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SUSTAINABLE ENERGY AND CLIMATE ACTION PLAN OF THE TALIN COMMUNITY, ARAGATSOTN MARZ

TALIN 2026

This document was prepared by experts of the "Nexus Intellect Research" NGO and "Sky Net" LLC within the framework of the "Decarbonisation and Climate Resilience in the Eastern Partnership Countries" (EU4ClimateResilience) regional programme, 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 (BMUKN), and jointly implemented by the German Agency for International Cooperation (GIZ) and the Organisation for Economic Co-operation and Development (OECD).

Annex 1. Decision No. 52-A of the Council of Elders of the Talin Community, dated 28 April 2023, on granting consent to join the Covenant of Mayors for Climate and Energy initiative

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<< 28>> ապրիլի 2023 թվական N 52-Ա

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Ղեկավարվելով «Տեղական ինքնակառավարման մասին» օրենքի 18-րդ հոդվածի 1-ին մասի 42-րդ կետով, հիմք ընդունելով «Քաղաքապետերի դաշնագիր հանուն կլիմայի և էներգիայի» նախաձեռնությանը (այսուհետ՝ նախաձեռնություն) միանալու մասին հայտարարությունը և առաջնորդվելով Եվրոպական միության կողմից իրականացվող նախաձեռնության դրույթներով՝

Թալին համայնքի ավագանին որոշում է՝

1.Տալ համաձայնություն Հայաստանի Հանրապետության Արագածոտն մարզի Թալին համայնքին միանալու Եվրոպական միության կողմից իրականացվող նախաձեռնությանը:

2. Հայաստանի Հանրապետության Արագածոտն մարզի Թալին համայնքի ղեկավարին՝

1)Մինչև 2023թ. մայիսի 11-ը նշանակել Հայաստանի Հանրապետության Արագածոտն մարզի Թալին համայնքի կայուն էներգետիկ զարգացման և կլիմայի պահպանության գործողությունների ծրագրի մշակման պատասխանատու (այսուհետ՝ պատասխանատու)՝ էներգետիկ կառավարիչ,

2)Հանձնարարել պատասխանատուին՝ երկու տարվա ընթացքում Եվրոպական հանձնաժողովի «Քաղաքապետերի դաշնագիր՝ Արևելք» տարածաշրջանային ծրագրի և այլ գործընկերների աջակցությամբ, Դաշնագրի շրջանակներում մշակել Հայաստանի Հանրապետության Արագածոտն մարզի Թալին համայնքի կայուն էներգետիկ զարգացման և կլիմայի պահպանության գործողությունների ծրագիրը (Sustainable Energy and Climate Action Plan), ինչպես նաև համայնքի կլիմայի փոփոխության հանդեպ դիմակայունության բարձրացմանն ուղղված գործողությունները և միջոցառումները:

3.Սույն որոշումն ուժի մեջ է մտնում պաշտոնական հրապարակմանը հաջորդող օրվանից:

Կողմ-17	Դեմ-0	Ձեռնպահ-3
1.Բաբկեն Պողոսյան		1.Կարեն Գրիգորյան
2.Արման Կարապետյան		2.Վահե Եղիազարյան
3.Սարգիս Գրիգորյան		3.Գևորգ Սահակյան

4.Սնակ   Սիմոնյան

5.Գեղամ Ղազարյան

6.Սերգե Մկրտչյան

7.Միեր Մարգարյան

8.Ավետիս Մինասյան

9.Հարություն Կարապետյան

10.Էմին Մկրտչյան

11.Արմեն Ծառուկյան

12.Նելլի Մարգարյան

13.Գեղամ Սարգսյան

14.Նարեկ Գրիգորյան

15.Սարգիս Մուրադյան

16.Ղուկաս Հակոբյան

17.Ալբերտ Հարոյան

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝ Տ.ՍԱՓԵՅԱՆ

ք.Թալին
28 ապրիլի 2023թ.

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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	Municipal Non-Commercial Organisation
UNDP	United Nations Development Programme
UN	United Nations
YCC	Youth Creative Centre
PEI	Pre-school Educational Institution
SB	State Budget (including subvention programmes)
SNCO	State Non-Commercial Organisation
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

Introduction

The Covenant of Mayors for Climate and Energy is a broad, community-driven initiative that brings together local self-government bodies and territorial authorities that voluntarily commit to implementing climate and energy targets defined by the European Union. The initiative was launched by the European Commission in 2008 to promote the achievement of climate and energy goals. Within the framework of the Covenant, signatory municipalities undertake commitments to reduce CO_2 emissions by at least 40% by 2030 (30–35% for Eastern Partnership countries), implement climate change adaptation measures, and address energy poverty by ensuring secure, sustainable, and affordable energy for all.

By joining the Covenant of Mayors, the Talin Municipality commits to the development and implementation of a Sustainable Energy and Climate Action Plan (SECAP), which shall serve as a long-term strategic document for the community. The SECAP is designed to achieve three principal objectives:

- Improving energy efficiency and expanding the deployment of renewable energy sources;
- Decarbonising the municipal territory and reducing greenhouse gas emissions;
- Enhancing the community's resilience to climate risks.

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

The Talin Municipality SECAP is based on the methodologies of the European Union and the Covenant of Mayors, as well as on municipal data, relevant national strategic documents, and the outcomes of local consultations.

Sustainable Energy and Climate Action Plan

In accordance with Covenant procedures, the SECAP includes a set of components essential for effective climate policy development and action planning:

- A structured questionnaire was developed and submitted to the municipality, on the basis of which relevant departments provided the required data. Continuous coordination with municipal staff was ensured throughout the SECAP preparation process, alongside the organisation of technical meetings on data collection and monitoring.
- A preliminary assessment of community energy consumption was conducted, serving as the baseline for subsequent measurement and emission reduction efforts.
- Greenhouse gas emissions were calculated using a top-down assessment approach based on energy consumption data, enabling comparison of the municipality's carbon footprint against baseline year indicators.
- A preliminary analysis of municipal vulnerability to climate change impacts was undertaken, resulting in the identification of key risks and potential adaptation measures.
- Strategies and measures for achieving greenhouse gas emission reductions and sustainable energy targets were defined. These will be further refined and expanded in line with municipal priorities, additional data availability, and stakeholder engagement.
- An implementation framework was developed, outlining the sequencing of measures, responsible entities, and indicative timelines.

The document also defines a priority package of actions intended to ensure both emission reductions and improvements in the quality and reliability of municipal energy services. These measures were formulated through stakeholder engagement processes and are subject to periodic review and adjustment based on evolving data and local priorities.

The SECAP serves as a strategic development instrument for Talin Municipality, contributing to energy sustainability, climate resilience, and alignment with the Republic of Armenia's national policies and international commitments.

Talin Municipality's Accession to the Covenant

Talin Municipality joined the Covenant of Mayors for Climate and Energy on 28 April 2023 by Decision No. 52-A of the Municipal Council (Annex 1).

Through its accession, Talin Municipality voluntarily undertook the following commitments:

- To appoint a responsible Energy Manager for the development of the Talin Municipality Sustainable Energy and Climate Action Plan (SECAP);
- Within two years of the decision's entry into force, and with the support of the European Commission's Covenant of Mayors – East programme and other partners, to develop the SECAP for Talin Municipality of Aragatsotn Marz, Republic of Armenia. The SECAP shall consolidate measures and actions aimed at reducing greenhouse gas emissions in target sectors by 2030, as well as strengthening municipal resilience to climate change.

Programmes implemented in Talin Municipality in recent years

- Within the framework of 5 million AMD accumulated from environmental levies of the Talin Municipality, in 2025, a 30 kW solar photovoltaic plant and a 24 kW electric boiler were installed on the kindergarten's roof in the Nerkin Sasnashen settlement.
- In 2024, within the framework of the UNDP "Sustainable Communities" programme and with co-financing from Talin Municipality, a 10 kW solar photovoltaic plant with installed capacity was installed on the roof of the House of Culture in the Arteni settlement, and 50 LED lamps were provided.
- In 2024, financed by the Territorial Development Fund and Talin Municipality, a 250 kW solar photovoltaic plant was installed in the Aragatsavan settlement of Talin Municipality, in the area of the deep-well pumps.
- In addition to the above-mentioned measures, the community regularly discusses initiatives to create green zones and artificial forests, solutions to retain soil moisture, mechanisms for the efficient use of water resources, and potential practical steps for their implementation.

Chapter 1. Foundations for the Development of the Talin Municipality SECAP

1.1 Objectives of the Action Plan and Sectors Covered

The principal mission of the Sustainable Energy and Climate Action Plan (SECAP) for Talin Municipality is to define a system of long-term economic, technical, technological, and investment-oriented measures to improve energy efficiency and promote the deployment of renewable energy resources.

Through the phased, systematic implementation of these measures, the community will be able to ensure a significant increase in local energy generation, promote the rational and efficient use of energy resources, enhance energy security, and improve living conditions and environmental quality by reducing greenhouse gas emissions.

At the same time, the Plan is designed to strengthen the community's climate resilience by systematically introducing and continuously applying climate change adaptation measures.

Within the framework of the SECAP, the following sectors are primarily considered: municipal, public, and private transport, public street lighting systems, residential and public buildings, municipally owned facilities, as well as organisations operating under municipal jurisdiction.

In order to achieve the objectives defined in the Talin Municipality SECAP, it is necessary to:

1. Promote the use of renewable energy resources and the adoption of modern technologies;
2. Implement comprehensive energy-saving and energy-efficiency programmes through the application of modern green technologies;
3. Reduce energy consumption in municipally managed facilities and residential buildings by introducing efficient management tools and green procurement policies;
4. Establish a municipal energy management system and ensure continuous monitoring and control of data to maintain target indicators;
5. Assess climate hazards and vulnerabilities specific to Talin Municipality, periodically review adaptation measures, and cooperate with scientific and professional institutions;
6. Promote public awareness of energy efficiency, renewable energy, and climate change mitigation measures;
7. Strengthen programme management capacities, mobilise international and domestic investments, and foster effective cooperation with donors and stakeholders.

1.2 Legal and Methodological Framework for Plan Development

The development of the Talin Municipality SECAP is guided by a set of national and international normative, strategic, informational, and methodological documents. The combination of these documents forms the policy framework for energy and climate action, encompassing international commitments, national strategies, and local and regional programmes that determine the structure, priorities, and implementation mechanisms of the SECAP.

1. Law of the Republic of Armenia on Energy (07.03.2001), establishing the general principles of governance and regulation in the energy sector.
2. Law of the Republic of Armenia on Energy Saving and Renewable Energy (09.11.2004), defining the responsibilities of local self-government bodies in implementing energy-saving measures and promoting renewable energy technologies.
3. Law of the Republic of Armenia on Environmental Impact Assessment and Expertise (21.06.2014), requiring the consideration of energy efficiency and climate resilience in the design of new buildings and infrastructure.
4. Energy Sector Development Strategic Programme of the Republic of Armenia until 2040 (2021), targeting at least a 15% share of renewable energy in total electricity generation by 2030 (excluding large hydropower) and 26% by 2040.
5. Long-Term Low-Emission Development Strategy of the Republic of Armenia until 2050 (2023), setting a per-capita emissions reduction target of 2.07 tonnes of CO_2 per year.
6. Energy Saving and Renewable Energy Programme of the Republic of Armenia (2022–2030), defining measures across buildings, transport, agriculture, and industry.
7. Procedure for Greenhouse Gas Emissions Inventory (Government Decision No. 54-N, 11.01.2024), regulating emissions accounting and reporting.
8. Five-Year Development Programme of Talin Municipality for 2023–2027 (2022).
9. Comprehensive and Enhanced Partnership Agreement (CEPA) between the Republic of Armenia and the European Union (2017), establishing obligations related to energy efficiency, renewable energy, and building energy performance.
10. Nationally Determined Contributions (NDC) of the Republic of Armenia (2021–2030), committing to a 40% reduction in emissions by 2030 compared to 1990 levels.
11. Paris Agreement (2015) and Armenia's commitments on mitigation and adaptation.
12. United Nations Framework Convention on Climate Change (UNFCCC) and its reporting and inventory requirements.
13. United Nations Sustainable Development Goals (SDGs, 2030), particularly SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

14. Guideline: "How to Develop a Sustainable Energy and Climate Action Plan in Eastern Partnership Countries."
15. Reporting Guidelines, Covenant of Mayors Office (2020).

