2**.** In cases where the required financing volumes exceed the municipality's financial capacity, it is advisable to consider revising investment scenarios, including adopting more cost-effective alternatives, such as acquiring used or lower-capacity electric vehicles, as well as implementing in phases.
Overall, the relatively high unit costs of mitigation measures are explained by the fact that such interventions often pursue objectives beyond greenhouse gas emission reduction (which in some cases may be of secondary importance). They are also aimed at improving urban mobility, enhancing air quality, and advancing broader socio-economic development priorities.
In this context, it is recommended to sequence the implementation of measures according to a strategic logic: first prioritizing energy efficiency improvements, and subsequently transitioning to renewable energy deployment, so as to fully or partially meet the already reduced energy demand.
The summary table of measures envisaged under the Sustainable Energy and Climate Action Plan (SECAP) is presented in Table 22. The table also includes indicative implementation timelines, which will be finalized by the municipality taking into account the availability of financial resources, investment priorities, and other objective factors.

Table 22. Summary table of cost-intensive measures envisaged in the SECAP of the Akunk community, Kotayk region of the Republic of Armenia

No.	Brief Description of the Measure	Financing Volume (thousand AMD)	Energy savings/production MWh/year						GHG emissions reduction, t CO2 / year						Year of investment
			Electricity	Natural gas	Gasoline	Diesel	LPG	∑	Electricity	Natural gas	Gasoline	Diesel	LPG	∑	
Budgetary institutions and municipal economy															
1.1.1	Installation of a PV system for the administrative residence of Nor Gyugh settlement	800.0	6.152	0	0	0	0	6.15	1.4770	0	0	0	0	1.47	2026-2030
1.1.2	Installation of PV systems for the administrative residences of Kotayk and Kaputan settlements	5,600.0	43.064	0	0	0	0	43.06	10.3450	0	0	0	0	10.34	2026-2030
1.1.3	Installation of a PV system for the administrative building of Akunk settlement	9,000.0	69.210	0	0	0	0	69.21	29.7157	0	0	0	0	29.71	2022-2030
1.1.4	Installation of PV systems for the administrative residences of Zar and Hatis settlements, Zar pumping station, and Akunk kindergarten	26,700.0	181.375	0	0	0	0	181.37	43.639	0	0	0	0	43.63	2022-2030
1.1.5	Installation of a PV system for Nor Gyugh kindergarten	1,600.0	12.304	0	0	0	0	12.30	2.9559	0	0	0	0	2.95	2026-2030
1.1.6	Installation of a PV system for Zar wastewater treatment plant and Kaputan pumping station	31,000.0	238.39	0	0	0	0	238.39	57.357	0	0	0	0	57.35	2026-2030
1.1.7	Energy efficiency improvement of administrative residences in Hatis, Zovashen and Sevaberd settlements	10,000.0	0.932	43.07	0	0	0	44.01	0.219	0.924	0	0	0	1.14	2026-2030
Total		**84,700.0**	**551.42**	**43.07**	**0**	**0**	**0**	**594.50**	**145.70**	**0.92**	**0**	**0**	**0**	**146.63**	
Local production of electrical energy															
2.1.1	Construction of a community commercial PV power plant	100,000.0	770.0	0	0	0	0	770.0	185.26	0	0	0	0	185.26	2026-2030
Total		**100,000.0**	**770.0**	**0**	**0**	**0**	**0**	**770.0**	**185.26**	**0**	**0**	**0**	**0**	**185.26**	
Residential sector															
3.1.1	Installation of PV systems in private homes by owners	218,400.0	1,679.49	0	0	0	0	1,679.4	404.08	0	0	0	0	404.08	2026-2030
3.1.2	Increasing the energy efficiency of private houses in Akunk	1000,000.0	685.8	11,427.3	0	0	0	12,113.1	161.85	2,250.56	0	0	0	2,412.41	2026-2030
Total		**1218,400.0**	**2,365.29**	**11,427.3**	**0**	**0**	**0**	**13,792.66**	**565.93**	**2,250.56**	**0**	**0**	**0**	**2,816.50**	
Transportation															

4.1.1	Replacing municipal passenger and freight vehicles with electric vehicles	60,000.0	0	0	83.536	422.40	0	505.93	0	0	20.056	101.49	0	121.54	2026-2030
4.1.2	Replacing 40% of private and commercial passenger transport vehicles with electric passenger vehicles	650,000.0	0	1,020.07	774.01	2,590.56	796.28	5,180.93	0	245.063	185.94	622.356	191.29	1,244.66	2026-2030
Total		**710,000 . 0**	**0**	**1,020.07**	**857.55**	**3,012.96**	**796.28**	**5,686.86**	**0**	**245.063**	**206.00**	**723,846**	**191.299**	**1,366.21**	
Street lighting															
5.1.1	Installation of PV systems for street lighting in 3 settlements of the community	12,000.0	92.28	0	0	0	0	92.28	22.20	0	0	0	0	22.20	2026-2030
Total		**12,000 . 0**	**92.28**	**0**	**0**	**0**	**0**	**92.28**	**22.20**	**0**	**0**	**0**	**0**	**22.20**	
Solid waste management															
6.1 .1	Introduction of a municipal solid waste sorting system	16,000 . 0	0	0	0	0	0	0	0	0	0	0	0	144.0	2026-2030
Total		**16,000 . 0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**144.0**	
Increasing forest areas															
7.1 .1	Increase in forest areas	19,000 . 0	0	0	0	0	0	0	0	0	0	0	0	4.2	2026-2030
Total		**19,000 . 0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4.2**	
Total		**2160,000.0**	**5,458.56**	**12,490.4**	**857.55**	**3012.96**	**796.28**	**20936.3**	**919.11**	**2,496.55**	**206.00**	**723.84**	**191.29**	**4,685.0**	

Chapter 14. Assessment of the Akunk Community's vulnerability to climate change and adaptation measures

14.1 Climate Change and the Covenant

Within the framework of the EU "Covenant of Mayors for Climate and Energy" initiative, climate change adaptation is a key component of Sustainable Energy and Climate Action Plans (SECAPs). It implies that local self-government bodies should not only implement measures to reduce greenhouse gas emissions but also be prepared to withstand climate impacts and minimise their consequences.

By joining the Covenant, Akunk and other communities undertake the obligation to systematically assess climate risks, identify vulnerable sectors and groups, and implement targeted adaptation measures as an integral part of the SECAP.

In practical terms, this means that, alongside mitigation actions, communities must carry out a Risk and Vulnerability Assessment (RVA) and develop a local adaptation plan to prevent or reduce the negative impacts of climate change.

This adaptation commitment aligns with the broader European Union resilience policy (for example, the EU Mission on Adaptation to Climate Change) and emphasises that strengthening climate resilience by 2030 is a common and strategic objective of EU partner communities.

14.2 Armenia's Policy in the Field of Climate Change

Adaptation planning in Akunk is also aligned with the objectives of Armenia's national climate policy. In May 2021, the Government of Armenia approved its first comprehensive National Adaptation Plan (NAP) (with a list of measures for 2021–2025), which defines medium-term adaptation goals and priorities. The NAP identifies the country's most significant climate hazards and outlines measures to reduce risks and strengthen resilience at different levels of governance and across sectors. Notably, it emphasizes the roles and mandates of communities and local authorities, aiming to integrate adaptation into local development programmes.

For Akunk Community, the relevant national strategy is highly pertinent, as many of the priority sectors of the NAP, agriculture, water resources, healthcare, infrastructure, and disaster risk management, coincide with the local needs of Akunk Community. The community's adaptation efforts are based on the NAP framework, enabling the translation of national priorities into local actions. This ensures that the SECAP of Akunk Community is consistent with Armenia's climate commitments (in accordance with Article 7 of the Paris Agreement on adaptation) and allows the community to access potential support for adaptation measures (state programmes, the Green Climate Fund, etc.).

Thus, climate adaptation planning in the Akunk Community is grounded in both the Covenant of Mayors methodology and Armenia's NAP, ensuring the coherence and continuity of objectives at the local and national levels.

14.3 Climatic Conditions of Akunk

Geographical and climatic conditions. Akunk is located in the central part of the Republic of Armenia, in Kotayk Marz, at an altitude of approximately 1,450 metres above sea level. Akunk is characterised by a humid continental, non-arid climate with warm summer days. Due to its high-altitude location, Akunk records significant daily temperature variations, while its highest temperatures are lower than the peak temperatures in the valley areas of Kotayk. Nevertheless, during summer days temperatures above 30°C are recorded, and during winter days temperatures fall below zero.

Temperature. Summers in Akunk are warm to hot, whereas winters are substantially and sharply cold. On average, the warmest month is July (average daily maximum temperature of about 27°C and minimum of about 13°C), while the coldest month is January (average temperature of about -4°C, with night-time temperatures around -9°C). In the community, extreme temperatures reach up to 30°C in summer and approximately -20°C during the coldest winter nights.

Table 23. Weather by month in Akunk[25]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high	5.93	9.88	19.76	22.73	25.69	32.86	34.59	35.58	30.63	23.72	18.78	12.85	35.58
Average high	-1.04	0.83	5.83	12.3	18.22	23.76	27.22	26.8	22.3	14.9	7.26	1.79	13.35
Daily mean	-4.26	-2.6	2.63	8.97	14.93	20.12	23.12	22.59	17.88	11.22	4.09	-1.38	9.77
Average low	-8.82	-7.66	-2.77	2.91	7.59	14.1	14.39	14.94	12.62	5.35	-1.98	-6.59	5.59
Record low	-23.82	-23.62	-20.77	1.76	3.95	5.95	9.95	11.59	5.17	-4.13	-7.1	-14.24	-23.82

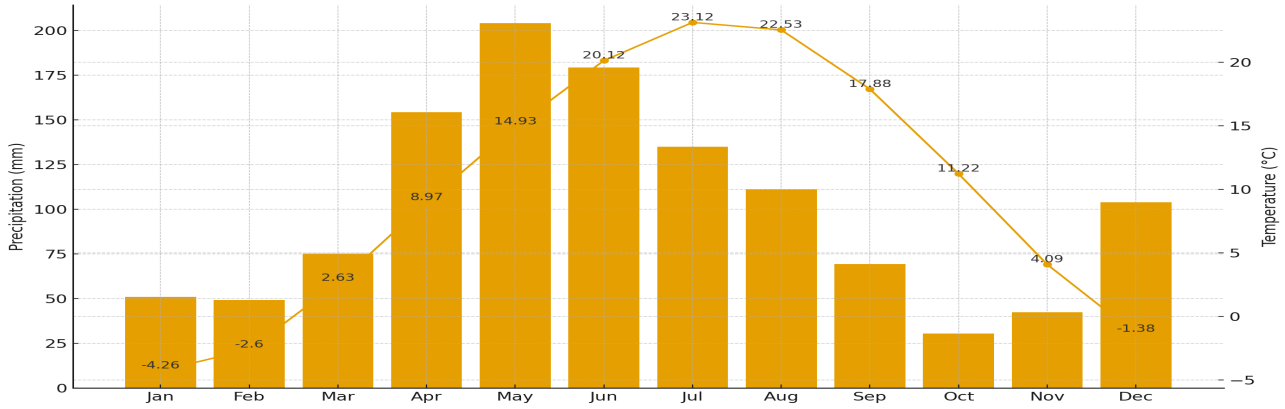


Figure 13. Average monthly temperature and precipitation in Akunk[26]

Figure 13 presents the seasonal characteristics of Akunk, with warm summers, cold winters, and peak precipitation in spring.

The warm period lasts approximately 3.4 months, from 6 June to 18 September, when the average daily maximum temperature exceeds 18°C. The warmest month is July, with temperatures typically ranging between 13°C (night-time) and 23°C (daytime).

The cold period lasts around 3.5 months, from 24 November to 10 March, during which the average daily maximum temperature remains below 2°C. The coldest month is January, with night-time temperatures dropping to –11°C, while daytime temperatures do not exceed –3°C.

Figure 14 shows the differences between summer and winter temperatures, highlighting the community's distinctly continental climate and the significant daily and seasonal temperature variations.

[25] *Source: https://weatherandclimate.com/armenia/kotayk/akunk*
[26] *Source: https://weatherandclimate.com/armenia/kotayk/akunk*

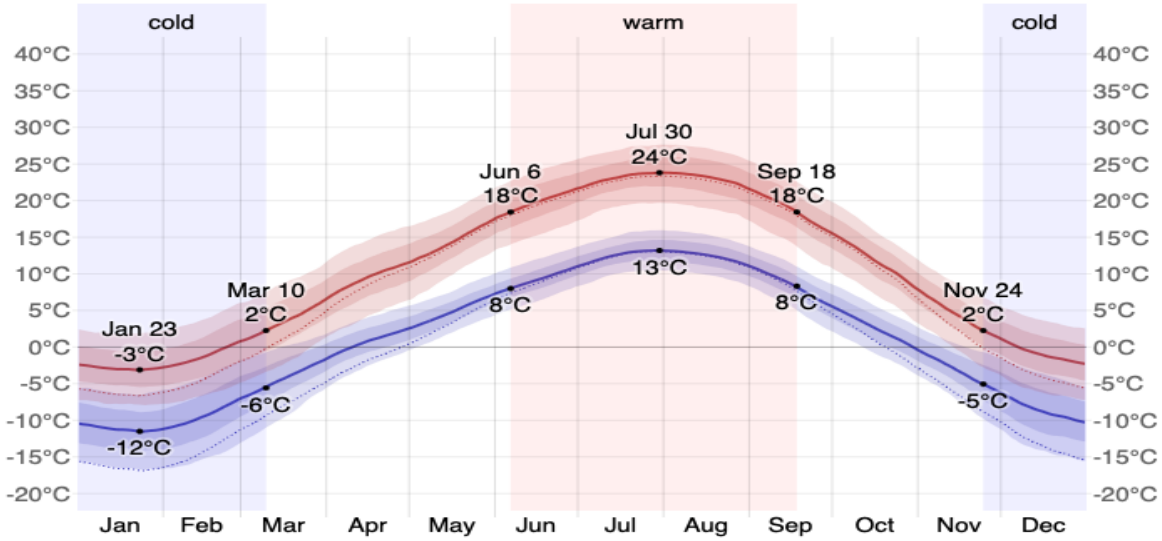


Figure 14. Average monthly highest and lowest temperatures in Akunk[27]

Precipitation. Based on monthly observations, the annual precipitation in Akunk is relatively high, at approximately 1,105 mm. This is characteristic of a humid climate influenced by mountainous conditions.

Table 24. Monthly climatic indicators of the Akunk community

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average precipitation (mm)	50.96	49.26	75.15	154.25	204.1	179.36	135.04	111.12	69.31	30.59	42.53	104.01	1,105
Average precipitation days (≥1 mm)	9.53	9.44	13.83	17.88	15.34	23.81	20.84	17.52	14.73	11.41	6.65	7.1	14.69
Average relative humidity (%)	78.37	78.15	70.71	62.9	59.86	56.41	55.59	53.23	54.61	57.47	60.24	70.43	63.18
Mean monthly sunshine hours	8.65	9.86	10.73	11.0	13.96	14.12	13.96	11.49	11.31	10.79	8.35	7.99	11.02

Spring is the rainiest season in Akunk. Precipitation increases sharply from 75 mm in March to 154 mm in April, then to 204 mm in May, the highest monthly figure of the year. Summer is relatively humid compared to Armenia's climatic norms. In June, precipitation amounts to 179 mm, while in July (135 mm) and August (111 mm) it decreases. Autumn is characterised by a gradual drying trend. In September, precipitation totals 69 mm, decreasing to 30 mm in October, the driest month of the year. In November, the figure slightly increases to 42 mm. During this season, soil moisture depletion frequently occurs.

Winter is characterised by moderate precipitation, mainly in the form of snow. Monthly precipitation ranges between 49 and 104 mm. December is more humid (104 mm), while January and February record 50 mm and 49 mm of precipitation, respectively.

[27] *Source:* https://weatherspark.com/s/103830/0/Average-Spring-Weather-in-Akunk'-Armenia#Figures-Humidity

Snowy days are regular, and snow cover persists for extended periods. The occurrence of precipitation on 7 to 24 days per month indicates that precipitation in Akunk is relatively frequent throughout the year, especially from March to August.

Humidity and wind. Relative humidity during the cold winter months, when temperatures are low, averages around 70–75%, while during the warmest and driest summer months it decreases to approximately 50–55%. In summer afternoons, moderately dry air conditions prevail, contributing to evaporation and drought stress.

Wind patterns in Akunk are generally moderate. Valley–mountain airflows influence the prevailing winds. Spring is typically the windiest season. For example, in March, the average wind speed may reach approximately 25–30 km/h, occasionally causing dust storms or intensifying soil erosion on exposed land. In winter, winds are lighter (around 10 km/h) but may make cold conditions feel more severe. The combination of relatively low humidity and periodic strong winds, especially during the warm months, highlights water scarcity and temperature extremes in Akunk, thereby demonstrating the community's vulnerability to climate change.

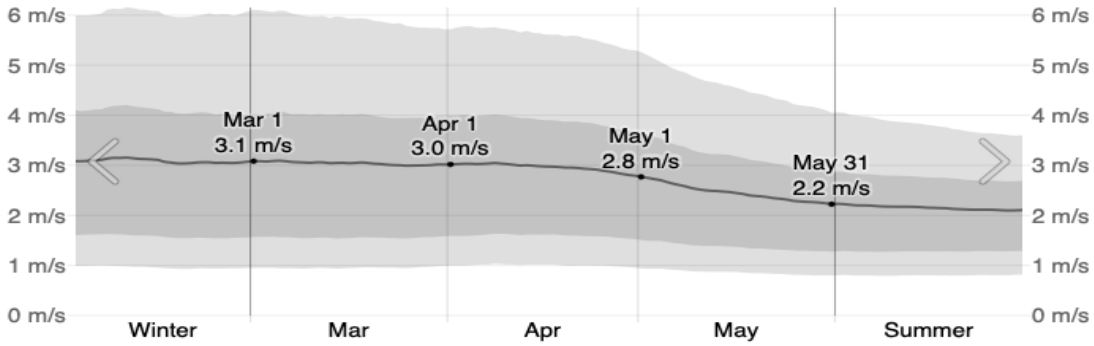


Figure 15. Average wind speed in Akunk[28]

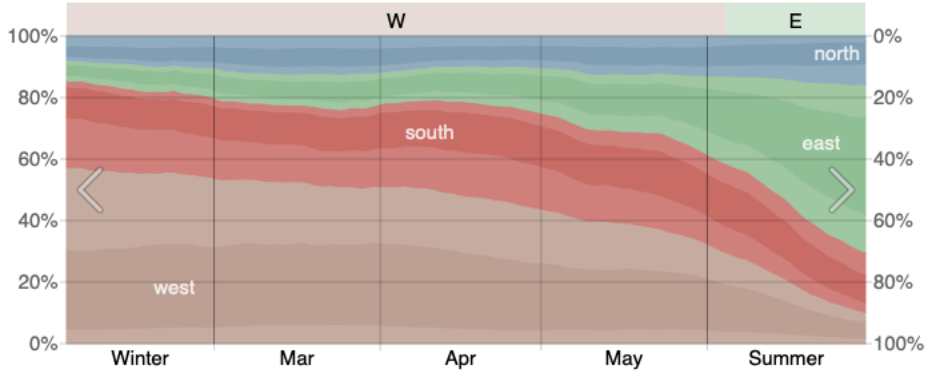


Figure 16. Wind direction in Akunk

14.4 Climate Change in Akunk

14.4.1 Observed Climate Change in Akunk

Air Temperature

Regional data and local observations indicate that the climate of Akunk has already begun to change, in line with the overall climatic trends observed in Armenia. Data recorded by the meteorological

[28] *Source: Weather Spark, https://weatherspark.com/s/103830/0/Average-Spring-Weather-in-Akunk'-Armenia#Figures-Humidity*

station show a clear upward trend in air temperature. Since the mid-20th century, the average annual temperature in Armenia has increased by approximately 1.2°C. In Kotayk Marz, where Akunk is located, this warming is reflected in more frequent hot days and slightly milder winters. Residents have noted that extremely hot summer days (above 35°C) are now more frequent than in previous decades, and that spring arrives earlier than it used to.

Table 25. Observed changes in average monthly temperature in Kotayk Marz during 2010–2020

Month	1951-1960	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2020	1991-2020
Jan	-7.33	-6.1	-6.68	-4.17	-6.29	-5.49	-5.21	-6.09
Feb	-7.21	-4.73	-6.12	-2.48	-6.66	-2.45	-5.5	-4.47
Mar	1.91	-2.35	1.83	1.18	-0.07	3.92	0.04	0.47
Apr	7.23	5.54	4.85	3.62	7.06	7.76	5.15	5.81
May	10.83	12.44	11.57	8.3	9.37	9.94	10.55	10.84
Jun	14.32	15.69	13.44	13.91	14.77	15.73	15.58	15.3
Jul	18.39	17.44	18.63	18.1	18.17	18.28	19.5	18.21
Aug	17.99	17.39	16.61	16.87	18.2	18.88	17.65	18.33
Sep	13.16	11.57	15.72	14.51	14.06	15.12	13.63	14.27
Oct	3.75	7.13	6.43	8.92	9.65	7.43	7.06	8.67
Nov	1.56	2.47	1.7	-0.16	1.63	0.42	-3.44	1.4
Dec	-5.45	-2.23	-6.44	-0.89	-6.04	-3.24	-4.97	-3.96

Atmospheric Precipitation. Precipitation patterns in Akunk reflect the broader climatic trends observed in Armenia. Long-term data recorded by the meteorological station indicate that total precipitation has experienced a moderate but noticeable decline, decreasing by approximately 9–10% compared to the mid-20th century. This trend is manifested through changes in both the intensity and duration of rainfall and snowfall. In Akunk, this is particularly evident in reduced winter precipitation and unstable snow cover.