This comprehensive legal and methodological framework ensures that the Talin Municipality SECAP aligns with the policies of the Republic of Armenia and the European Union, supports the fulfilment of international commitments, and provides a basis for the development of practical, implementable actions at the municipal level.

1.3 Potential Financing Mechanisms for Plan Implementation

For the effective, consistent, and systematic implementation of the measures included in the SECAP, it is of primary importance that the local self-government authority allocates appropriate financial resources within the annual municipal budget. Such allocations should be determined based on the Plan's established priorities, expected outcomes, and implementation timelines, thereby ensuring the feasibility and continuity of interventions.

It should be noted that the overall implementation of the Plan requires substantial investment resources, which cannot be fully covered by the municipal budget alone. For this reason, Talin Municipality will undertake actions aimed at mobilising additional financial resources by exploring both nationally available programmes and subvention mechanisms, as well as credit and grant instruments provided by international financial institutions and donor organisations. Private sector investments may also play a significant role in this process.

The establishment of a municipal revolving fund may be considered as a sustainable financing instrument for supporting energy efficiency and renewable energy initiatives.

Improving financing efficiency also requires the targeted allocation of financial flows, gradually shifting from direct expenditure financing toward mechanisms that incentivise savings. The principal financing options available for SECAP implementation are outlined below.

- **Financing from the Municipal Budget**

One of the primary sources of financing for the Talin Municipality SECAP is the municipal budget. In this regard, it is important to emphasise that the Five-Year Development Programme[1] of Talin Municipality for 2023–2027 already предусматриес financial allocations for the modernisation of energy infrastructure and street lighting systems. In particular, approximately AMD 49 million has been allocated to modernise street lighting systems, and AMD 240 million to install solar power plants. Such an approach ensures coherence between development and climate-energy actions and creates enabling conditions for attracting co-financing from state subvention programmes, international financial institutions, and donor organisations, which often require municipal participation.

- **State Subventions**

The state subvention programme for the development of community economic and social infrastructure, implemented by the Government of the Republic of Armenia, represents an effective framework for community–state partnership. Under this mechanism, capital investment projects submitted by municipalities may receive co-financing from the state budget upon obtaining a positive governmental assessment. The co-financing share is determined based on project characteristics, sectoral priorities, and socio-economic impact, ranging from 10% to 80% of the total project value. Where third-party co-financing of at least 20% is secured, the state contribution may increase by an additional 5%.

State subvention programmes have been operational since 2018 and cover 19 sectors, including energy efficiency improvements, the construction and rehabilitation of street lighting systems, the installation

[1] https://talin.am/Pages/DocFlow/Def.aspx?a=v&g=1e5c50f7-fe44-456b-a62e-14ba16bec547

of solar photovoltaic plants, the construction or reconstruction of kindergartens and public buildings, and the modernisation of common shared property in multi-apartment buildings.

In addition, municipalities participating in subvention programmes may benefit from technical assistance provided by international and donor organisations. For example, under the UNDP–GEF programme "De-risking and Scaling-up Investment in Energy Efficient Building Retrofits," co-financing was provided for the thermal modernisation of more than 140 buildings during 2020–2023.

According to regulations introduced in 2022, households participating in subvention-supported programmes are required to provide at least 10% co-financing, while for programmes incorporating energy efficiency components, this requirement may be reduced to 5%. Furthermore, under Government Decision No. N 520-L (2022), the State Support Programme for Energy-Efficient Renovation of Apartments and Individual Residential Houses, provides for the compensation of interest rates on loans obtained for energy-efficient renovations.

- **Household Financial Participation**

In Talin Municipality, as in many small and medium-sized communities, major energy-consuming sectors such as industry or centralised heating systems are largely absent. Under these conditions, the residential building sector represents the dominant source of energy consumption and greenhouse gas emissions, while also offering the highest potential for energy savings and emission reductions. Baseline Emission Inventory calculations indicate that transport and residential sectors are the principal consumers of energy, implying that meaningful SECAP results cannot be achieved without active household participation.

Accordingly, the municipality shall pursue targeted engagement with residents, encouraging participation and co-financing in the implementation of measures within the residential buildings sector, as well as the adoption of sustainable and energy-efficient solutions in the transport sector.

Such an approach will simultaneously reduce energy consumption, promote resource-efficient and environmentally responsible behaviour, and contribute to substantial greenhouse gas emission reductions at the municipal level.

Residents may access green and concessional loan instruments offered by commercial banks, as well as state-supported financing schemes introduced by the Government of the Republic of Armenia, including programmes supporting energy-efficient renovation of apartments and individual houses. Even partial household co-financing may enable thermal insulation improvements, reduced heat losses, the deployment of efficient heating systems, and the adoption of renewable energy technologies.

- **Business and Private Sector as a Financing Source**

The promotion of sustainable energy development may also be supported through the active engagement of the private sector. Such participation may take various forms, including encouraging energy-efficient material production, developing entrepreneurship, and introducing and applying modern technologies. Private sector involvement may be facilitated through awareness and promotional mechanisms, the inclusion of minimum energy-efficiency requirements in public procurement, and the provision of targeted service orders. In addition, co-financing schemes, public–private partnership arrangements, and incentive mechanisms may be applied. These may include access to international credit resources, as well as state-supported interest rate compensation or subsidies to provide more accessible, concessional financing conditions.

- **Financial Institutions, Funds, and Programmes**

In addition to state and municipal resources, important financing opportunities for SECAP implementation are provided by financial institutions, specialised funds, and programmes that incorporate grant components and support climate change mitigation and adaptation. Their engagement enables municipalities to implement projects to improve energy efficiency, advance renewable energy deployment, and strengthen climate resilience.

The key advantage of such institutions lies in their role as independent financial actors, providing not only direct grants and loans but also technical assistance and advisory services. Through these mechanisms, financing may be made available to municipalities with limited budgetary resources or restricted access to conventional credit instruments. Furthermore, such programmes frequently support the structuring of investment packages and the application of Energy Service Company (ESCO) models.

In this context, the Renewable Resources and Energy Efficiency Fund of Armenia (R2E2 Fund) may be highlighted[2], whose principal mission is to promote the adoption of sustainable energy solutions, thereby contributing to national energy security, energy independence, and economic development. The Fund has extensive experience in financing and implementing energy-efficiency and renewable-energy projects across Armenian communities.

Among relevant financial institutions and initiatives, the following may be noted:

- Green for Growth Fund (GGF);
- Green Climate Fund (GCF);
- Eastern Europe Energy Efficiency and Environment Partnership (E5P);
- Municipal Project Support Facility;
- Nordic Environment Finance Corporation (NEFCO);
- Global Climate Partnership Fund;
- United Nations Development Programme (UNDP Armenia);
- Covenant of Mayors Demonstration Projects (CoM-DeP);
- As well as national and local financing initiatives.

The mobilisation of these institutions may ensure both the diversification of financial resources and access to technical expertise and capacity-building support, thereby facilitating effective SECAP implementation.

- **Other Financing Mechanisms and Sources**

Non-traditional financing mechanisms may also be applied for SECAP implementation. One such instrument is a revolving fund, designed to ensure the continuous financing of investment projects. At the initial stage, the fund may be capitalised through loans, grants, or contributions, and subsequently become self-sustaining through savings generated by implemented measures or revenues derived from local energy production[3].

Leasing arrangements may represent another viable financing option, often more accessible than conventional loans, as periodic leasing payments may be lower than loan servicing costs. For example, leasing mechanisms may support the installation of solar photovoltaic systems.

Municipalities may also utilise commercial loans provided by financial institutions for energy-efficiency and renewable-energy projects, either directly or through ESCO mechanisms. Targeted credit lines, including concessional state-supported lending instruments channelled through financial institutions, may further improve access to financing. Credit risks may be mitigated through guarantee schemes and risk-sharing mechanisms, whereby donors or government entities partially cover potential losses.

Additional financing sources may include international technical assistance facilities, environmental funds, targeted fundraising mechanisms, and various forms of state support and subsidy programmes.

These instruments collectively enable municipalities to establish diversified financing frameworks, ensure programme sustainability, and reduce reliance on municipal budgetary resources alone.

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

[3] In accordance with PSRC Decision No. 374-N of 1 November 2013, a licence for the generation of electricity from solar power plants may be granted to municipal non-commercial organisations and to the Renewable Resources and Energy Efficiency Fund of Armenia for electricity generation activities in plants with an installed capacity of up to 1 MW.

1.4 Monitoring of Plan Implementation

A critical prerequisite for the effective implementation of the Talin Municipality SECAP is the establishment of a structured monitoring system. Such a system ensures tracking progress, assessing performance against defined objectives, and, where necessary, introducing corrective actions. Monitoring facilitates both qualitative and quantitative evaluation of programme outcomes, thereby enhancing transparency and strengthening governance effectiveness.

Responsibility for monitoring coordination rests with the municipality and may be exercised either by a dedicated structural unit or by an authorised specialist, namely the Energy Manager. The designation of an Energy Manager represents a key requirement under the Covenant of Mayors framework, ensuring oversight of SECAP development and implementation.

The principal functions of the Energy Manager or the responsible unit include:

- Participation in SECAP development and target-setting processes;
- Periodic collection and analysis of energy consumption data across all target sectors;
- Organisation of energy audits and assessments;
- Introduction of energy management tools within municipal facilities;
- Coordination across municipal departments and subordinate entities;
- Cooperation with financing and technical assistance organisations;
- Monitoring of SECAP implementation and preparation of reports.

Prior to the establishment of a dedicated energy management structure, monitoring functions may be performed by a designated municipal working group.

The monitoring process shall include:

- Development and application of data collection methodologies;
- Continuous recording of energy consumption and greenhouse gas emission indicators;
- Identification of internal and external data sources (municipal financial departments, utilities, Electricity Networks of Armenia, Gazprom Armenia, etc.);
- Introduction of data verification and validation mechanisms;
- Definition of monitoring periodicity (annual or more frequent);
- Establishment of indicators and benchmark thresholds;
- Development and municipal approval of reporting formats.

Reporting shall be conducted via the MyCovenant online platform in accordance with established requirements:

- Simplified monitoring report (qualitative description of implemented measures) – every two years;
- Full monitoring report (qualitative and quantitative indicators, Baseline Emission Inventory updates, and emission reduction assessment) – every four years.

Talin Municipality also envisages more frequent monitoring cycles, including annual or semi-annual assessments, to ensure more detailed performance evaluation. This approach supports objective analysis of realised energy savings, as well as financial and environmental effectiveness.