According to local observations, snow accumulation in recent decades has decreased due to an overall reduction in snowfall and earlier spring melting. These observations are confirmed by regional climate analyses, which indicate that in Armenia's highland communities, including Akunk, the duration of snow cover has decreased by 10–15 days compared to the end of the 20th century. The shortening of the snow cover period directly affects natural water accumulation, which traditionally ensures soil moisture and surface water flows in spring and early summer. Early snowmelt not only reduces water availability during the dry season but may also increase the risk of spring floods due to rapid melting.

Table 26. Average number of monthly precipitation days in Akunk[29].

Month	Rainfall (day/mm)	Mixed (day)	Snow (day/mm)	Any (day)
January	0.0 /0.1	0.1	1.3 /48.7	1.4
February	0.0 /0.3	0.1	1.3 /55.2	1.5
March	0.7 /3.2	0.6	1.1 /60.3	2.4

[29] *Source:* *https://weatherspark.com/y/103830/Average-Weather-in-Akunk'-Armenia-Year-Round#Sections-Precipitation*

April	3.3 /14.5	0.7	0.2 /27.4	4.2
May	5.3 /21.7	0.1	0.0 /3.0	5.5
June	4.5 /18.6	0.0	0.0 /0.0	4.5
July	2.4 /9.5	0.0	0.0 /0.0	2.4
August	1.8 /6.6	0.0	0.0 /0.0	1.8
September	2.5 /10.4	0.0	0.0 /0.4	2.6
October	2.9 /12.8	0.3	0.2 /13.1	3.3
November	1.1 /5.1	0.4	1.0 /53.9	2.6
December	0.1 /0.4	0.1	1.2 /48.4	1.3

The data indicate that in Akunk, the number of precipitation days per month is relatively low, with most precipitation occurring in late spring and early summer. May has the most rainy days (5.3), followed by June (4.5). Precipitation in the form of snow occurs only during the winter months, averaging approximately 1–1.3 days per month.

Overall, these data highlight two main vulnerabilities: (1) a limited number of snowfall days, which reduces the duration of stable snow cover, and (2) the concentration of precipitation within a few wet months, which may increase the risk of dry periods and potential spring floods. These trends emphasise the importance of improving water resource management and seasonal forecasting systems within Akunk's climate adaptation planning.

Extreme weather events. In terms of extreme weather phenomena, certain hazards in Akunk have become more frequent and intense over the past decade. These particularly include hailstorms and wildfires, which damage crops and pastures. In contrast, storms and heavy snowfall events have occurred less frequently in recent years compared to the past, indicating a decline in cold-related extreme weather events. At the same time, droughts and summer heatwaves remain recurrent issues. Since 2010, they have not shown a significant increase in frequency (drought and extreme heat remain relatively stable). Nevertheless, even the "normal" levels of these phenomena already pose challenges for agriculture and water supply in Akunk.

Table 27. Frequency of extreme weather events in Kotayk Marz

Event Type	Typical Recurrence (pre-2000)	Current Recurrence	Notable Local Effects
Drought	In the late 20th century, severe droughts in Armenia were intermittent (only a few major events per decade). Foothill areas like Kotayk experienced drought in roughly half of years.	Droughts are now more frequent and prolonged. Lowland regions face drought almost every year. The annual number of strong drought days has risen ~38% (from ~87 to 120 days) in the 2000s compared to the 1961–1990 baseline.	Recurrent water shortages and crop failures. Recent multi-year droughts (e.g. 2000, 2006, 2010) in Kotayk/Armenia led to ~50% grain yield losses and widespread rural impacts. Agriculture in Akunk suffers reduced harvests and pasture die-back during droughts.
Heatwave (>35 °C)	Historically rare in Akunk's highland climate – days above 35 °C occurred infrequently (peak summer temperatures were usually below this extreme). Heatwaves, when they did occur, were shorter and less intense.	Episodes of extreme heat have become more common. Nationally, the incidence of heatwave conditions has **~doubled** since the mid-20th century (heat depression events up 128.8% from 1948 to 2016). Kotayk now occasionally sees summer highs in the upper 30s °C, and heatwaves last longer than before.	Heat stress impacts on health and farming are rising. Prolonged heatwaves contribute to crop yield declines and increase wildfire risk. Health officials warn of more heat-related illnesses (e.g. dehydration, cardiac issues) as heatwave frequency grows. In Akunk, extreme heat has caused pasture drying and discomfort for

			vulnerable populations (elderly, etc.).
Hailstorm	Hailstorms occurred regularly each spring–summer. Kotayk typically saw a few hail events per year under past climate norms, though the most hail-prone areas were in northern and Ararat plain regions.	Severe hail events are slightly **more frequent** now. Overall hazardous weather occurrences (incl. large hail ≥20 mm) have increased ~23% in Armenia compared to 1961–1990. *(Some local data suggest a recent modest decline in hail days, but risk remains)*.	Hailstorms cause significant damage to crops and property. In Kotayk, a single storm can devastate orchards and fields – each year about 10–15% of fruit orchards nationwide are impacted by hail, with occasional total crop loss in hit communities. Akunk has experienced roof damage and destroyed gardens from intense hail.
Heavy Rain / Flash Flood	Major flash floods were relatively infrequent historically. Heavy downpours usually coincided with spring snowmelt season; floods occurred only in particularly wet years or storm events.	**Increasingly erratic heavy rainfall.**Intense rainstorms (≥30 mm/hour) are more common in recent decades. Sudden cloudbursts now occur in summer as well, raising flash flood frequency. Kotayk's spring rains remain heaviest, but overall rainfall is falling in shorter, more intense bursts.	Frequent localized floods and mudflows damage infrastructure and farms. In Akunk, saturated spring soils plus heavy rain often trigger flash floods, landslides, and erosion. Rural roads and bridges are washed out more often – heavy rain has damaged roads/culverts in the region, cutting off access during storms. Residents report more incidents of fields flooding and irrigation channels overflowing in recent years.
Strong Winds	High-wind storms (gales ≥25 m/s) were uncommon in the past, striking mainly during rare severe fronts. Akunk's mountain-valley breezes historically caused only occasional wind damage.	Evidence of **higher wind extreme s**now. The frequency of winter anticyclone events bringing strong winds has jumped (~+154% vs. mid-century). Overall severe wind incidents have risen with climate variability, though Akunk's recent records rate wind hazard as low and slightly decreasing. Spring gusts in Kotayk can reach 25–30 km/h, sometimes stirring dust storms.	Windstorms have downed power lines and ripped roofs in Kotayk. In Akunk, powerful gusts periodically tear off roofing and topple trees. Strong winds also exacerbate soil erosion on farmlands (dust storms), damaging crops and reducing topsoil fertility. Emergency crews in the region have had to reinforce structures against spring storm winds.

Climate change outlook and increasing climate risks. Although observations over recent decades indicate that Akunk's climate has remained relatively stable, climate projections for Armenia indicate that the coming years will bring noticeable warming and changes in precipitation patterns. Model simulations indicate that by the end of the century, the average temperature in Armenia may increase by approximately 4–5°C under high-emission scenarios. Such an increase in temperature will significantly alter conditions even in a high-altitude community such as Akunk, where a cooler climate has traditionally mitigated summer heat. According to the community's assessment, in the short term this will not have a significant impact on the community; however, in the medium- to long-term, its effects will intensify.

Future precipitation trends are less predictable; nevertheless, a decrease in total precipitation is evident. Projections indicate that prolonged droughts will become more frequent, while precipitation will decrease in both duration (shorter) and intensity. These changes, reflected in the increase in drought periods and the decline in precipitation intensity, are consistent with Armenia's projected climate trajectory. They exacerbate existing challenges, including reduced water availability, higher heat stress, and increased vulnerability to storms, hail, and erosion.

In practical terms, Akunk may face risks related to irrigation water shortages, hailstorms, droughts, and other hazards. The cumulative impacts of these risks are significant for agriculture, water resource management, ecosystems, and human health, underscoring the need for local early warning systems and adaptation measures.

Table 28. Climate risk assessment in the short term

Hazard	Risk Level
Extreme Heat	Insignificant
Droughts	Insignificant
Periods of Very High Temperature (several days or weeks)	Insignificant
Strong Winds / Storms / Tornadoes	Insignificant
Severe Winter / Cold Waves	Insignificant
Thunderstorm / Lightning	Severe
Hailstorms	Severe
Fires (forest or grassland)	Severe
Frost	Severe
Water Scarcity	Severe
Loss of Groundwater	Severe

Table 29. Climate risk assessment in the medium term

Hazard	Risk Level
Severe Winter / Cold Waves	Insignificant
Extreme Heat	Moderate
Droughts	Moderate
Periods of Very High Temperature (several days or weeks)	Moderate
Strong Winds / Storms / Tornadoes	Moderate
Thunderstorm / Lightning	Severe
Hailstorms	Severe
Fires (forest or grassland)	Severe
Frost	Severe
Water Scarcity	Severe
Loss of Groundwater	Severe

Table 30. Climate risk assessment in the long term

Hazard	Risk Level
Severe Winter / Cold Waves	Insignificant
Extreme Heat	Moderate
Droughts	Moderate
Periods of Very High Temperature (several days or weeks)	Moderate
Strong Winds / Storms / Tornadoes	Moderate
Thunderstorm / Lightning	Severe
Hailstorms	Severe
Fires (forest or grassland)	Severe
Frost	Severe
Water Scarcity	Severe
Loss of Groundwater	Severe

Short-, medium-, and long-term assessments of climate risks in Akunk indicate a clear upward trend in stress levels. This trend is particularly associated with drought, water scarcity, strong winds, and other weather phenomena. Water-related hazards, including groundwater depletion, become especially evident in the medium- and long-term perspective. These imply future challenges both for agriculture and for household water supply.

14.4.2 Methodology for Climate Risk and Vulnerability Assessment

The climate risk and vulnerability assessment was carried out in three main stages:

1. **Identification of climate risks.** The main climate risks resulting from climate change were identified, and their impact on the Akunk Community was assessed.
2. **Vulnerability assessment.** An analysis was conducted to determine the extent to which different sectors are sensitive and vulnerable to the identified risks and climate change, as well as their level of adaptive capacity.
3. **Development of priority adaptation measures.** Practical and targeted measures to increase resilience were proposed, and a preliminary assessment of their financial and institutional requirements was conducted.

The analytical framework was based on theoretical and statistical data and evidence obtained from various sources, including the RA Hydrometeorology and Monitoring Center, the RA National Statistical Service, the World Bank, the Akunk Community databases, and stakeholder consultations conducted within the framework of the SECAP development process.
Vulnerability scores were determined by combining the magnitude of risk with sectoral impact and adaptive capacity, based on both quantitative indicators and qualitative expert assessments.
In accordance with the JRC (2024) guidelines, an integrated assessment system was applied. Impact, vulnerability, and adaptive capacity were assessed on a scale of 1–3, where 1 = low, 2 = medium, and 3 = high. Quantitative indicators (e.g., the share of vulnerable population) were used where data were available, while qualitative assessments were derived from stakeholder consultations. Final vulnerability scores were calculated using an integrated method that combined these criteria to identify the sectors most exposed to risk.

14.4.3 Main Climate Hazards in Akunk and Risk Assessment

Within the framework of developing Akunk's SECAP, a detailed study of climate risks was conducted to assess the main hazards facing the community. The assessment was carried out taking into account both current impacts and potential developments in the short-term (0–5 years), medium-term (6–14 years), and long-term (15+ years). The frequency and intensity of each hazard, as well as their impact on the population, economy, and ecosystems, were evaluated in accordance with the Covenant of Mayors and the NAP.
At present, several hazards already represent medium to high risk, creating serious challenges even in the short term (see Table 28). In the short-term horizon, these include hailstorms, spring frost, water scarcity, and groundwater depletion, among others, which may cause significant damage to agriculture, infrastructure, and the community's livelihoods. Hail events have increased both in frequency and intensity, particularly in late spring and summer. Frost remains a seasonal threat, especially in spring, when it may damage young fruit trees and vegetables. Wildfires are becoming more frequent, while seasonal water shortages persist due to the combined effects of drought and inefficient infrastructure.

Other hazards, such as extreme heat/high-temperature periods and droughts, currently have medium and/or low probability; however, according to projections, their threat level will also be considered medium (see Tables 28–30). At the same time, the frequency and impact of severe winter conditions/frost are declining, reflecting the clearer warming trends observed in Kotayk Marz. Annex 2 summarises the projected trajectory of the main climate hazards in Akunk.
Thus, Akunk faces a range of climate risks that are gradually intensifying in terms of their impacts. According to projections up to 2030, hazards such as hailstorms, frost, wildfires, water scarcity, and groundwater depletion will have a significantly negative impact on the community. This outlook underscores the urgent need for targeted adaptation strategies, including climate-resilient agriculture, improved water resource management, and community preparedness measures. These actions are examined in Sections 14.4.6 and 14.4.7.

Table 31. Summary of the main climatic hazards of Akunk

Hazard	Trend Since 2010	Current Risk Level	Future Outlook (15+ yrs)
Droughts	Frequency and intensity have remained stable, though seasonal water shortages persist	Medium	Slightly increasing – Higher temperatures may intensify evapotranspiration and water stress
Extreme Heat	Stable frequency; hot summers increasingly affect health and agriculture	Medium	Slightly increasing – Longer heatwaves expected, intensifying health demand
Hailstorms	Notably increasing in both frequency and intensity	Medium–High	Increasing – Crop damage risk is projected to rise unless protection systems are improved
Frost	No significant change in frequency or timing	Medium	Stable – Slight decline in events possible with warming, but early frosts still a risk
Wildfires	Occurrence and severity are increasing, particularly in grasslands	High	Increasing – Hotter, drier summers will likely worsen fire risk
Water Scarcity	Stable; tied to droughts and inefficient infrastructure	Medium	Stable – Infrastructure upgrades will determine future resilience
Strong Winds	Decreasing trend in recent years	Low	Decreasing – Risk of wind damage likely to stay low but dust storms could rise with erosion
Heavy Snowfall	Frequency and severity are declining	Low	Decreasing – Shorter winters and rising temperatures reduce snow-related hazards

14.4.4 Local Perceptions of Climate Risks

During the assessment of Akunk's climate vulnerability, particular importance was given to the involvement of local stakeholders. This made it possible to understand which climate hazards are most visible and disruptive in daily life. Interviews and surveys conducted with community representatives and local authorities provided valuable input for the climate risk assessment.
Representatives of the Akunk Community identified hailstorms, frost, and water scarcity as major concerns. They recalled years when hailstorms destroyed orchards or fields within minutes, describing such events as becoming more frequent. Late spring frosts were also highlighted as a persistent threat to fruit crops, particularly apricots and early vegetables. Such events often destroy months of agricultural work and investments within a single day.
Water scarcity, particularly during summer and early autumn, was identified as one of the most urgent challenges. It was noted that unreliable irrigation systems and reduced water availability affect

agricultural production. This perception is consistent with the identified issues, which indicate that water shortages in Akunk already pose a medium-to-high level of risk, potentially worsening under continued climate stress.

Regarding temperature extremes, it was noted that summer temperatures are higher than in the past and more difficult to manage, particularly for elderly residents and those without air conditioning. Although heatwaves have not yet reached critical levels, there is an increasing sense of discomfort and an expectation that conditions may deteriorate.

Wildfires in forests and grasslands also raise concern, as they occur more frequently in pastures during dry periods. Interestingly, strong winds and snowfall are not considered major issues in the community. Wind is perceived as an occasional phenomenon rather than a serious threat. As for snowfall, it occurs less frequently. Similarly, there have been no reports of large-scale floods or landslides in recent decades, suggesting that these hazards have a lower risk.

Community representatives also observed changes in soil conditions, such as signs of land degradation or reduced fertility in certain fields, particularly after heavy rainfall. These observations suggest growing awareness of how climate variability affects long-term soil productivity.

14.4.5 Sectoral Vulnerability Analysis

The identification of climate hazards has also enabled assessment of the vulnerability, sensitivity, and adaptive capacity of each sector in relation to the identified risks. The results indicate that agriculture/forestry, water resources, and natural ecosystems (environment/biodiversity) are the most vulnerable sectors of the community.

It is noteworthy that tourism is also considered a vulnerable sector for Akunk, as climate change affects the community's attractiveness. Compared with agriculture, tourism is viewed as an alternative source of income for households, particularly when the community loses its appeal. The installation of a statue on Mount Hatis, although expected to attract a significant number of tourists in the coming years, underscores the need to ensure balanced tourism development within the community while promoting eco-tourism. This would provide an opportunity to reduce significant dependence on agriculture, which is strongly negatively affected by climate change. At the same time, the community is sensitive to climatic conditions and currently has limited capacity to withstand adverse changes.

For example, agriculture in Akunk is largely rain-fed and highly dependent on weather conditions. Recurrent droughts, late spring frosts, or hailstorms may result in significant crop losses and pasture degradation. Summers characterised by extreme heat and water scarcity have already led to reduced yields and livestock stress. As most local households rely on small-scale agriculture for their livelihoods, any climate-related shock in agriculture directly threatens income and food security. The water sector is equally critical, and Akunk faces irrigation water shortages during summer, which negatively affects households.

Groundwater levels show a declining trend, and the outdated water supply system is characterised by leakages. This means that the community is highly vulnerable to drought and changes in precipitation; even a single dry year may lead to water shortages for crops and households. Ecosystems and biodiversity are also assessed as highly vulnerable, as they are affected by drought (drying of soil and vegetation), increased wildfires, and erosion. The semi-arid grassland and shrub ecosystems surrounding Akunk are fragile; drought and fire may reduce biodiversity and damage soil fertility, while ecological restoration capacity (through afforestation or conservation programmes) remains limited. Across these highly vulnerable sectors, adaptive capacity is constrained by limited financial resources and technical conditions. Farmers have limited access to crop insurance schemes, irrigation infrastructure requires modernisation, and resources for ecosystem management are scarce.

Other sectors generally exhibit relatively lower vulnerability, depending on the specific climate hazard. For example, the energy sector (electricity supply) may be disrupted by extreme events: strong winds may damage power lines, lightning or heavy precipitation/ice may affect transformers, and rising summer temperatures increase electricity demand for cooling. On the positive side, the energy system has a certain degree of resilience (ongoing modernisation and solar energy potential), yet further investments are required to cope with increasing climate stress.

The health sector also demonstrates a medium level of vulnerability. Heatwaves may cause a sharp increase in heat exhaustion, respiratory problems, and other illnesses, particularly affecting the elderly and those with chronic conditions. Local healthcare services have limited capacity (small clinics with basic facilities) and may struggle to respond if climate-related health incidents increase.

Infrastructure and buildings in Akunk have mixed vulnerability. Some buildings are old and not designed for new climate extremes (e.g., lacking thermal insulation or storm protection). Hailstorms occasionally damage roofs and structures, while unpaved rural roads are vulnerable to flooding and heavy rainfall. However, infrastructure can often be repaired, and targeted retrofitting can significantly reduce vulnerability.

The transport network (local roads) is moderately vulnerable, and key routes may occasionally become blocked. The scale of these hazards is limited by the small size of the community, and improvements to road drainage can mitigate the problem. The information and communication technology (ICT) sector has relatively low vulnerability, though not negligible. Extreme heat or wildfires may damage telecommunications equipment or cables, but such hazards are generally short-term, as operators can usually restore service quickly.

In summary of the sectoral analysis, water and food security represent the Achilles' heel of Akunk. At the same time, although health, energy, and infrastructure are less vulnerable, they are also exposed to significant risks. Therefore, adaptation planning must be comprehensive, strengthening the resilience of water and agricultural systems while protecting infrastructure and public services, in order to effectively reduce the community's overall vulnerability.

Table 32. Comparative Vulnerability Table

Climatic danger / Sector	Agriculture / Forestry	Water system	Energy system	Healthcare	Surrounding environment and biodiversity	Buildings and structures	ICT	Transportation	Tourism	Civil protection and emergencies	Waste	Land use planning	Education
Water scarcity													
Droughts													
Period of extreme heat/very high temperatures													
Hail													
Fires (forest, grassland)													
Strong winds / hurricanes / tornadoes													
Frost													
Severe winter / frosts													
Groundwater loss													

*Note : **0 = Green**, **1= Yellow**, **2 = Orange**, **3 = Red***

14.4.6 Vulnerable Population Groups

Climate impacts do not affect everyone equally, as certain social groups become more vulnerable due to their livelihoods, health conditions, or location. The conducted RVA enabled the identification of several such groups. Rural households, particularly low-income households, are among the most vulnerable groups. These groups depend on climate-sensitive livelihoods (crops and livestock) and often lack financial buffers, such as agricultural insurance or savings. In the event of drought or hail, they may incur financial losses, and the absence of savings or insurance further exacerbates the situation. A single adverse weather event may place a farming household in economic difficulty. Therefore, supporting these households (for example, through crop insurance programmes) is vital.