Chapter 2. Brief Profile of Talin Municipality

2.1 Geographic Location

Talin[4] Municipality is located in the north-western part of Aragatsotn Marz of the Republic of Armenia. The municipal centre of Talin is situated 68 km from Yerevan and 48 km from the marz administrative centre. The community borders the Akhuryan River to the west, which forms the state border with

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

Turkey; Shirak Marz to the north; Ashtarak Municipality to the east; and Armavir Marz to the south. The North–South interstate highway passes through the municipal territory.

The municipal territory extends from approximately 1,200 metres above sea level to nearly the summit of the Aragats mountain massif, at around 3,500 metres. It encompasses the western mountain slopes shaped by lava flows of the Aragats volcanic massif, including the Talin and Karmrashen plateaus, as well as Mount Arteni (Artin). Mount Arteni has two peaks: Greater Arteni (2,047 m) and Lesser Arteni, also known as Areguni (1,753 m).

The mineral resources of the municipality are largely associated with the volcanic origin of Mount Aragats. Deposits of tuff of varying colours and structures are widespread throughout the territory, including grey, purple-pink, and reddish-brown varieties. Significant quantities of volcanic slag are also present. In certain areas, deposits of asbestos, perlite, and obsidian are observed.

The mountainous zone of the municipality is characterised by abundant sources of relatively high-quality cold water, which primarily supply local settlements. The lowland zone is defined by a semi-desert, arid climate.

Talin Municipality occupies a favourable economic–geographical position. The Gyumri-Armavir-Yerevan railway, as well as the Yerevan-Armavir-Gyumri and Yerevan-Ashtarak-Talin-Gyumri highways, traverse the municipal territory. As of November 2022, Talin has functioned as an enlarged municipality comprising 33 settlements, including 32 rural settlements and one urban settlement.

2.2 Population

As of 1 January 2025, the municipality's registered population is 38,611 persons. Demographic dynamics indicate a marginal level of natural increase: 234 births and 200 deaths, for a total of 34 persons. This minimal growth reflects a relatively stable yet nearly stagnant demographic trend, potentially associated with low birth rates and indicating the need for targeted demographic policies.

Marriage and family statistics indicate that during the same period, 109 marriages and 13 divorces were registered, reflecting a comparatively stable social structure.

There are 5,757 households, of which 819 receive family benefits. This implies that approximately 14.2% of households depend on state social support, suggesting socio-economic vulnerability or low income levels among a significant segment of the population.

Table 1. Demographic and social indicators of Talin Municipality as of 1 January 2025[5].

No.	Indicator	Value
1	Registered population	38,611
2	Number of registered births	234
3	Number of deaths	200
4	Number of marriages	109
5	Number of divorces	13
6	Number of households	5,757
7	Number of family benefit recipients	819
8	Number of pensioners	6,158
9	Number of persons with disabilities	2,174

A notable characteristic of the population structure is the significant share of elderly residents. The number of pensioners is 6,158, representing 15.9% of the total population. This indicates a demographic

[5] Here and after all quantitative data are taken from the official website of Talin municipality https://talin.am/Pages/CustomPage/?CustomPageID=722b890c-cc0b-4c5d-bdf2-30fbebab4291

ageing trend, which may have long-term implications for social services, the healthcare system, and labour force dynamics.
In addition, 2,174 persons with disabilities are registered in the municipality, accounting for approximately 5.6% of the population. This indicator highlights the importance of inclusive policies and the development of support services for persons with special needs.

2.2.1 Gender sensitivity and energy poverty

An analysis of data from the Statistical Committee of the Republic of Armenia[6] and relevant sectoral strategic documents indicates that energy poverty remains a significant socio-economic challenge in regional communities of Armenia, including the Talin 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[7], 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 Talin community, driven by income levels, the predominance of individual heating systems, and the low energy efficiency of the building stock. In the Talin community, approximately 3080 residents live below the poverty threshold, representing the primary group potentially exposed to energy affordability challenges. In addition, 565 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.

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 Talin 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 Talin 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.

[6] https://armstat.am/am/?nid=82&id=2657
[7] https://www.arlis.am/hy/acts/161408

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[8] 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 Talin 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 Talin community.

2.3 Economy

Three industrial enterprises operate within the municipal territory. One of these enterprises, previously engaged in diamond stone processing and possessing considerable production capacity, is currently non-operational. The remaining two enterprises are active, with one specialising in dairy production and the other in the manufacture of anti-hail installations.

The principal services provided within the municipality include water supply, wastewater services, electricity supply, gas supply, telecommunications, and postal services, which are delivered through local branches or operational units of national service providers. Municipal services are responsible for solid waste collection, while the municipality oversees transport services. Road maintenance and construction activities are carried out by the Talin Road Maintenance Public Non-Commercial Organisation.

The municipality's primary agricultural products include cereals (wheat and barley), milk, and meat. Production volumes are limited and largely oriented toward subsistence. A substantial portion of settlements lacks access to irrigation water, resulting in low and unstable cereal yields. High fodder costs contribute to higher agricultural production costs.

The affected areas currently exhibit a low level of development, primarily due to limited industrial capitalisation, the absence of modern processing technologies, and insufficient irrigation water availability. In rural settlements, approximately 10% of municipal land is irrigated.

Table 2. Land use and agricultural indicators as of 1 January 2025.

No.	Indicator	Value
1	Total land area (ha)	94,867.64
2	Agricultural land (ha)	74,853.75
3	Total settlement area (ha)	4,604.89
4	Number of large livestock (cows, bulls)	13,085
5	Number of small livestock (sheep and goats)	29,198
6	Number of pigs	4,773
7	Number of poultry	37,358
8	Number of horses	41
9	Number of beehives (colonies)	3,702
10	Agricultural machinery	
10.1	Number of tractors	–
10.2	Number of combine harvesters	–

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

11	Number of agricultural households	8,273

As of 1 January 2025, the municipality's total land area is 94,867.64 hectares, of which approximately 79% (74,853.75 hectares) is classified as agricultural land. The residential (settlement) area comprises 4,604.89 hectares, reflecting the predominance of an agricultural landscape and a spatially dispersed settlement structure.

Livestock production constitutes an important component of the local economy. The number of large livestock amounts to 13,085 head (including cows and bulls), while small livestock (sheep and goats) totals 29,198 head. Poultry farming is also widespread, with a total of 37,358 birds. Pig farming accounts for 4,773 head, while horse breeding and apiculture are developed on a more limited scale, with 41 horses and 3,702 beehives, respectively, indicating the presence of niche agricultural activities.

Despite the significant scale of agricultural activity, no tractors or combine harvesters are officially registered within the municipality. This may reflect outdated registration data, the exclusion of privately owned machinery from official records, or a structural deficit in agricultural mechanisation. The absence of modern agricultural machinery poses constraints for productivity, operational efficiency, and sustainable development, particularly given the extent of cultivated land.

A total of 8,273 agricultural households operate within the municipality, suggesting that the agricultural system is predominantly composed of small-scale, family-based farms. While these farms form the backbone of local agricultural production, they also face limitations in capital availability, technology adoption, and market access.

Table 3. Main industrial enterprises operating in Talin Municipality.

No.	Organization name	Type of activity
1	"PRESS STAND" LLC	Grocery store
2	"N.S MARKET" (LLC)	Grocery store
3	"ALE-LEA" LLC, Director HAYKAZ APRIKYAN	Grocery store
4	"RASH EGHBAIRNER" LLC, Director RADIK HAKOBYAN	Grocery store
5	"AREVMANE" LLC, Director ANDRANIK HAROYAN	Grocery store
6	"PRESS STAND" LLC	Grocery store
7	"AREVMANE" LLC, Director ANDRANIK HAROYAN	Grocery store
8	"FINTIME" LLC	Accounting office
9	"RASH EGHBAIRNER" LLC, Director RADIK HAKOBYAN	Grocery store
10	"LENTEX" LLC, Director KAREN GOMTSYAN	Clothing store
11	"AGATH GROUP" LLC	Household goods store
12	"KARAPETYANNERI OJAKH" LLC, Director GAGIK KARAPETYAN	Public catering / food service
13	"GALOFARM" LLC, Director VAHRAM GALSTYAN	Sale of liquid fuel at retail fuel points
14	"GALOFARM" LLC, Director VAHRAM GALSTYAN	Compressed natural gas sales
15	"MARALL" LLC	Sale of liquefied gas at retail points
16	MASIS-94 LLC, Director HAKOB SARGSYAN	Sale of liquid fuel at retail fuel points
17	"KARAVAN" LLC, Director ARAYIK STEPANYAN	Compressed natural gas sales
18	"WINTER FLOWER" LLC, Director ARTASH HAJATYAN	Compressed natural gas sales

19	"ARSUR" LLC, Director ARTHUR TOROSYAN	Compressed natural gas sales
20	"CHAKHRKANK" LLC, Director HOVHANNES GALEYAN	Sale of technical fluids
21	KOLYA TUTKHALYAN (IE)	Grocery store
22	EVGENYA PIROYAN (IE)	Grocery store
23	ANAHIT VARDANYAN (IE)	Grocery store
24	MARINE HARUTYUNYAN (IE)	Grocery store
25	AIDA AVETISYAN (IE)	Grocery store
26	VAHRAM MNATSAKANYAN (IE)	Grocery store
27	ARGISHTI MANUKYAN (IE)	Grocery store
28	HMAYAK MARGARYAN (IE)	Grocery store
29	LUSINE KHAMOYAN (IE)	Grocery store
30	MUSHEGH KHACHATRYAN (IE)	Grocery store
31	ARMEN SAFARYAN (IE)	Grocery store
32	MKHITAR HAKOBYAN (IE)	Grocery store
33	YURIK SAROYAN (IE)	Grocery store
34	VARDANUSH MELKONYAN (IE)	Grocery store
35	ARSHAK OHANYAN (IE)	Grocery store
36	NORVARD DAVTYAN (IE)	Grocery store
37	ARGISHTI MKRTCHYAN (IE)	Grocery store
38	NORIK TONOYAN (IE)	Grocery store
39	ARTHUR SARGSYAN (IE)	Grocery store
40	AVETIK MARGARYAN (IE)	Grocery store
41	ARMEN PETROSYAN (IE)	Grocery store
42	MARMAR MARKOSYAN (IE)	Grocery store
43	SARGIS HOVHANNISYAN (IE)	Grocery store
44	HERMINE KHACHATRYAN (IE)	Grocery store
45	LILIT PETROSYAN (IE)	Grocery store
46	SARGIS NERSISYAN (IE)	Grocery store
47	TARON HOVSEPYAN (IE)	Grocery store
48	MARGARIT GHAZARYAN (IE)	Grocery store
49	LUSINE HOVHANNISYAN (IE)	Grocery store
50	GEGHAM GRIGORYAN (IE)	Grocery store
51	VAZGEN MOVSISYAN (IE)	Grocery store
52	HABETH HAYRAPETYAN (IE)	Grocery store
53	MARINE MKRTCHYAN (IE)	Grocery store
54	HAKOB KHNKOYAN (IE)	Grocery store
55	LAERT KHACHATRYAN (IE)	Grocery store
56	MARETA GALSTYAN (IE)	Grocery store
57	VAZGEN SARGSYAN (IE)	Grocery store
58	TIGRAN VARDIKYAN (IE)	Grocery store
59	MELANYA VARDIKYAN (IE)	Grocery store
60	ARTASHES HARTHENYAN (IE)	Grocery store
61	GNEL SHEKIKYAN (IE)	Grocery store
62	ARMEN MAKARYAN (IE)	Grocery store
63	BARSEGHYAN ARMEN (IE)	Grocery store
64	ARSEN GASPARIYAN (IE)	Grocery store