Women in the community may also experience climate stress differently. In many households, women manage water use and care for family members; therefore, in the event of water shortages or other challenges, their burden increases. Women engaged in agriculture face the same risks as men. To ensure equal resilience, it is important that adaptation measures (such as training and early warning systems) are accessible to women as well.

Elderly people and individuals with chronic illnesses are highly vulnerable to extreme heat and cold. Older persons have a reduced ability to regulate body temperature, making heat particularly dangerous, and they may also face mobility limitations. In Akunk, many elderly residents continue to work outdoors or live alone, which requires special attention to ensure their protection.

Children are also a sensitive group, as they are more prone to dehydration and heat-related illnesses. Any climate-related disruption (for example, school closures due to storms or reduced access to food and water during drought) may affect their well-being.

Finally, low-income families may also be highly vulnerable to floods, landslides, or strong winds, as they may lack the capacity to recover from damage.

Overall, Akunk's adaptation planning follows an inclusive approach, prioritising these vulnerable groups. Measures such as targeted awareness campaigns, social support during climate events, and the involvement of youth and women in community climate initiatives will help ensure that resilience-building efforts leave no one behind.

14.4.7 Akunk Adaptation Programme and Measures

Based on the above risk and vulnerability assessment, a comprehensive adaptation programme has been developed to reduce climate risks and strengthen resilience in Akunk. The proposed measures address the identified priority hazards and sectors (particularly those assessed as medium or high risk) and have been developed in accordance with the Covenant of Mayors guidelines, the principles of the JRC (2024) "Risk and Vulnerability Assessment" guidance, and the objectives of the NAP, with emphasis on integration, cost-effectiveness, and gradual capacity strengthening.

Adaptation actions cover multiple sectors, agriculture, water resources, energy, infrastructure, health and emergency preparedness, tourism, environment and biodiversity, and a timeline is defined for each action: short-term (0–5 years) for urgent and preparatory measures, medium-term (6–14 years) for consolidating improvements, and long-term (15+ years) for ensuring transformation and sustainability (Annex 4).

Agriculture and forestry are priority issues for Akunk, given the community's dependence on agriculture. Measures focus on reducing drought and heat stress by improving irrigation efficiency, rainwater harvesting, and introducing smart technologies such as drip systems, climate-resilient crops, and early warning tools. The construction of pilot smart barns and greenhouses reflects a strategic transition towards sustainable, year-round agricultural production. In the short term (0–5 years), this

is expected to reduce water losses by 20% and crop losses by 15%, with gradual improvements anticipated over the following decades.

Energy sector measures respond to increasing risks from extreme temperatures, lightning, and heavy rainfall. The programme proposes modernisation of energy infrastructure, insulation of cables, and construction of climate-resilient substations, particularly in rural areas, to reduce outage frequency and improve reliability. It is projected that reliability will reach 90% over the 15+ year horizon.

The ICT infrastructure component addresses often overlooked digital vulnerabilities. In the short term, replacing 10 km of cables with fire-resistant sheathing and installing temperature and smoke sensors aims to protect critical communication services from wildfires and heatwaves. Gradual scaling up towards full cable replacement will ensure long-term resilience.

With regard to buildings and structures, the municipality should implement a series of pilot retrofitting projects to protect vulnerable houses from hail, floods, and heatwaves. These include roof reinforcement, waterproofing, and replacement. Although the initial number of retrofitted roofs is limited to 10–20 structures, such pilot projects are important for demonstrating cost-effective resilience solutions that can later be replicated.

Water system adaptation measures aim to improve water availability and storage, addressing both droughts and floods. The installation of mobile pumping stations and a 2,000 m^3 drinking water tank will enhance both daily management and emergency response capacity. Smart meters will help reduce consumption and losses. The programme sets realistic targets, aiming to achieve a 50% improvement in drainage and access in the medium term and up to 90% improvement by 2040.

In the transport sector, the proposed measures will enhance road safety and ensure access to essential services, including medical assistance, during extreme weather conditions. Proposals related to side drainage and culvert systems are particularly relevant for erosion-prone rural areas.

Health sector measures reflect the priority of social adaptation. The introduction of telemedicine at the Abovyan Medical Centre and the establishment of cooling and green centres for vulnerable residents will help reduce heat-related health risks. These are low-cost, high-impact measures with immediate public safety benefits. Over time, they aim to ensure full accessibility of medical facilities during climate extremes.

In the field of environment and biodiversity, measures are proposed to expand green infrastructure, restore ecosystems, and reduce land degradation in order to mitigate the negative impacts of climate change. In the short term, it is proposed to plant at least 800–1,000 trees, establish protective belts, create at least one ecological buffer zone, and rehabilitate degraded land. Over time, scaling up these measures will enhance soil stability and restore natural biodiversity in the medium to long term.

In the case of tourism, which is expected to become a second source of income for the community in the coming years, particularly due to the installation of the statue on Mount Hatis, broader diversification is proposed through the creation of two eco-tourism trails. These would include visits to restored areas and tourists' participation in restoration activities. Over time, expanding such trails will increase the number of eco-tourists, particularly across several settlements of the community.

Overall, Akunk’s adaptation measures reflect a consistent, data-driven community strategy. They balance physical investments with soft measures. The multi-stakeholder approach, through cooperation between the municipality, ministries, and international partners, will ensure that the programme is realistic and scalable. The consistent implementation of these measures will not only reduce vulnerability across sectors but will also strengthen Akunk’s institutional and technical capacities to adapt to a changing climate.

Conclusions

Research evidence confirms that a significant share of GHG emissions in urban communities is a direct consequence of various economic and social activities carried out within their territories. This is largely explained by the concentration of population, industrial capacity, service providers, transport vehicles, and other energy consumers in cities. At the same time, in the context of global climate change, communities may be highly vulnerable to extreme weather events and their consequences.

Therefore, subject to sufficient political will, technical expertise, and financial capacity, local self-government bodies can make a substantial contribution to the efficient use of limited energy resources, climate change mitigation, and adaptation - both at the local and national levels. To this end, it is essential to develop a comprehensive strategy that includes:

- Annual volumes of greenhouse gas emissions resulting from energy consumption across different sectors within the community territory for a selected baseline year;
- Identification of climate risks specific to the community and its most vulnerable sectors;
- Mitigation and adaptation measures, the consistent implementation of which will reduce emissions and enhance the community's resilience to climate change.

The strategy should promote the application of energy-saving and energy-efficient technologies, the introduction of energy management systems, the large-scale deployment of renewable energy sources, the implementation of adaptation measures, and active engagement and cooperation with the local population and stakeholders.

Recognizing the importance of sustainable development, the Council of Elders of Akunk Community decided to join the EU initiative "Covenant of Mayors for Climate and Energy", aimed at supporting municipalities in Europe, the Eastern Partnership, and other regions in developing and implementing sustainable energy and climate policies. The initiative seeks to reduce dependence on fossil fuels, combat energy poverty, mitigate the negative impacts of extreme climate events, and ultimately improve living conditions.

Accordingly, the local authorities of Akunk voluntarily committed to reducing greenhouse gas emissions within the community territory by at least 35% by 2030 and strengthening resilience to climate change impacts.

This SECAP represents Akunk Community's strategic framework for energy and climate development. The Plan may be periodically revised and updated with new economically and technically justified measures implemented by local authorities, residents, and civil society organizations, financed through various budgetary or external funding sources. Revisions may also be based on monitoring results from SECAP implementation.

Climate Change Mitigation

As part of the development of the SECAP, a comprehensive analysis of energy consumption and greenhouse gas emissions was conducted for the selected baseline year. The analysis covered municipal and residential buildings, road transport, and public street lighting systems. Measures were developed to ensure at least a 35% reduction in community-wide greenhouse gas emissions by 2030.

According to the Baseline Emission Inventory (BEI), total GHG emissions in the baseline year amounted to **12,948.952 tCO_2/year**, forming the basis for calculating the community's target commitments.

Emissions are distributed across sectors as follows:

- Municipal (budgetary) institutions – 173.341 tCO_2/year
- Residential sector – 7,351.344 tCO_2/year

- Road transport – 5,105.196 tCO_2/year
- Street lighting – 35.431 tCO_2/year

Within the SECAP preparation process, the impact of the municipal solid waste sector on total GHG emissions was also assessed, particularly considering methane emission potential. The analysis confirmed that this subsector represents a source of methane emissions and was therefore included in the overall inventory calculations.

By 2030, Akunk Community has committed to reducing greenhouse gas emissions by at least 35% compared to the baseline year, corresponding to **4,532.1 tCO_2/year**. To achieve this target, the Plan includes both low-cost ("soft") and investment-intensive ("hard") measures, whose comprehensive and consistent implementation will ensure the targets are met.

The SECAP places particular emphasis on improving energy efficiency, promoting energy savings, and expanding local energy production from renewable sources. According to projections, renewable energy deployment will contribute a significant share of total emission reductions.

Solar energy is identified as the community's primary renewable energy source, given the community's favorable natural conditions and technical feasibility. At the same time, diversifying the energy mix with other renewable sources may be considered, subject to appropriate technical and economic justification.

The total investment required for implementing mitigation measures under the SECAP is estimated at approximately 2.160 billion AMD.

Climate Change Adaptation

Recognizing the long-term impacts of climate change and the importance of sustainable development strategies, the Akunk Community joined the European Union's "Covenant of Mayors for Climate and Energy" initiative to develop and implement an integrated energy and climate policy that addresses both mitigation and adaptation.

The SECAP defines medium-term strategic actions to reduce emissions and strengthen adaptive capacity. The Plan is designed to be periodically reviewed and updated to reflect technological developments, new financing opportunities, and evolving local needs.

Climate-related hazards such as hailstorms, spring frosts, droughts, heatwaves, and wildfires are already significantly affecting Akunk. Water scarcity and land degradation threaten agricultural production, while infrastructure vulnerability increases overall community risk.

Based on vulnerability assessment and risk prioritization, 39 adaptation measures have been proposed across the following sectors:

- Agriculture – 17 measures
- Energy – 5
- ICT – 1
- Buildings and infrastructure – 5
- Water systems – 2
- Transport – 2
- Health – 3
- Environment and biodiversity – 3
- Tourism – 1

The prioritization and investment requirements for these measures should be further clarified by the municipality through technical and financial analyses, as well as through participatory engagement with residents and stakeholders.

ANNEX 2. Current climate risks for the community[30]

	Change in frequency since 2010	Change in intensity since 2010	Current risk		Expected impacts					
			Probability of occurrence	Expected impacts	Expected change in intensity (0–5 years)	Expected change in intensity (6–14 years)	Expected change in intensity (15+ years)	Expected change in frequency (0–5 years)	Expected change in frequency (6–14 years)	Expected change in frequency (15+ years)
Extremely hot/very high temperature period (several days, weeks)	remained unchanged	remained unchanged	moderate, likely	average	will decrease	will remain unchanged	will remain unchanged	will decrease	will remain unchanged	will remain unchanged
Droughts	remained unchanged	remained unchanged	moderate, likely	average	will decrease	will remain unchanged	will remain unchanged	will decrease	will remain unchanged	will remain unchanged
Hail	has increased	has increased	moderate, likely	high	will increase	will increase	will increase	will increase	will increase	will increase
Fires (forest, grassland)	has increased	has increased	highly likely	high	will increase	will increase	will increase	will increase	will increase	will increase
Strong winds/hurricanes/tornadoes	decreased	decreased	low, unlikely	low	will decrease	will decrease	will decrease	will decrease	will decrease	will decrease
Frostbite	remained unchanged	remained unchanged	moderate, likely	average	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged
Severe winter/frost	decreased	decreased	low, unlikely	low	will decrease	will decrease	will decrease	will decrease	will decrease	will decrease
Water scarcity	remained unchanged	remained unchanged	moderate, likely	average	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged
Groundwater loss	remained unchanged	remained unchanged	moderate, likely	average	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged	will remain unchanged

[30] ***Note:*** *For impacts, a* ***low*** *level may be associated with consequences leading to minor or insignificant changes in daily life. A* ***medium*** *level may be associated with adverse impacts causing noticeable disruption to daily life, with limited cascading effects. A* ***high*** *level may be associated with severe impacts leading to major disruption of daily life, irreversible changes, and cascading effects.*

ANNEX 3. Potential vulnerability of key sectors in the Akunk community to selected climate hazards and vulnerable groups

Water scarcity					
Vulnerability Sector	**Yes / No**	**Impact**	**Impact Level (1–3)**	**Vulnerable Group**	**Yes / No**
Agriculture / Forestry	yes	Yield decline due to irregular irrigation schedules, which can cause financial losses	1		
	yes	Reduction of surface water due to some reduction in groundwater reserves, which affects the availability of irrigation water	3		
	yes	Food security issue in the community	2		
	yes	Disruption of regular irrigation water supply	3		
Water system	yes	Risk of irregular water supply schedules for the population	2		
Healthcare	yes	Risk of maintaining sanitary and hygienic conditions	1		
Environment and biodiversity	yes	Risk of increased soil erosion, which will further impact the environment and biodiversity, as well as agriculture	2		
Tourism	yes	The risk of inadequate provision of tourism services, resulting in the community losing its appeal as a tourist destination, which may lead to a reduction in the number of tourists	2		
Land use planning	yes	The issue of maintaining green/landscaped areas	2		
Hail					
Vulnerability area	**Yes/No**	**Impact**	**Impact level (1-3)**	**Vulnerable group**	**Yes/No**
Agriculture/ forestry	yes	Crop loss, which causes financial losses, especially if the crop is not insured and the effectiveness of the anti-hail system is low	3	Women and girls	Yes
	yes	Food security problem in the community	2	Children	Yes
	yes	Damage to trees and shrubs, which affects the future income level of rural households if they contract various diseases due to the damage	3	Elderly	Yes

	yes	Yield decline	3	Low-income households	yes
	yes	Damage to greenhouses	2		
	yes	Reducing the demand for labor in the community	2		
Energy system	yes	Damage to power lines/wires, disruption of stations/substations	1		
	yes	Disruption of regular electricity supply	1		
Period of very high temperatures/extreme heat					
Vulnerability area	**Yes/No**	**Impact**	**Impact level (1-3)**	**Vulnerable group**	**Yes/No**
Healthcare	yes	Increase in diseases, including cardiovascular and respiratory complications, as well as kidney disease	1	Children	yes
	yes	Deterioration of air quality due to increased production of ground-level ozone, which can damage the respiratory system and is particularly dangerous for people with asthma, which is also due to the increased use of air conditioners, resulting in increased emissions.	2	Elderly	yes
	yes	Limited capacity to receive patients at a medical facility within 30 minutes	2	People with disabilities	yes
	yes	Negative effects of increased temperature and ultraviolet radiation	2	People with chronic diseases	yes
	yes	Risk of heat rash, heat cramps, or heat stroke in humans	2	Low-income households	yes
Agriculture / Forestry	yes	High daytime temperatures negatively affect plant growth	3	Unemployed people	yes
	yes	Heatwaves also increase the likelihood of heat stress in livestock, and in cattle, stress can reduce milk production, lead to slower growth, and reduce the frequency of conception.	1	People working outdoors	yes
	yes	The heat wave period may increase the risk of drought and fires, which could have a negative impact on agriculture.	3	Rural households	yes
Energy system	yes	Increased demand for electricity, which at the same time can reduce the ability of power transmission lines to transmit electricity, leading to problems with the reliability of power supply and, in particular, outages.	2		
Water system	yes	The risk of an irregular water supply schedule for the population, due to the increased demand for drinking water, as well as the fact that irrigation is carried out with drinking water	3		

Tourism	yes	The community may lose its attractiveness as a tourist destination and may lead to a reduction in the number of tourists.	3		
Frostbite					
Vulnerability area	**Yes/No**	**Impact**	**Impact level (1-3)**	**Vulnerable group**	**Yes/No**
Agriculture / Forestry	yes	Damage to flowering trees and new shoots, as well as loss of newly hatched cocoons, damage or destruction of agricultural crops, which can lead to loss of income if the crop is not insured	2	Women and girls	yes
	yes	Increase in fuel consumption in greenhouse farms	3	People working outdoors	yes
	yes	Growth in pastures is delayed, resulting in a problem with animal feed, which could lead to a decline in livestock production.	2	Rural households	yes
	yes	Food security issue in the community	1		
	yes	Yield decline	2		
	yes	Reduction in food processing industry purchases	2		
Fires (grassland, forest)					
Vulnerability area	**Yes/No**	**Impact**	**Impact level (1-3)**	**Vulnerable group**	**Yes/No**
Environment and biodiversity	yes	Fires release greenhouse gases and particulate matter (significant amounts) into the atmosphere.	3	Women and girls	yes
	yes	Destruction of vegetation, threat of biodiversity loss	3	Children	yes
	yes	Increased sedimentation in water bodies/resources and deterioration of water quality due to pollutants in water sources	3	Elderly	yes
	yes	Soil pH changes, affecting its chemical and biological properties.	3	Marginal groups (homeless people, etc.)	yes
	yes	Fires can lead to an aggravation of soil erosion problems, and changes in nutrient content are also recorded.	3	People with disabilities	yes
Agriculture / Forestry	yes	Decreased soil fertility, which negatively affects new crops	3	Low-income households	yes
	yes	Decline in beekeeping volumes	3	People with poor housing conditions	yes
	yes	Livestock feed problem due to burned pastures	3	People working outdoors	yes
	yes	Crop loss	3	Displaced persons/migrants	yes
	yes	Food security issue and risk of price increases	3	Rural households	yes
	yes	Yield decline	3		
	yes	Decline in livestock production	3		
Energy system	yes	Power lines may be damaged, substations may malfunction.	3		
ICT	yes	There may be a power outage/disconnection in the community.	3		

	yes	Exiting the station line		
Buildings and structures	yes	Damage to cables, resulting in disruption of connectivity and internet coverage	2	
Transportation	yes	Damage to residential buildings and homes, resulting in financial losses if the property is not insured	3	
	yes	Roads are limited or closed	1	
Tourism	yes	The community may lose its attractiveness as a tourist destination and may lead to a reduction in the number of tourists.	2	
Healthcare	yes	Increase in respiratory diseases due to smoke, impact of microparticles on health	2	
	yes	Increase in psychological problems	2	
	yes	Overcrowding of medical facilities	3	
	yes	Limited capacity to receive patients at a medical facility within 30 minutes	2	
Civil protection and emergencies	yes	Risk of population evacuation	2	
	yes	Limited ability to respond quickly due to water scarcity		

Droughts

Vulnerability area	Yes/No	Impact	Impact level (1-3)	Vulnerable group	Yes/No
Agriculture / Forestry	yes	Crop loss and tree drying due to irregular irrigation schedules, which causes financial losses, which may require tree felling, etc.	3	Women and girls	Yes
	yes	Loss of pastures, which may cause a decline in livestock production	3	Children	Yes
	yes	Disruption of regular irrigation water supply	3	Elderly	Yes
	yes	Food security issue and risk of price increases	3	Marginal groups (homeless people, etc.)	Yes
	yes	Yield decline	3	People with disabilities	Yes
	yes	Decline in livestock production	3	Low-income households	Yes
	yes	Reduced food processing industry supplies, leading to price increases	3	People with poor housing conditions	Yes
	yes	Reducing demand for labor	1	People working outdoors	Yes
	yes	Reduction in surface and groundwater resources, which affects the availability of irrigation water	3	Rural households	Yes
	yes	Drought, combined with high temperatures, can lead to increased pest and disease outbreaks that affect crops, forage, and livestock.	3		
	yes	Drought can lead to land degradation and desertification	3		
	yes	Fire hazard	3		
	yes	Decline in beekeeping volumes	3		

Healthcare	yes	Risk of maintaining sanitary and hygienic conditions	3		
	yes	Mental health problems, especially among rural households			
	yes	Health problems (dehydration, skin diseases)			
Tourism	yes	For a certain period of time, the community may lose its attractiveness as a tourist destination due to the damage caused by the climate disaster.	3		
Water system	yes	Irregular water supply schedule for the population may be due to increasing demand	3		
	yes	Irregular schedule of water supply to the population, which may be due to the purpose of irrigation with drinking water			
	yes	Insufficient water for cooling, leading to the spread of industrial dust			
	yes	Inadequate quality water supply due to increased demand, as well as increased strain on the drainage system			
Environment and biodiversity	yes	More water use, leading to water scarcity	3		
	yes	Loss of soil fertility, which may later lead to desertification			
	yes	Disruption of the ecosystem, as plants, animals, and microorganisms that feed on healthy soil cannot be provided with adequate nutrition			
	yes	Disruption of climate cycles, changing landscapes			
	yes	The negative impact of pests on vegetation			
Land use planning	yes	Threat to the preservation of green/landscaped areas	3		
Strong winds/hurricanes/tornadoes					
Vulnerability area	**Yes/No**	**Impact**	**Impact level (1-3)**	**Vulnerable group**	**Yes/No**
Agriculture / Forestry	yes	Crop failure, which causes financial losses, especially if the crop is not insured	3	Women and girls	Yes
	yes	Damage to seedlings, breakage of trees, which requires financial costs to replant them, restore orchards if the crop is not insured and this may take several years		Children	Yes
	yes	Damage and financial losses to livestock barns and food storage structures if they are not insured		Elderly	Yes
	yes	Food security issue in the community		Marginal groups (homeless people, etc.)	Yes
	yes	Yield decline		People with disabilities	Yes
	yes	Reduced food processing industry supplies, leading to price increases		People with chronic diseases	Yes
	yes	Reducing demand for labor		Low-income households	Yes
	yes	Damage to greenhouses resulting in material loss if not insured		People with poor housing conditions	Yes
Energy system	yes	Damage to power lines/wires, disruption of stations/substations	3	Unemployed people	Yes
	yes	Disruption of regular electricity supply		People working outdoors	Yes