65	HARUTYUN AVDALYAN (IE)	Grocery store
66	HAMLET HAKOBYAN (IE)	Grocery store
67	KARINE KHACHATRYAN (IE)	Grocery store
68	ANDRANIK GHANDILYAN (IE)	Public catering / food service
69	RUZANNA SUKIASYAN (IE)	Grocery store
70	NORIK ASATRYAN (IE)	Grocery store
71	MERRI SAHARYAN (IE)	Grocery store
72	NAREK HAYRAPETYAN (IE)	Grocery store
73	AGAPI TADEVOSYAN (IE)	Grocery store
74	KAREN GABRIELYAN (IE)	Grocery store
75	MKRTICH HOVHANNISYAN (IE)	Grocery store
76	ARMEN KIRAKOSYAN (IE)	Grocery store
77	TIGRAN PETOYAN (IE)	Grocery store
78	HRACHUHI SARGSYAN (IE)	Grocery store
79	ARGAM MURADYAN (IE)	Grocery store
80	GAGIK POGHOSYAN (IE)	Grocery store
81	SIRAZNIK ASATRYAN (IE)	Grocery store
82	GAGIK MKRTCHYAN (IE)	Grocery store
83	HAYK KHACHATRYAN (IE)	Grocery store
84	LYUDMILA ZAKARYAN (IE)	Grocery store
85	HARUTYUN AVAGYAN (IE)	Grocery store
86	KHACHATUR YEGHIAZARYAN (IE)	Grocery store
87	SANDUKHT GHARIBYAN (IE)	Grocery store
88	HAKOB SARGSYAN (IE)	Grocery store
89	SASUN TOROSYAN (IE)	Grocery store
90	ANI MKRTCHYAN (IE)	Grocery store
91	RUBIK BAREYAN (IE)	Gold / jewelry store
92	LEYLI MKRTCHYAN (IE)	Grocery store
93	GEVORG HARUTYUNYAN (IE)	Grocery store
94	TAVROS VARDANYAN (IE)	Grocery store
95	MELANYA DANIELYAN (IE)	Grocery store
96	TARON YEGHIAZARYAN (IE)	Grocery store
97	KAREN POGHOSYAN (IE)	Grocery store
98	AGHUNIK HOVHANNISYAN (IE)	Grocery store
99	HRACHIK SARGSYAN VACHAGANI (IE)	Grocery store
100	MANVEL MKRTCHYAN (IE)	Grocery store
101	VARDAN KHACHATRYAN (IE)	Grocery store
102	MIKAYEL GEVORGYAN (IE)	Grocery store
103	ANAHIT HOVHANNISYAN (IE)	Grocery store
104	KAREN GHAZARYAN (IE)	Grocery store
105	MKRTICH TONOYAN (IE)	Grocery store
106	HRANUSH STEPANYAN (IE)	Grocery store
107	KARINE SAHAKYAN (IE)	Grocery store
108	ASYA KHACHATRYAN (IE)	Grocery store
109	SIRANUSH BAGHDASARYAN (IE)	Grocery store
110	HAYK HAKOBYAN (IE)	Grocery store
111	ANZHELA SARGSYAN (IE)	Grocery store

112	LILIT YEGHIAZARYAN APRESI (IE)	Grocery store
113	MELANYA VEZIRYAN (IE)	Grocery store
114	KARINE TUMOYAN (IE)	Grocery store
115	GERASIM HOVHANNISYAN (IE)	Grocery store
116	RUBEN PETROSYAN (IE)	Grocery store
117	SEVAK SARGSYAN (IE)	Grocery store
118	VERGUSH KARAPETYAN (IE)	Grocery store
119	ARAM ATHANESYAN (IE)	Grocery store
120	GYULNARA HAMBARZUMYAN (IE)	Grocery store
121	TIGRAN VARDIKYAN (IE)	Grocery store
122	MARGARIT GHAZARYAN (IE)	Grocery store
123	SASUN TOROSYAN (IE)	Grocery store
124	TARON HOVSEPYAN (IE)	Grocery store
125	SARGIS NERSISYAN (IE)	Grocery store
126	LUSINE HOVHANNISYAN (IE)	Grocery store
127	MARETA GALSTYAN (IE)	Grocery store
128	NORVARD DAVTYAN (IE)	Grocery store
129	ANAHIT HOVHANNISYAN (IE)	Grocery store
130	ANAHIT VARDANYAN (IE)	Grocery store
131	MANVEL MKRTCHYAN (IE)	Grocery store
132	GAGIK MKRTCHYAN (IE)	Grocery store
133	HERMINE KHACHATRYAN (IE)	Grocery store
134	GEGHAM GRIGORYAN (IE)	Grocery store
135	HARUTYUN AVDALYAN (IE)	Grocery store
136	GAGIK POGHOSYAN (IE)	Grocery store
137	MARINE MKRTCHYAN (IE)	Grocery store
138	KHACHATUR YEGHIAZARYAN (IE)	Grocery store
139	MKRTICH HOVHANNISYAN (IE)	Grocery store
140	ANI MKRTCHYAN (IE)	Grocery store
141	KARINE KHACHATRYAN (IE)	Grocery store
142	LYUDMILA ZAKARYAN (IE)	Grocery store
143	MELANYA VARDIKYAN (IE)	Grocery store
144	VARDAN KHACHATRYAN (IE)	Grocery store
145	AGHUNIK HOVHANNISYAN (IE)	Grocery store
146	MARINE HARUTYUNYAN (IE)	Grocery store
147	RUBEN PETROSYAN (IE)	Grocery store
148	MKRTICH TONOYAN (IE)	Grocery store
149	HRANUSH STEPANYAN (IE)	Grocery store
150	GRIGOR PETROSYAN (IE)	Grocery store
151	SARGIS HOVHANNISYAN (IE)	Grocery store
152	HAMLET HAKOBYAN (IE)	Grocery store
153	ANNI STEPANYAN (IE)	Grocery store
154	NVARD PETROSYAN (IE)	Grocery store
155	HERMINE KHNKOYAN (IE)	Grocery store
156	SEVAK SARGSYAN (IE)	Grocery store
157	VERGUSH KARAPETYAN (IE)	Grocery store
158	ARAM ATHANESYAN (IE)	Grocery store

159	GRIGOR PETROSYAN (IE)	Public catering / food service
160	BARSEGHYAN ARMEN (IE)	Grocery store
161	LILIT STEPANYAN (IE)	Dishware store
162	AMALYA SEFILYAN (IE)	Flower shop
163	TATUL MARKOSYAN (IE)	Beauty salon
164	RAYA MARTIROSYAN (IE)	Flower shop
165	SANDUKHT AVETISYAN (IE)	Beauty salon
166	GEGHANUSH ISRAELYAN (IE)	Clothing store
167	RUZANNA VARDANYAN (IE)	Dental clinic
168	TIGRAN PETOYAN (IE)	Public catering / food service
169	TIGRAN VARDIKYAN (IE)	Public catering / food service
170	MELANYA VARDIKYAN (IE)	Grocery store
171	LUSINE KHAMOYAN (IE)	Grocery store
172	HRACHIK SARGSYAN VACHAGANI (IE)	Grocery store
173	ANI MKRTCHYAN ZOHRABI (IE)	Grocery store
174	ARGISHTI MKRTCHYAN (IE)	Grocery store
175	ARTAK MKRTCHYAN (IE)	Grocery store
176	VARDAN KHACHATRYAN (IE)	Public catering / food service
177	SUREN GRIGORYAN (IE)	Clothing store
178	TIGRAN MARTIROSYAN (IE)	Stationery and souvenir shop
179	ANDRANIK TIGRANYAN (IE)	Electronics and souvenir shop
180	NELLI YEGHIAZARYAN (IE)	Clothing store
181	PATVAKAN GRIGORYAN (IE)	Printing services
182	MARINE DAVTYAN (IE)	Clothing store
183	LAERT KHACHATRYAN (IE)	Grocery store
184	KARINE SAHAKYAN (IE)	Grocery store
185	YURA KOTANJYAN (IE)	Sale of technical fluids
186	AGAPI KARAPETYAN (IE)	Flower shop
187	HAYK GRIGORYAN (IE)	Sale of technical fluids
188	KARINE KHACHATRYAN (IE)	Public catering / food service
189	LIDA DILANYAN (IE)	Grocery store
190	GARIK KHACHOYAN (IE)	Household goods store
191	HRACHUHI SARGSYAN (IE)	Grocery store
192	HRANUSH YESAYAN (IE)	Clothing store
193	GEVORG BARSEGHYAN (IE)	Household goods store
194	ARTASHES HARTHENYAN (IE)	Public catering / food service
195	DAVIT MKHITARYAN (IE)	Dental clinic
196	PARUYR MELKONYAN (IE)	Beauty salon
197	MNATSAKAN SAHAKYAN (IE)	Online retail point
198	MARTIK SARGSYAN (IE)	Sale of liquid fuel at retail fuel points
199	SANAM HAROYAN (IE)	Sale of liquid fuel at retail fuel points
200	RUDIK MKHITARYAN (IE)	Sale of liquid fuel at retail fuel points
201	RUDIK MKHITARYAN (IE)	Sale of liquefied gas at retail points

202	SAMSON YESAYAN (IE)	Sale of liquid fuel at retail fuel points
203	GAGIK GASPARYAN (IE)	Sale of liquefied gas at retail points
204	ARTAK MKHITARYAN (IE)	Sale of liquefied gas at retail points
205	ZVART ANANYAN (IE)	Public catering / food service
206	GRIGOR PETROSYAN (IE)	Public catering / food service
207	LYOVA ALEKSANYAN (IE)	Public catering / food service
208	HABETH HAYRAPETYAN (IE)	Public catering / food service
209	TIGRAN VARDIKYAN (IE)	Public catering / food service
210	ARTASHES HARTHENYAN (IE)	Public catering / food service
211	KARINE KHACHATRYAN (IE)	Public catering / food service
212	ARSEN KALIAN (IE)	Public catering / food service
213	TIGRAN PETOYAN (IE)	Public catering / food service
214	EDIK SAHAKYAN (IE)	Public catering / food service
215	VARDAN KHACHATRYAN (IE)	Public catering / food service
216	KAREN GHAZARYAN (IE)	Public catering / food service
217	GAGIK GHAZARYAN (IE)	Public catering / food service
218	TIGRAN VARDIKYAN (IE)	Public catering / food service
219	TARON HOVSEPYAN (IE)	Public catering / food service
220	LYOVA ALEKSANYAN (IE)	Public catering / food service
221	KARINE KHACHATRYAN (IE)	Public catering / food service
222	VARDAN KHACHATRYAN (IE)	Public catering / food service
223	NVARD PETROSYAN (IE)	Public catering / food service
224	HERMINE KHNKOYAN (IE)	Public catering / food service
225	GHAZAR SARGSYAN (IE)	Sale of technical fluids
226	ARTAK MKRTCHYAN (IE)	Sale of technical fluids
227	SPARTAK MALKHASYAN (IE)	Sale of technical fluids
228	ARGAM GRIGORYAN (IE)	Sale of technical fluids
229	YURA KOTANJYAN (IE)	Sale of technical fluids
230	TIGRAN KHACHATRYAN (IE)	Sale of technical fluids
231	HAYK GRIGORYAN (IE)	Sale of technical fluids
232	KARINE HAYRAPETYAN (IE)	Sale of technical fluids
233	ROBERT HAMBARZUMYAN (IE)	Sale of technical fluids
234	NAREK SAFARYAN (IE)	Sale of technical fluids

2.4 Climate

Climatic conditions are variable and predominantly continental, which are not always favourable for agricultural activities. The majority of the land is not irrigated, and agricultural productivity largely depends on annual precipitation. Winters are moderately cold, while summers are generally cool, occasionally hot and dry. Spring begins early, and autumn ends late. Snow cover does not persist for extended periods and is frequently accompanied by strong winds, often resulting in snowstorms. Spring is characterised by heavy rainfall. Annual precipitation averages between 400 and 450 mm. The terrain is predominantly rocky, with numerous hills, gorges, mountains, and uneven relief.

Hazardous hydrometeorological phenomena characteristic of the municipality include droughts, hailstorms, and floods. Among secondary exogenous processes, land degradation and soil erosion are notable. The absence of forest cover significantly influences local microclimatic conditions.

Table 4. Climatic Characteristics of the Municipality

Indicator	Value
Average annual precipitation (mm)	500
Average air temperature in January (°C)	-10
Average air temperature in July (°C)	+30

In recent years, Talin Municipality has frequently experienced adverse meteorological events, including droughts, hail, and early frosts. Land resources have been degraded. Overall, reductions have been observed in pasture areas and their fodder capacity. Pasturelands lack sufficient watering points. Declines have been recorded in the yields of apricots, cultivated berries, and cereal crops, as well as in the number of large and small livestock and milk production volumes.

Table 5. Cultural, Educational, and Sports Institutions as of 1 January 2025

No.	Indicator	Quantity
1	Number of libraries	16
2	Number of art schools	1
3	Number of music schools	2
4	Number of kindergartens	16
5	Number of general education schools	36
6	Number of secondary vocational institutions	1
7	Number of higher education institutions	–
8	Number of sports schools	1

2.5 Education and Culture

As of 1 January 2025, the municipality maintains a relatively modest yet functional network of cultural, educational, and sports institutions. The presence of 16 libraries indicates the availability of public resources for information access and learning, which is important for both educational and cultural development. The number of kindergartens is also 16, suggesting adequate coverage of preschool education services.

General education is well represented in the municipality, with 36 schools operating across the territory, reflecting the broad accessibility of primary and secondary education. However, the continuing education system remains limited. Only one secondary vocational education institution operates within the municipality, while no higher education institutions are present. Consequently, young residents seeking professional or tertiary education are required to relocate to other cities, which may pose challenges for educational accessibility and the retention of youth potential.

In the field of cultural and artistic education, the municipality hosts one art school and two music schools, offering opportunities to engage in creative disciplines. In addition, one sports school operates within the community, indicating the existence of a basic institutional framework for physical education and sports development.

2.6 Housing Stock

As of the beginning of 2025, the municipality's total housing stock exceeds 1 million square metres, amounting to 1,070,373 sq. m. The data in Table 6 indicate a well-developed residential infrastructure.

The housing structure comprises 1,269 multi-apartment buildings and a significantly higher number of individual residential houses (7,052), reflecting the predominance of low-density, individual housing patterns.

Table 6. Characteristics of the Municipal Housing Infrastructure

No.	Indicator	Value
1	Total housing stock area (sq. m)	1,070,373
2	Total number of multi-apartment buildings	1,269
3	Total number of individual residential houses	7,052

The predominance of individual residential houses over multi-apartment buildings (approximately a 5.5-to-1 ratio) suggests that the municipality is largely characterised by a rural settlement pattern, where detached housing remains the dominant and preferred form of residence. This structural profile has important implications for spatial planning, infrastructure investment, and service delivery, as low-density areas typically require greater resource allocation for road maintenance, utility networks, and public transport services than more compact urban environments.

2.7 Infrastructure

Municipal infrastructure reflects a relatively developed environment characterised by the availability of core communal services and facilities. Access to electricity and natural gas contributes to the energy security of households and businesses. The presence of a landfill indicates a certain level of environmental management capacity, though existing data suggest further improvements are needed in sanitary infrastructure.

Table 7. Overview of Infrastructure as of 1 January 2025

No.	Indicator	Value
1	Number of electrical substations (solar, municipally owned)	–
2	Availability of gas supply within the municipality	Yes
3	Presence of a landfill	Yes
4	Length of interstate roads passing through the municipality (km)	35.48 km
5	Length of national roads passing through the municipality (km)	45.25 km
6	Availability of communal and road construction machinery	Yes
6.1	Number of dump trucks	3
6.2	Number of excavators	3
6.3	Number of waste collection vehicles	2
6.4	Number of multifunctional communal vehicles	–
6.5	Number of vacuum cleaning vehicles	–
7	Presence and number of commercial bank branches	Yes
8	Availability of intra-municipal public transport routes	Yes

The road network includes both interstate (35.48 km) and national (45.25 km) roads, indicating a comparatively high level of regional and national connectivity. Such accessibility is essential for trade, labour mobility, emergency services, and economic integration.

The municipal technical fleet is modest yet operational, comprising three dump trucks, three excavators, and two waste collection vehicles. However, the absence of tractors, multifunctional communal vehicles, and vacuum street-cleaning equipment may constrain the municipality’s operational capacity during periods of intensive or seasonal works, particularly under adverse weather conditions or emergency situations.

The presence of commercial bank branches within the municipality confirms access to financial services, which represents an important enabling factor for economic activity and entrepreneurship. In addition, public transport services support mobility and access to education, healthcare, and markets.

2.8 Local Self-Government

During 2025, the municipality's actual budget revenues exceeded the planned level by approximately AMD 69 million, amounting to AMD 2.54 billion compared to the initially approved AMD 2.47 billion. This reflects a modest budget surplus, which may result from effective financial management or higher-than-expected collection performance across specific revenue categories.

Particularly notable is the overperformance of land tax revenues, which exceeded the planned AMD 9 million and reached AMD 33.2 million. This may indicate improved tax compliance, updated cadastral valuations, or increased economic activity related to land use. Revenues from other property taxes and property leasing also exceeded expectations, contributing positively to the municipal budget.

Table 8. Municipal Budget Revenues: Planned vs. Actual (thousand AMD, 2025)

Revenue Source	Approved Budget	Actual Revenue
Property tax on buildings and structures	1,000.0	1,284.9
Land tax	9,000.0	33,351.2
Real estate tax	121,500.0	99,623.1
Other property taxes	205,000.0	211,789.7
Local duties	12,300.0	16,648.6
State duties	5,000.0	7,450.0
Official grants	2,623,521.0	2,142,162.4
Revenues from property leasing	60,840.0	79,989.0
Local fees	96,813.0	101,931.5
Penalties and fines	400,000.0	104,000.0
Other revenues	175,318.9	195,246.1
Total	2,467,691.9	2,536,027.9

Despite positive trends, real estate tax collection underperformed, reaching approximately AMD 99.6 million compared to the planned AMD 121.5 million. This may reflect valuation challenges, inefficiencies in collection mechanisms, or a constrained tax base. Similarly, revenues from penalties and fines were significantly below the projected AMD 400 million, amounting to only AMD 104 million, suggesting unrealistic forecasting assumptions or the need to strengthen enforcement mechanisms.

The most substantial deviation occurred in the official grants category, where actual inflows were approximately AMD 481 million below expectations. Given that grants constitute the largest share of municipal revenues, fluctuations in this category significantly affect overall fiscal stability. The shortfall may be due to administrative delays, changes in eligibility criteria, or unmet procedural requirements.

At the same time, most local revenue categories, including local duties, fees, and other revenues, achieved or exceeded planned levels, suggesting a relatively stable and diversified local revenue base.

Table 9. Municipal Administrative Budget Expenditures (thousand AMD)

Expenditure Category	Approved Budget	Actual Expenditure
Total expenditures	2,471,211.9	1,875,160.4

In 2025, actual administrative expenditures amounted to approximately AMD 1.88 billion, significantly below the approved budget of AMD 2.47 billion. The under-execution of approximately AMD 596 million (around 24%) may reflect prudent expenditure management or, more likely, incomplete implementation of planned programmes and activities.
While underspending may indicate fiscal discipline, it may also signal administrative constraints, procurement delays, implementation bottlenecks, or overestimation during the budgeting phase. Considering the underperformance of grant financing and the municipality's dependence on such resources, part of the under-execution may be attributable to delayed or unrealised external funding.
For future planning cycles, this variance highlights the importance of realistic budgeting, strengthening institutional capacity, and improved alignment between revenue projections and expenditure planning to ensure the full delivery of intended public services and development objectives.

Table 10. Municipal Capital Budget Expenditures (thousand AMD)

Expenditure Category	Approved Budget	Actual Expenditure
Total expenditures	1,576,359.5	663,684.6

In 2025, the execution of the municipal capital (investment) budget amounted to only AMD 663.7 million out of the planned AMD 1.58 billion, representing an under-execution of approximately 58%. This substantial gap between planned and actual capital expenditures indicates delays in implementing infrastructure and investment programmes, as well as potential constraints in financing, procurement, and administrative capacity. Such a low execution rate suggests that a significant share of planned development projects, including construction, rehabilitation, or major infrastructure investments, were either postponed or not implemented. This may be attributable to delays in technical planning, insufficient co-financing, delayed transfers from government or donors, or inefficiencies in project execution.
While capital budget under-execution may superficially appear as fiscal prudence, it effectively results in deferred community development, delayed service improvements, and slower infrastructure modernisation. To achieve higher capital investment execution rates in the future, it is necessary to strengthen project planning, financing procedures, and contractor management mechanisms.

Table 11. Local Self-Government Staffing and Budgetary Indicators

No.	Indicator	Value
1	Total number of municipal staff	195 persons
1.1	Including municipal civil servants	86 persons
2	Total administrative apparatus maintenance expenditures (thousand AMD)	724,076.7
3	Number of Municipal Council members	27 persons

As of 2025, the municipality employs 195 people, of whom 86 are municipal civil servants. This reflects a comparatively robust administrative structure, considering that the municipality serves a population exceeding 38,000 residents and manages a broad range of service delivery functions. The approximately

44% share of civil servants among total staff indicates that a substantial share of personnel consists of contractual or support staff rather than formally appointed civil servants.
Expenditures for maintaining the administrative apparatus amount to approximately AMD 724 million, reflecting the financial requirements for sustaining municipal operations, including salaries, utility costs, and administrative expenses. This figure represents a considerable share of current expenditures (AMD 1.88 billion, roughly 39%), warranting an efficiency assessment.
The presence of 27 Municipal Council members reflects the municipality's size and administrative complexity. Their governance role is essential for legislative functions, decision-making processes, and budget approval; however, the effectiveness of such a representative body largely depends on institutional capacity and internal coordination.

Chapter 3. Energy Carrier Consumption in Talin Municipality

In 2023, Talin Municipality's energy expenditures amounted to approximately AMD 169 million (equivalent to approximately USD 433,300), of which 67% was allocated to electricity payments. Electricity consumption was distributed almost equally between public street lighting, internal lighting of municipal buildings, and equipment use. Approximately 8% corresponded to natural gas expenditures, primarily for heating public and administrative buildings, while the remaining 18% related to fuel expenditures for municipal service vehicles[9].