Buildings and structures	yes	Damage to residential buildings, house roofs, windows, etc., which leads to financial losses if the property is not insured	3	Displaced persons/migrants	Yes
	yes	Damage to private buildings, roofs, and windows, etc.		Rural households	yes
	yes	Damage to roofs of buildings and structures under the jurisdiction of the state sector, etc.			
Education	yes	Damage to the roofs of preschool and educational institutions, etc., which may disrupt the regular teaching process	3		
ICT	yes	Exiting the station line	3		
	yes	Damage to cables, resulting in disruption of connectivity and internet coverage			
Healthcare	yes	Disruption of the normal operation of medical facilities due to damaged roofs, windows, etc.	3		
	yes	Injuries to a person that could result in death			
	yes	The emergence of psychological problems in people			
	yes	Increase in respiratory, skin diseases and eye problems			
Transportation	yes	Damage to means of transport	3		
	yes	Damage to infrastructure in the form of damaged asphalt, impassable roads due to fallen trees, power poles			
Tourism	yes	For a certain period of time, the community may lose its attractiveness as a tourist destination due to the damage caused by the climate disaster and may lead to a reduction in the number of tourists.	3		
Environment and biodiversity	yes	Forest damage, tree felling	3		
	yes	Ecosystem disruption			
	yes	Changing natural landscapes			
	yes	The spread of industrial dust throughout various settlements in the community, which pollutes the air and water, as well as settles on the soil, plants, and trees.			
Waste	yes	Spread of gas/unpleasant odors from household waste from landfills throughout the community's settlements.	3		
Severe winter/frost					
Vulnerability area	**Yes/No**	**Impact**	**Impact level (1-3)**	**Vulnerable group**	**Yes/No**
Agriculture / Forestry	yes	Increase in fuel consumption in greenhouse farms	3	Women and girls	Yes
Energy system	yes	A sudden increase in demand for temporary heating, if the frosts are prolonged and the heating is provided by electricity, can cause strain on the power distribution network.	3	Children	Yes
	yes	Increased gas consumption levels, which are an additional expense for households		Elderly	Yes
	yes	Power outages due to snow or ice		Marginal groups (homeless people, etc.)	Yes
Healthcare	yes	Increased incidence of hypothermia, cardiovascular disease, flu/respiratory illnesses, etc., which could overburden medical facilities	3	People with disabilities	Yes

	yes	Increase in fractures if roads are not cleaned properly		People with chronic diseases	Yes
	yes	Increase in accidents that result in human casualties if roads are not well cleaned		Low-income households	Yes
Transportation	yes	Impassable roads, increase in accidents	3		
	yes	Rapid wear and tear of transportation infrastructure if salt is applied frequently and in large quantities	2		
Environment and biodiversity	yes	Loss of wildlife	1		
	yes	Biodiversity decline			
Groundwater loss					
Vulnerability area	**Yes/No**	**Impact**	**Impact level (1-3)**	**Vulnerable group**	**Yes/No**
Agriculture / Forestry	yes	Crop loss and tree drying due to irregular irrigation schedules, which causes financial losses	3	Women and girls	yes
	yes	Loss of pastures		Children	yes
	yes	Disruption of regular irrigation water supply		Elderly	yes
	yes	Food security issue in the community		People with disabilities	yes
	yes	Yield decline		Low-income households	yes
	yes	Reduction in livestock production		People with poor housing conditions	yes
	yes	Reduction in food processing industry purchases		Unemployed people	yes
	yes	Reducing demand for labor		Rural households	yes
	yes	Risk of soil degradation			
Water system	yes	Irregular schedule of water supply to the population	2		
	yes	Poor quality water supply			
Healthcare	yes	Increase in diseases caused by poor water quality	2		
	yes	Biodiversity decline			
Environment and biodiversity	yes	Drying of rivers/lakes	3		
Land use planning	yes	Threat to the preservation of green/landscaped areas	3		
Tourism	yes	The community may lose its attractiveness as a tourist destination, which may lead to a reduction in the number of tourists.	3		

ANNEX 4. Adaptation measures in the Akunk community

Vulnerable sector	Adaptation measures	Timeframe	Responsible entities	Financing	Expected outcomes
Agriculture/Forestry					
Drought, hail, frost, heat waves, erosion, winds, fires	-Restore/reconstruct/rehabilitate 15 km of irrigation canals - Construct 2 rainwater harvesting basins - Install 1 high-efficiency eco-sustainable anti-hail station with protective coverage - Support the provision of 75 drip irrigation systems and provide training to 75 farming households - Support the provision of 100 hail-protection and sun-protection systems to farming households - Support 75 farming households in obtaining agricultural insurance and organise awareness-raising activities - Support the transition to 3 drought-resistant and frost-resistant crop varieties through the provision of seeds - Support 100 farming households in implementing crop rotation and mulching to preserve soil moisture, including training - Develop a community application for early warning to inform households about hazards - Support the construction of 1 new smart livestock barn in the community - Support the construction of 1 new smart greenhouse in the community - Establish 10–15 km of field-protective forest shelterbelts - Introduce a pasture management system - Restore perennial plantations over an area exceeding 10 hectares (perennial cover restoration) - Support the provision of 100 frost-protection covers to farming households - Support the provision of 100 wind-protection covers to the most vulnerable farming households - Establish 1 firebreak zone across vulnerable areas	• **0–5 years:** Restore 15 km of irrigation canals, construct 2 basins, and install 1 eco-sustainable anti-hail station; develop a community application. Construct 1 smart livestock barn. Construct 1 smart greenhouse. Establish 10–15 km of field-protective forest shelterbelts. Introduce a pasture management system. Restore perennial plantations over an area exceeding 10 hectares. Establish 1 firebreak zone. Provide appropriate protective nets/structures/systems to households. • **6–14 years:** Expand irrigation coverage by 40%. Expand the coverage of efficient anti-hail systems by 40%. Increase field-protective forest shelterbelts by 40%. Alternative livestock grazing (rotational grazing) to reach approximately 35–45%. Restore perennial plantations by 25–40%. Increase frost-, hail-, and wind-protected areas by 50%. Establish firebreak zones covering 25–30% of vulnerable areas. Increase wind-protected areas by 40%. • **15+ years:** Fully transition to a smart irrigation network. Fully transition to eco-sustainable anti-hail stations. Increase field-protective forest shelterbelts by 60%. Alternative livestock grazing	Akunk Municipality Ministry of Territorial Administration and Infrastructure of the Republic of Armenia Ministry of Economy of the Republic of Armenia Farming households	Akunk Municipality EU Mission Adaptation (P2R) IFAD World Bank / GEF RA State Budget / Subvention Programmes GIZ / KfW Water Committee of the Republic of Armenia Ministry of Economy of the Republic of Armenia	• **0–5 years:** Water loss reduction by 20%. Crop loss reduction by 15%. Increase in insurance coverage by 15%. Public awareness level reaching 90%. Share of smart livestock barns in the community reaching 10%. Share of smart greenhouses in the community reaching 10%. Increase in crop productivity by 15–20%. Improvement in pasture management efficiency by 15–20%. • **6–14 years:** Water loss reduction by 40%. Crop loss reduction by 40%. Increase in insurance coverage by 35%. Share of smart livestock barns in the community reaching 40%. Share of smart greenhouses in the community reaching 40%. Increase in crop productivity by 35–40%. Improvement in pasture management efficiency by 50%. • **15+ years:** Water loss reduction by 90%. Crop loss reduction by

		(rotational grazing) to reach approximately 60–80%. Restore perennial plantations by 70%. Increase frost-, hail-, and wind-protected areas by 90%. Establish firebreak zones covering 50–60% of vulnerable areas.			90%. Increase in insurance coverage by 90%. Share of smart livestock barns in the community reaching 80%. Share of smart greenhouses in the community reaching 70%. Increase in crop productivity by 60–80%. Improvement in pasture management efficiency by 80%.
Energy					
Heat waves/ Very high temperature/extreme heat, drought, heavy rainfall, lightning	• 2 substations protected against climate impacts, ensuring electricity supply to residential buildings and houses and their grid connection • Construction/waterproofing of 3 substations and 7 transformer cabins • Conversion of 15 km of low-voltage lines into insulated cables • Installation of surge protection devices on lines supplying households, as well as improvement of grounding systems in substations and transformer cabins in 2 rural settlements • Replacement of 15 km of overhead lines supplying residential areas with anti-icing conductors, reinforcement of poles, and installation of insulated electricity transmission lines for residential buildings	**• 0–5 years:** 2 substations protected against climate impacts. Construction/waterproofing of 3 substations and 7 transformer cabins. Installation of surge protection devices and improvement of grounding systems in substations and transformer cabins in 2 rural settlements. 15 km of overhead lines with anti-icing conductors and installation of insulated electricity transmission lines to buildings and houses. Conversion of 15 km of low-voltage lines into insulated cables. **• 6–14 years:** Increase in the number of climate impact-protected substations by 25%. Increase in insulated cable coverage by 20%. **• 15+ years:** Increase in the number of climate impact-protected substations by 70%. Increase in insulated cable coverage by 70%.	Akunk Municipality Electric Networks of Armenia (ENA) High-Voltage Electric Networks (HVEN) Ministry of Territorial Administration and Infrastructure of the Republic of Armenia Ministry of Environment of the Republic of Armenia Public Services Regulatory Commission (PSRC)	World Bank / GEF RA State Budget / Subvention Programme Asian Development Bank (ADB) European Investment Bank (EIB)	**• 0–5 years:** Reduction in overload and number of outages by 15%. Increase in reliability in rural areas by 35%. **• 6–14 years:** Reduction in overload and number of outages by 40%. Increase in reliability in rural areas by 70%. **• 15+ years:** Reduction in overload and number of outages by 80%. Increase in reliability in rural areas by 90%.