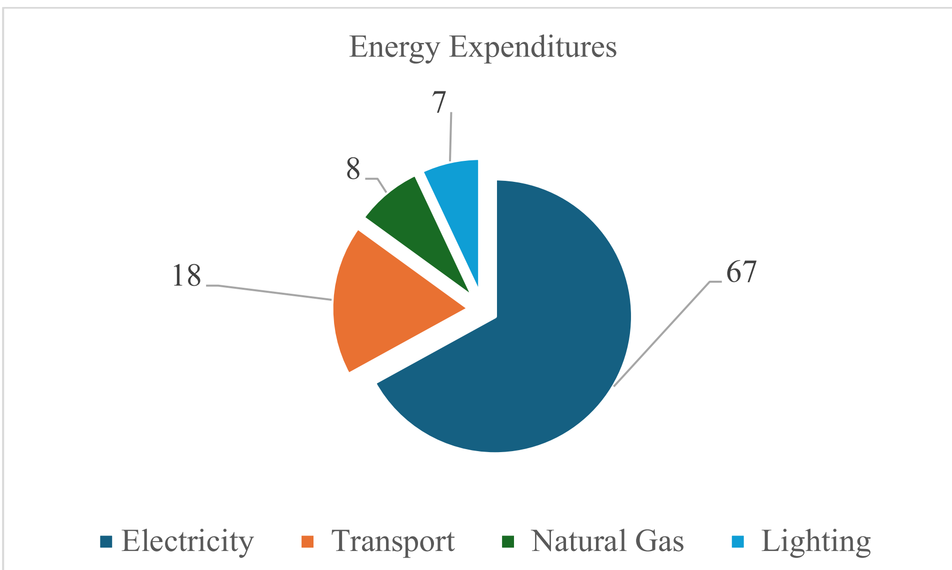


Figure 1. Energy Expenditures of Talin Municipality (%), 2023

The structure of energy consumption in Talin Municipality is primarily formed by the following energy carriers:

- Electricity;
- Natural gas;
- Transport fuels, including gasoline and diesel.

Based on the municipality's data and analyses, it is assumed that other energy carriers do not play a significant role in the municipal energy balance. Accordingly, the above-mentioned energy carriers

[9] Source: Talin Municipality

constitute the core structure of energy consumption in Talin Municipality and serve as the basis for the Baseline Emission Inventory calculations.

The principal sources of reliable and verifiable data on municipal energy consumption were the indicators for 2023–2024. Talin Municipality underwent administrative consolidation in the second half of 2022, which significantly affected data availability and comparability. The selection of the baseline year for the Baseline Emission Inventory was therefore made within this period in accordance with the Covenant of Mayors methodological requirements[10].

As a result, 2023 was designated as the baseline year against which emission reduction progress in subsequent target years will be assessed. Figure 2 presents the overall structure of energy carrier consumption in Talin Municipality in the baseline year.

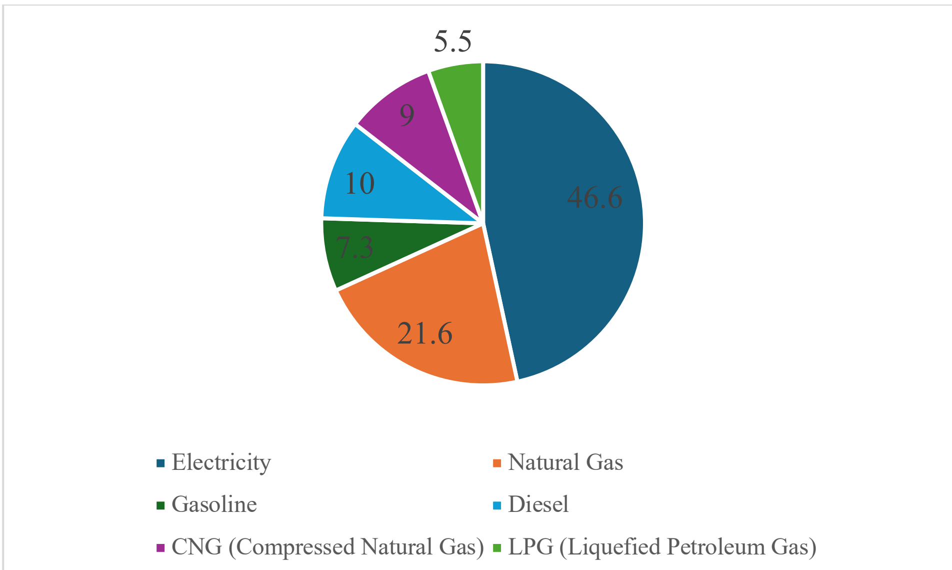


Figure 2. Structure of Energy Carrier Consumption in Talin Municipality in the Baseline Year (2023), %

The year 2023 was selected as the baseline year due to the relative completeness and availability of data obtained from the municipality, sectoral organisations, and publicly accessible sources. Furthermore, the energy consumption and emission structure during this period may be considered sufficiently stable and comparable, thereby providing a reliable foundation for long-term calculations and monitoring. Data for the transport sector were available only for 2025.

The total energy consumption of Talin Municipality for 2023–2024, by energy carrier and sector, is presented in Table 12.

Table 12. Total Energy Consumption of Talin Municipality (2023–2024) by Energy Carriers and Sectors

Energy Carrier	Residential Sector (MWh/year)		Community Institutions (MWh/year)		Transport (MWh/year)	Lighting (MWh/year)		Total Consumption (MWh/year)	
	2023	2024	2023	2024	2025	2023	2024	2023	2024
Electricity	16,167.367	16,352.475	2,369.740	1,723.789	–	234.094	205.120	18,771.201	18,281.384

[10] Baseline year – the reference year against which the emission reduction target is assessed. Energy consumption and emission data for this year are compiled in the form of a Baseline Emission Inventory (BEI), which serves as the primary benchmark for subsequent monitoring and progress evaluation.

Natural Gas	44,749.427	50,705.024	850.428	1,015.353	–	–	–	45,599.855	51,720.377
CNG	–	–	–	–	98,271.145	–	–	98,271.145	98,271.145
LNG	–	–	–	–	11,571.008	–	–	11,571.008	11,571.008
Firewood	–	–	–	–	–	–	–	–	–
Gasoline	–	–	–	–	15,490.224	–	–	15,490.224	15,490.224
Diesel	–	–	–	–	21,016.730	–	–	21,016.730	21,016.730
Manure (Biomass Fuel)	–	–	–	–	–	–	–	–	–
Total	**60,916.794**	**67,057.499**	**3,220.168**	**2,739.142**	**146,349.107**	**234.094**	**205.120**	**210,720.163**	**216,350.868**

As observed, the total energy consumption of Talin Municipality increased by approximately 2.6% during the period 2023–2024. Although this growth remains moderate, it underscores the need for targeted measures to improve energy efficiency and reduce greenhouse gas emissions.

The supply of electricity and natural gas is organised through centralised systems operated by Electricity Networks of Armenia CJSC (ENA) and Gazprom Armenia CJSC. These entities operate within a regulated market framework, with service tariffs set by the Public Services Regulatory Commission of the Republic of Armenia (PSRC).

Electricity tariffs are structured based on time-of-use zones and vary according to applicable thresholds (e.g., PSRC Decision No. 478-N of 29 December 2021; see Table 13).

Table 13. Electricity Tariffs for Consumers Supplied by Electricity 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 effective from 1 February 2022, except as specified in the table)[11]

Including VAT

No.	Final Consumer Groups	Unit	Tariff
1	Socially vulnerable families (according to 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 consumers in Group 1)		
a	Day tariff	AMD/kWh	46.48
b	Night tariff	AMD/kWh	36.48
c	Tariff applied in cases defined by EMA rules (reconnection of electricity supply, or if the consumer fails to obtain qualified consumer status within the prescribed period and procedure, or does not select an alternative electricity supplier)	AMD/kWh	54.61
3	Residential consumers supplied at 0.38 kV with monthly consumption from 200 kWh to 400 kWh (except consumers in Group 1)		
a	Day tariff	AMD/kWh	48.48
b	Night tariff	AMD/kWh	38.48
c	Tariff applied in cases defined by EMA rules (same conditions as above)	AMD/kWh	54.61
4	Residential consumers supplied at 0.38 kV with monthly consumption above 400 kWh (except consumers in Group 1)		
a	Day tariff	AMD/kWh	53.48
b	Night tariff	AMD/kWh	43.48
c	Tariff applied in cases defined by EMA rules (same conditions as above)	AMD/kWh	54.61
5	Other consumers supplied at 0.38 kV (non-residential)		
a	Day tariff	AMD/kWh	53.48
b	Night tariff	AMD/kWh	43.48

[11] **Source:** Official website of the Public Services Regulatory Commission.

c	Tariff applied in cases defined by EMA rules (same conditions as above)	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 applied in cases defined by EMA rules (same conditions as above)	AMD/kWh	54.61
7	Consumers supplied at 35 kV		
a	Day tariff	AMD/kWh	44.48
b	Night tariff	AMD/kWh	40.48
c	Tariff applied in cases defined by EMA rules (same conditions as above)	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 applied in cases defined by EMA rules (same conditions as above)	AMD/kWh	54.61

Natural gas supply tariffs are likewise approved by the same regulatory authority in accordance with the applicable regulatory framework (see Table 14).

Table 14. Natural Gas Tariffs for Consumers Supplied 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	233.90	
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	233.90	
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	46.70	
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 Ap

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 parameters used to prepare the Energy Balance and the Baseline Emission Inventory of Talin Municipality were obtained not only from relevant service providers but also from information supplied by the municipality and from open-source data.

Due to the absence of comprehensive institutional records and reliable statistical data, several indicators, particularly those related to liquid fuel consumption and private transport activity, were determined through expert estimation, based on reconciling municipal information, sectoral studies, and supplementary data sources.

The dynamics of population change enable the calculation of specific energy consumption indicators on a per-capita basis across sectors. These metrics provide a more objective basis for assessing the potential for energy efficiency improvements and for identifying priority sectors for investment allocation.

For recalculation and comparability, the physical quantities of energy carriers were converted to standard energy units. Conversion factors published in the European Commission's methodological guidance, as well as officially applied national coefficients of the Republic of Armenia, were utilised. This approach ensures methodological consistency and supports subsequent analytical assessments, scenario development, and projections. The complete list of applied conversion factors is presented in Table 15, which serves as a basis for transparency and reproducibility in calculations.

Table 15. Energy Conversion Factors and Parameters

Energy Carrier	Value	Unit	Comment
Natural Gas	9.41	kWh / Nm³	Corresponds to a lower heating value (LHV) of 8,100 kcal/m³
Diesel Fuel	10	kWh / liter	Or 11.9 kWh/kg (density assumed: 0.84 kg/l)
Gasoline	9.2	kWh / liter	Or 12.3 kWh/kg (density assumed: 0.75 kg/l)
Firewood	2.476	MWh / m³	Corresponds to LHV of 3,000 kcal/kg; bulk density assumed: 710 kg/m³
Liquefied Petroleum Gas (LPG)	7.3	kWh / liter	Or 13.1 kWh/kg (density assumed: 0.536 kg/l)
Manure (Biomass Fuel)	3.2	kWh / kg	Corresponds to LHV of 2,771 kcal/kg

Chapter 4. Energy Consumption of Municipal Facilities

As of the baseline year (2023), several institutions operate under the authority of Talin Municipality and are financed from the municipal budget. These include the municipality administration, administratively subordinate offices, preschool educational institutions, and other cultural and public-service facilities. All listed entities are consumers of electrical energy, while a significant portion are also subscribers to natural gas.

It should be noted that during the data collection and reporting process in Talin Community, a consolidated approach was applied in certain cases. In particular, in some settlements, energy consumption data for the administrative head’s office were presented alongside the respective settlement’s street lighting indicators as a single aggregated figure. Similarly, in some cases, the

electricity consumption of kindergartens, cultural centers, and street lighting operating within the same settlement was reported as one combined value.
The energy consumption volumes of these institutions constitute one of the principal components of the community's energy balance and, within the framework of the SECAP, are treated as priority sectors for implementing energy efficiency improvements and emission reduction measures.

4.1. Electricity and Natural Gas Consumption in Budgetary Institutions

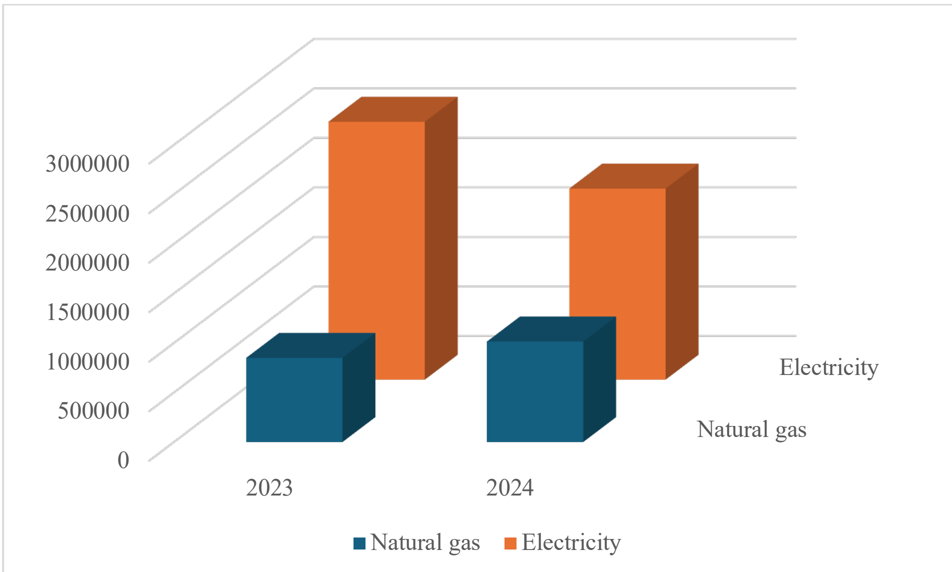


Figure 3. Energy Consumption of Municipal Institutions in 2023–2024

As previously noted, the primary energy carriers used in Talin Community institutions are electricity and natural gas. Certain facilities, such as the Irind Cultural Center and the Lusakani Administrative Head's Residence, meet their heating demand exclusively through electricity, while other institutions rely predominantly on natural gas, for example, the Katnaghbyur Nursery-Kindergarten and the Mastara Kindergarten SNCO.
Quantitative indicators of energy carrier consumption are based on final energy consumption, meaning that physical losses during production, transmission, and distribution are not included.
The annual consumption data for the main energy carriers, electricity and natural gas, used by municipally financed administrative, educational, cultural, and infrastructure-related institutions of Talin Community, as well as by the municipality administration, are presented in Table 16.

Table 16. Annual Electricity and Natural Gas Consumption Indicators of Municipal Budgetary Institutions

No	Institution Name	Electricity, kWh/year		Natural Gas, Nm³/year	
		2023	2024	2023	2024
1	Agharakavan Administrative Head's Office + Street Lighting	7,760	6,403	-	-
2	Agharakavan Culture House + Kindergarten + Street Lighting	15,699	16,185	-	-
3	Talin Street Lighting	310	1,634	-	-
4	Talin Kindergarten SNCO	690	918	501	1,944
5	Talin Culture House + Administrative Head's Office + Street Lighting	4,818	5,666	-	-
6	Ashnak Kindergarten SNCO	-	-	1,215	4,005
7	Ashnak Culture House + Administrative Head's Office + Street Lighting	2,287	5,039	2,313	2,548

8	Ashnak Events Hall	2,415	1,811	573	398
9	Ashnak Street Lighting	5,474	4,615	-	-
10	Aragatsavan Kindergarten SNCO	3,957	263	9,414	10,126
11	Aragatsavan Deep Well Pump	5,720	0	-	-
12	Aragatsavan Administrative Head's Office	7,700	5,863	3,834	4,083
13	Aragatsavan Culture House	10,586	7,944	-	-
14	Aragatsavan Music School SNCO	-	-	3,703	3,901
15	Aragatsavan Street Lighting	66,629	14,255	-	-
16	Aragatsavan Deep Well Pump – Tunnel	182,860	3,664	-	-
17	Aragatsavan Deep Well Pump – Perlite Substation	320,540	0	-	-
18	Arteni Kindergarten SNCO	-	-	8,353	8,559
19	Arteni Administrative Head's Office	8,314	5,082	2,420	2,663
20	Arteni Street Lighting	14,008	5,855	-	-
21	Arteni Culture House + Street Lighting	17,453	0	-	-
22	Arteni Deep Well Pump	152,081	152,730	-	-
23	Garnahovit Administrative Head's Office	1,000	469	-	-
24	Garnahovit Street Lighting	6,188	5,419	-	-
25	Getap Administrative Head's Office	5,944	4,439	-	-
26	Getap Street Lighting	9,563	6,868	-	-
27	Getap Deep Well Pump	15,041	10,305	-	-
28	Dashtadem Medical Point	123	164	-	-
29	Dashtadem Administrative Head's Office	3,609	2,772	-	-
30	Dashtadem Kindergarten SNCO	4,776	1,919	557	1,353
31	Dashtadem Street Lighting	47,131	46,087	-	-
32	Davtashen Kindergarten SNCO	-	-	1,431	5,009
33	Davtashen Culture House	762	383	-	-
34	Davtashen Events Hall	-	-	461	85
35	Davtashen Administrative Head's Office + Street Lighting	11,187	7,499	0	378
36	Dian Administrative Head's Office + Street Lighting	4,099	4,446	-	-
37	Yeghnik Administrative Head's Office + Street Lighting + Kindergarten	10,658	12,990	0	791
38	Zarinja Culture House + Administrative Head's Office	2,267	3,424	-	-
39	Zarinja Street Lighting	13,490	11,849	-	-
41	Zarinja Events Hall	-	-	730	808
40	Zovasar Administrative Head's Office	2,114	11,911	-	-
42	Zovasar Culture House	2,939	1,498	-	-
43	Zovasar Street Lighting	3,705	3,258	-	-
44	Tatul Street Lighting	7,062	4,138	-	-
45	Tatul Administrative Head's Office + Culture House	3,319	5,643	595	9
46	Tatul Events Hall	-	-	51	4,127
47	Talin Municipality Building	1,252,028	1,166,946	7,196	8,788
48	Talin Kindergarten No. 3 SNCO	13,109	12,169	7,097	7,698
49	Talin Nursery Kindergarten No. 2 SNCO			700	616
50	Talin Children's Art School SNCO	15,489	17,683	6,676	5,345
51	Culture House SNCO	48,880	61,325	-	-
52	Talin Sports Center SNCO	18,225	22,290	7,971	6,945
53	Talin Music School SNCO	-	-	8,213	8,280
54	Talin Street Lighting	25,072	33,840	-	-
55	Irind Kindergarten SNCO	-	-	1,068	2,999
56	Irind Events Hall	1,323	7,273	243	120
57	Irind Culture House + Administrative Head's Office + Library + Medical Point + Street Lighting	9,340	8,040	-	-
58	Lusakn Administrative Head's Office	1,434	1,773	-	-
59	Lusakn Street Lighting	4,890	4,152	-	-
60	Tsaghkasar	0	0	-	-
61	Katnaghbyur Nursery Kindergarten SNCO	-	-	755	334

62	Katnaghbyur Culture House + Street Lighting	1,262	2,025	-	-
63	Katnaghbyur Administrative Head’s Office + Street Lighting	16,927	13,210	2,074	2,139
64	Karmrashen Administrative Head’s Office + Street Lighting + Events Hall + Culture House	9,547	8,736	-	-
65	Kakavadzor Culture House	634	1,406	-	-
66	Kakavadzor Cross Lighting	1,834	5,254	-	-
67	Kakavadzor Administrative Head’s Office + Street Lighting	6,885	8,251	-	-
68	Hatsashen Street Lighting	2,142	1,952	-	-
69	Hatsashen Culture House	2,196	1,425	-	-
70	Hatsashen Administrative Head’s Office	4,132	1,661	-	-
71	Mastara Kindergarten SNCO	-	-	7,538	7,596
72	Mastara Administrative Head’s Office	1,594	1,339	2,139	2,728
73	Mastara Culture House	2,346	2,922	-	-
74	Mastara Events Hall	3,590	3,218	922	533
75	Mastara Street Lighting	39,836	32,923	-	-
76	Nerkin Bazmaberd Street Lighting	30,232	21,289	-	-
77	Nerkin Bazmaberd Culture House + Administrative Head’s Office	8,214	8,196	-	-
78	Nerkin Sasnashen Culture House + Administrative Head’s Office + Medical Point + Street Lighting	8,850	11,580	-	-
79	Nerkin Sasnashen Kindergarten SNCO	11,510	11,640	-	-
80	Nor Artik Administrative Head’s Office	2,370	2,450	-	-
81	Nor Artik Street Lighting	3,720	3,913	-	-
82	Nor Artik Events Hall	-	-	630	793
83	Shgharshik Street Lighting	4,674	3,730	-	-
84	Shgharshik Culture House + Administrative Head’s Office + Kindergarten + Medical Point + Library	7,545	6,510	-	-
85	Shgharshik Events Hall	-	-	695	2,051
86	Vosketas Events Hall	611	321	-	-
87	Vosketas Culture House + Administrative Head’s Office + Street Lighting	7,623	8,686	-	-
88	Partizak Administrative Head’s Office + Medical Point	131	2,667	-	-
89	Partizak Street Lighting	4,044	4,270	-	-
90	Suser Administrative Head’s Office + Culture House + Events Hall + Street Lighting + Preschool	7,179	7,485	-	-
91	Verin Bazmaberd Administrative Head’s Office + Culture House + Street Lighting (12.6 Solar)	23,420	17,970	-	-
92	Verin Sasnashen Culture House + Administrative Head’s Office + Street Lighting + Medical Point	6,780	7,386	-	-
93	Tsamakasar Street Lighting	4,999	4,074	-	-
94	Tsamakasar Administrative Head’s Office + Culture House	4,939	3,521	-	-
95	Tsamakasar Events Hall	-	-	211	35
Total		**2,603,834**	**1,928,909**	**90,279**	**107,787**

The analysis of the data presented in the tables indicates that electricity consumption in budgetary institutions and organizations exhibits variability. The 2024 indicators, compared with the baseline year 2023, demonstrate an approximately 74% reduction in electricity consumption, attributable to the implementation of a series of energy-saving and structural measures within the community. In particular, the observed decrease is associated with energy-efficiency improvements in certain facilities, the installation of solar photovoltaic systems, and the gasification of administrative buildings in high-altitude settlements, resulting in a significant reduction in electricity use for heating.