ICT					
Grassland and forest fires; Heatwaves / Very high temperatures / Extreme heat; Drought; Floods	Replace 15 km of cables with fire-resistant cable sheathing and install temperature and smoke sensors	0–5 years: 15 km of fire-resistant cables and sensors installed 6–14 years: Replacement of up to 40% of required cables in the community 15+ years: Full replacement of cables	Akunk Municipality; Ministry of High-Tech Industry of the Republic of Armenia; Public Services Regulatory Commission (PSRC); Telecom Armenia OJSC; Viva Armenia CJSC; Ucom CJSC and other companies	Telecom Armenia OJSC; Viva Armenia CJSC; Ucom CJSC and other companies; Ministry of High-Tech Industry of the RA; RA State Budget / Subvention programmes	0–5 years: 20% reduction in internet service disruptions 6–14 years: 60% reduction in internet service disruptions 15+ years: 90% reduction in internet service disruptions
Buildings and structures					
Heavy rainfall causing floods/flash floods; strong winds/storms/tornadoes; hail; heatwaves/very high temperatures/extreme heat; heavy snowfall	• Pilot installation of wind-resistant anchoring systems and storm ties on roofs of 10 residential buildings/houses identified by the municipality as most vulnerable, designed to withstand wind gusts exceeding 100 km/h and reduce roof damage risk. • Pilot flood protection for 20 residential buildings/houses identified as most vulnerable, including installation of backwater valves and foundation waterproofing. • Pilot replacement of roofs of 5 vulnerable residential buildings/houses with hail-resistant tiles. • Pilot introduction of cool-roof coating and wall thermal insulation for 10 multi-apartment buildings/houses. • Reinforcement of roofs of 7 houses/multi-apartment buildings with appropriate load strengthening and installation of heated gutter systems to reduce roof damage.	**0–5 years:** • 10 reinforced residential roofs • 10 flood-protected residential buildings/houses • 5 hail-resistant roofs • 10 buildings/houses with insulated walls and cool-roof coating • 7 roofs reinforced with load strengthening and heated drainage systems **6–14 years:** • 50% increase in roof reliability • 30% increase in flood-protected buildings/houses • 35% increase in buildings/houses with thermal roofs and insulated walls **15+ years:** • 90% increase in roof reliability • 80% increase in flood-protected buildings/houses • 90% increase in buildings/houses with thermal roofs and insulated walls	Municipality; Private sector	Municipality; Public–private partnership; EU Resilience Fund; RA State Budget / Subvention programmes; ADB resilience bonds; WB Urban Climate Fund	**0–5 years:** • 15% reduction in roof damage cases • 10% reduction in flood-related damage cases **6–14 years:**• 50% reduction in roof damage cases • 60% reduction in flood-related damage cases **15+ years:** • 90% reduction in roof damage cases • 90% reduction in flood-related damage cases
Water system					
Floods; Drought; Heatwaves	• Install 2 mobile pumping units (≥300 L/sec each), pre-connected with rapid-connection manholes at 2 highest-risk nodes, ensuring response time from alarm signal does not exceed 60 minutes. • Install a 2,000 m³ drinking water storage tank and smart pressure meters in 2 high-pressure zones to reduce water losses and ensure 48-hour emergency water supply in case of accidents or extreme events.	**0–5 years:** • 2 pump units installed • 2,000 m³ drinking water tank installed **6–14 years:** • 50% increase in drainage efficiency • 50% increase in water availability **15+ years:** • 90% increase in drainage efficiency • 90% increase in water availability	Municipality; Ministry of Territorial Administration and Infrastructure of the Republic of Armenia	Municipality; RA State Budget / Subvention programmes; World Bank (WB); Asian Development Bank (ADB); European Investment Bank (EIB)	**0–5 years:** • ≥20% increase in water drainage speed **6–14 years:** • ≥50% increase in water drainage speed • 50% improvement in uninterrupted 48-hour water supply reliability **15+ years:** • ≥90% increase in water drainage speed • 90% improvement in uninterrupted 48-hour water supply reliability

Transportation					
Floods / Heavy rainfall; Erosion; Soil degradation	• Reconstruct 4–5 km of flood-prone roads in Akunk by adding side drainage ditches, culverts, and flood discharge systems, reducing flood-related road closures by more than 50%. • Construct 2 alternative routes connecting the Akunk healthcare facility with 2 major settlements.	**0–5 years:** • 4–5 km of flood-prone roads rehabilitated • 2 alternative routes constructed **6–14 years:** • 2 alternative routes constructed • 50% reduction in climate hazard–induced impassable roads **15+ years:** • 90% reduction in climate hazard–induced impassable roads • >90% reduction in recurrence probability of potholes	Municipality; Ministry of Territorial Administration and Infrastructure of the Republic of Armenia	Municipality; RA State Budget / Subvention programmes; Asian Development Bank (ADB); World Bank / Green Climate Fund (WB/GCF); European Investment Bank (EIB)	**0–5 years:** • 10% increase in passable roads during climate disasters **6–14 years:** • 40% increase in passable roads during climate disasters **15+ years:** • 90% increase in passable roads during climate disasters
Healthcare					
Very high temperatures / Extreme heat and other climate hazards	• Use telemedicine between Abovyan Medical Center and local outpatient clinics to provide appropriate treatment to individuals seeking care due to climate-related hazards. • Establish 2 community cooling centers by equipping designated areas within local cultural centers as shelters for people vulnerable to climate-related health conditions (heat stroke, etc.). • Pilot creation of 2 green cooling centers to provide shade and cooling during hot weather.	**0–5 years:** • Introduction of telemedicine at Akunk Medical Center • 2 cooling centers established in settlement cultural centers • Creation of 2 green centers **6–14 years:** • 100% increase in coverage of healthcare services provided by rural medical institutions • 50% increase in coping capacity among people with heat-related chronic diseases **15+ years:** • 80% increase in coping capacity among people with heat-related chronic diseases	Municipality	Municipality; RA State Budget / Subvention programmes	**0–5 years:** • 40% increase in effectiveness of medical assistance provided to patients visiting outpatient clinics during climate disasters • 30% increase in cooling/shelter availability **6–14 years:** • 100% increase in effectiveness of medical assistance during climate disasters • 80% increase in cooling/shelter availability **15+ years:** • 100% increase in cooling/shelter availability
Environment and biodiversity					
Erosion; Heat; Fires; Drought	• Expansion of green infrastructure by planting at least 800–1,000 trees and creating 2–3 km of corridors/protective shelterbelts. • Restore at least 5 ha of fire-affected or high-risk areas and establish at least 1 ecological buffer zone. • Restore more than 10 ha of erosion-prone land to combat soil erosion.	**0–5 years:** • 800–1,000 trees planted • 2–3 km of corridors/protective shelterbelts created • 5 ha of fire-affected land restored • 1 ecological buffer zone established **6–14 years:** • 40–60% expansion of green infrastructure and buffer zones and reduction of degraded land **15+ years:** • 80% expansion of green infrastructure and buffer zones and reduction of degraded land	Municipality; Ministry of Environment of the Republic of Armenia	Municipality; Ministry of Environment of the RA; Ministry of Economy of the RA; RA Government / Subvention programmes; FAO/IFAD; World Bank (WB)/Asian Development Bank (ADB); KfW	**0–5 years:** • 30–40% increase in green infrastructure • 30% ecosystem restoration **6–14 years:** • 60–70% increase in green infrastructure • 50–60% ecosystem restoration • 30% reduction in land degradation **15+ years:** • 80–85% increase in green infrastructure • 75–85% ecosystem restoration
Tourism					

Drought; Environment and biodiversity; Soil degradation	Creation of two ecotourism trails, including visits to restored areas and participation of tourists in restoration activities	**0–5 years:** • 2 ecotourism trails established **6–14 years:** • 40–60% increase in number of ecotourism trails, including elements of adventure tourism and expansion to several settlements **15+ years:** • 80% increase in number of ecotourism trails, including additional types of tourism and further expansion to several settlements	Municipality; Ministry of Economy of the Republic of Armenia; Tour operators / tourism companies	Municipality; Ministry of Economy of the RA; RA Government / Subvention programmes; World Bank (WB) / Asian Development Bank (ADB); KfW	**0–5 years:** • 15–20% increase in number of tourists whose primary purpose of visit is ecotourism, alongside increased visitor flows related to the statue installed on Mount Hatis **6–14 years:** • 40–60% increase in number of tourists whose primary purpose of visit is ecotourism **15+ years:** • 80–90% increase in number of tourists whose primary purpose of visit is ecotourism

ANNEX 5. Decision No. 10-L of the Council of Elders of the Akunk Community, dated 16 February 2026, on the Approval of the Sustainable Energy and Climate Action Plan (SECAP) of the Akunk Community.

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ
ԱԿՈՒՆՔ ՀԱՄԱՅՆՔԻ ԱՎԱԳԱՆԻ

Հայաստանի Հանրապետության Կոտայքի մարզի Ակունք համայնք
ՀՀ, Կոտայքի մարզ, գ. Ակունք, Կենտրոնական խճուղի 72, akunq.kotayq@mta.gov.am

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16 ՓԵՏՐՎԱՐԻ 2026թվականի N 10-Լ

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ ԱԿՈՒՆՔ ՀԱՄԱՅՆՔԻ «ԿԱՅՈՒՆ ԷՆԵՐԳԵՏԻԿ ԵՎ ԿԼԻՄԱՅԱԿԱՆ ԳՈՐԾՈՂՈՒԹՅՈՒՆՆԵՐԻ ԾՐԱԳԻՐ»-Ը ՀԱՍՏԱՏԵԼՈՒ ՄԱՍԻՆ

Ղեկավարվելով «Տեղական ինքնակառավարման մասին» օրենքի 18-րդ հոդվածի 1-ին մասի 4-րդ կետով,Ակունք համայնքի ավագանին որոշում է.

1.Հաստատել՝Հայաստանի Հանրապետության Կոտայքի մարզի Ակունք համայնքի«Կայուն էներգետիկ և կլիմայի գործողությունների ծրագիր»-ը՝ համաձայն հավելվածի:
2.Սույն որոշումն ուժի մեջ է մտնում հրապարակմանը հաջորդող օրվանից:

Համայնքի ավագանու նադամներ

Կողմ -8 Դեմ -0 Ձեռնպահ -0
ՌՈՒԲԵՆՅԱՆ ՀՈՒՆԱՆ
ՄԻՔԱՅԵԼՅԱՆ ԱՐՄԱՆ
ՀԱՐՈՒԹՅՈՒՆՅԱՆ ԳՈՀԱՐ
ՄԱՐՏԻՐՈՍՅԱՆ ԱՐԱՔՍԻ
ԱՎԵՏԻՍՅԱՆ ՄԱՐՋԱՆԻԿ
ՄԿՐՏՉՅԱՆ ԳԱՐԻԿ
ՍԵԴՐԱԿՅԱՆ ՀԱՐՈՒԹՅՈՒՆ
ԳՐԻԳՈՐՅԱՆ ՍԱՄՎԵԼ

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ **Հ. ՌՈՒԲԵՆՅԱՆ**