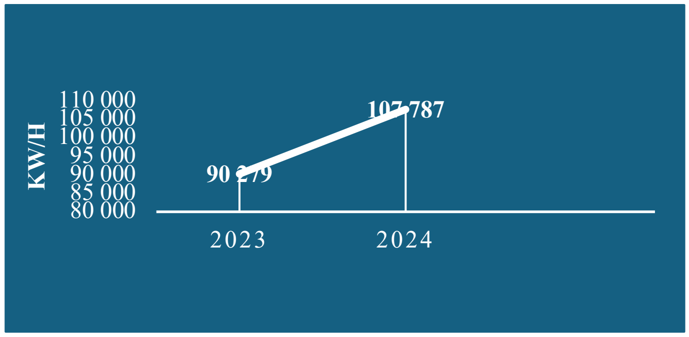


Figure 4. Natural Gas Consumption in Municipal Institutions

Figure 4 presents the increase in annual natural gas consumption. Overall, the consumption dynamics for 2023–2024 are characterized by an approximately 84% increase. These trends are primarily associated with the transition from electricity to natural gas to meet thermal demand.

The analysis of the 2023–2024 energy carrier consumption data provided by Talin Municipality indicates that among the largest consumers within municipally financed institutions are the Zari OKJ-N and the Kaputan Pumping Station. The Talin Administrative Office also remains among the consistently high consumers, with electricity consumption in 2024 totaling 43,289 kWh and natural gas consumption reaching 11,766 cubic meters. The remaining administrative offices, although exhibiting comparatively smaller volumes, collectively account for approximately one-third of total consumption, thereby constituting a significant component of the community's energy balance.

The analysis of the energy consumption structure shows that demand is primarily formed by natural gas and electricity. Within the overall consumption volume, electricity and natural gas are used in roughly equal amounts. Natural gas is predominantly used for heating, while electricity is mainly used for lighting and operating household and office equipment, except in facilities where natural gas is unavailable. The steady annual increase in consumption observed in these institutions reflects trends toward improved heating comfort and enhanced overall operating conditions.

Internal lighting in municipal facilities is predominantly provided through energy-efficient LED lamps.

Based on the above analysis, it can be concluded that insufficient thermal insulation of buildings, heat losses, and the limited efficiency of heating and ventilation systems contribute to excessive energy consumption and additional expenditures. Accordingly, the primary focus for energy savings should be modernizing heating and ventilation systems and reducing heat losses through the building envelope.

Chapter 5. Energy Consumption in the Residential and Public Sectors

The housing stock of the enlarged Talin Community consists of individual houses and multi-apartment buildings. The community includes 33 settlements, of which 32 are rural and 1 is urban. As of 1 January 2025, the community comprises 7,052 individual residential houses and 1,269 multi-apartment buildings. A significant portion of the housing stock is currently depreciated, both structurally and in its engineering systems.

Heating is predominantly provided through individual systems using natural gas.

5.1. Electricity Consumption by the Population and Public Facilities

The annual electricity consumption of private houses in Talin Community for 2023–2025 is presented in Table 17. It should be noted that, due to the absence of precise, disaggregated metering, the electricity consumption indicators for public facilities and residential buildings are presented as a single aggregated value.

Table 17. Annual Electricity Consumption in 2023–2024

Type of Residential Buildings	Unit of Measurement	Electricity Consumption Indicators		Notes
		2023	2024	
Apartment Buildings	MWh / year	1,924.341	1,950.669	
Specific Consumption of Apartment Buildings	kWh / year	1,567.00	1,588.00	Per apartment
Private Houses	MWh / year	14,243.026	14,401.806	
Specific Consumption of Private House	kWh / year	2,002	2,024	Per private house
Total	MWh / year	16,167.367	16,352.475	

All electricity consumption data were provided by the Musaler branch of "Electric Networks of Armenia" CJSC. The analysis of the data indicates that the level of electricity consumption by the population remained relatively stable and largely unchanged over the period under review. In 2024, an increase of approximately 1.1-1.3% was recorded compared to 2023, which can be assessed as a moderate fluctuation without any significant structural changes in consumption patterns. This trend is also illustrated in Figure 5.

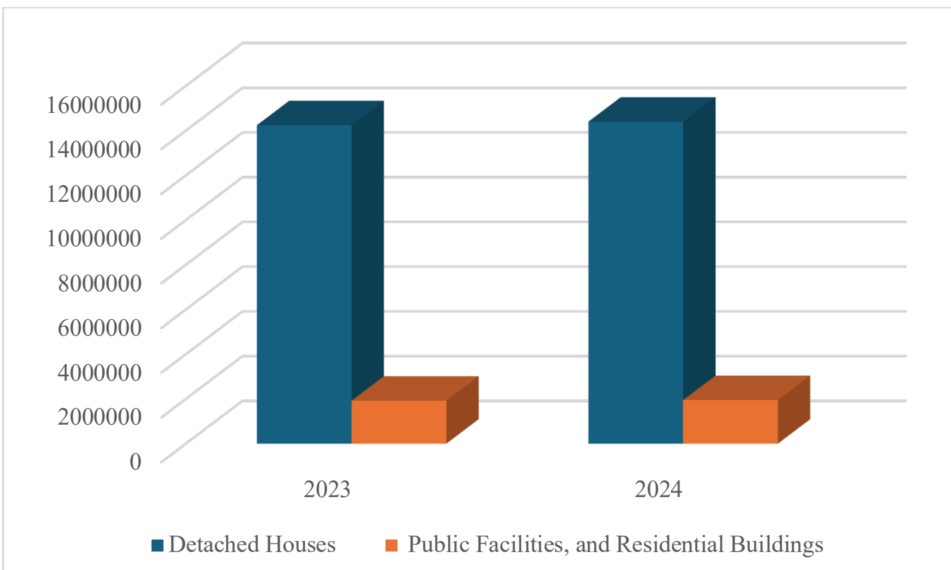


Figure 5. Electricity Consumption by the Residential and Public Sectors

5.2. Natural Gas Consumption by the Population

In Talin Community, gas supply infrastructures are largely in place; however, certain settlements are not yet included in the gasification network. In particular, gas supply is absent in the settlements of Agarakavan, Getap, Dian, Lusakn, Tsaghkasar, Kakavadzor, Nerkin Bazmaberd, Partizak, and Verin Bazmaberd.

In contrast to the electricity consumption indicators, natural gas consumption volumes demonstrate an increasing trend. Specifically, in 2024, natural gas consumption increased by approximately 9–10% compared to 2023 in private houses, residential buildings, and public service facilities. The corresponding gas consumption indicators are presented in Table 18.

Table 18. Natural Gas Consumption by the Population

Building Type	Annual Consumption, thousand m³ / year		Annual Consumption, MWh / year	
	2023	2024	2023	2024
Apartment Buildings	800.698	896.493	7,542.575	8,444.964
Specific Consumption of Apartment Buildings	16.9	16.7	159.2	157.3
Private Houses	3,949.772	4,486.206	37,206.852	42,260.061
Specific Consumption of Private House	83.1	83.3	83.1	83.3
Total	4,750.470	5,382.699	44,749.427	50,705.024

Chapter 6. Energy Consumption of the Transport Sector

In Talin Community, the transport system primarily consists of municipal and private vehicles, with public passenger transport services provided by private operators. This organizational model is typical for the majority of small and medium-sized communities in Armenia and reflects the general structural characteristics of their transport systems.

The main energy carriers used in the transport sector are compressed natural gas (CNG), liquefied petroleum gas (LPG), gasoline, and diesel fuel.

For converting motor fuel consumption volumes into energy units, the guidelines developed by the specialized bodies of the European Commission were applied, which define conversion factors for different fuel types[12].

6.1. Energy Consumption of Municipal Vehicles

The vehicles operating under the authority of Talin Community did not undergo quantitative changes during the period 2023–2024, and their operating regimes remained relatively stable. Taking this into account, Table 19 presents annual data on the energy carrier consumption volumes of municipal vehicles.

Table 19. Composition and Operational Indicators of Municipal Transport[13]

Type of Vehicles and Machinery	Model	Quantity, units	Average Annual Mileage, km	Engine Fuel Consumption		Type of Engine Fuel
				liters or m³ per 100 km	L/year, m³/year	
Passenger Cars	Toyota BZ4X Long Range Pro	2	27 500	-	-	Electric
	VAZ 21214		5 500	10.8	594	Compressed Natural Gas
Bus	RENAULT R 332 A1	2	40 000	25.0	10 000	Diesel Fuel

[12] 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*

[13] Source: Talin Municipality.

Multi-functional Backhoe Loader	SOLD BL385	1	1 750	9	15 750	Diesel Fuel
Dump Truck	Gaz SAZ 3507 /Arteni/	3	25 000	55.7	13 925	Compressed Natural Gas
	GAZ SAZ-3507 /Dashtadem/		12 000	55.7	6 684	Compressed Natural Gas
	HONGYAN 6X4 CQ3346HV35					
Garbage Trucks	MAZ-437121-542-011 KO-449-14	2	20 000	23	4600	Diesel Fuel
	MAZ-438121-540-001 KO-456-10		22500	23	5 175	Diesel Fuel
Water Truck	ZIL-130 KO-002	1	6000	18	1 080	Gasoline
Tractors	Belarus 82.1	8	432	8	3 456	Diesel Fuel
	SAME-603					
	YTO X 804					
	MTZ-82.1 Belarus					
	MTZ-82.1EO-1A					
	MTZ 82.1					
	Tractor Belarus 1523 (red)		810	8	6 480	Diesel Fuel
Total		3			21 203	Compressed Natural Gas
		13			45 461	Diesel Fuel
		1			1 080	Gasoline

The Talin Municipality fleet includes diesel, compressed natural gas, and gasoline-powered vehicles. Based on the data presented in the table, the physical volumes of motor fuels were converted to energy units using the aforementioned conversion factors. This approach enables the expression of different fuel consumption values in comparable units and their integration into a unified energy balance. Based on the results, Table 20 was developed to present summary indicators of energy consumption for Talin's municipal vehicles and construction machinery, thereby enabling a clearer assessment of total energy expenditures and their role within the community's energy system.

Table 20. Energy Consumption Structure of Municipal Transport

Type of Engine Fuel	Number of Vehicles	Energy Carrier Consumption		Consumption Structure, %
		Liters / year or	MWh / year	
Gasoline	1	1,080	9.936	1,5
Diesel Fuel	13	21,203	212.030	32,5
Compressed Natural Gas	3	45,461	428.243	66
Total	17	67,744	650.208	100

In summary, it can be stated that compressed natural gas (CNG) plays a significant role in the energy consumption structure of municipal transport in Talin, as it is characterized by relatively lower emissions compared to gasoline and diesel fuel. At the same time, even under conditions of widespread CNG use, the transport sector remains a substantial source of greenhouse gas emissions, thereby necessitating a systematic, long-term policy approach to further emission reductions and the gradual introduction of cleaner, more energy-efficient, and sustainable solutions in municipal transport.

6.2. Energy Consumption of Private and Commercial Transport

The assessment of energy consumption by private and commercial vehicles in the Talin Community was conducted based on limited data provided by the municipality, which relates exclusively to 2025. The lack of comprehensive data was addressed by applying average indicators published by the Statistical

Committee of the Republic of Armenia for the respective marz, which were correlated with the community's population size. The structure of Talin's private and commercial vehicle fleet, along with its principal annual operational parameters, is presented in Table 21, where the distribution by vehicle category is approximate.

Table 21. Characteristics of the Private and Commercial Vehicle Fleet

Type of Vehicles	Type of Fuel	Average Annual Mileage, km	Fuel Consumption		Number of Vehicles, units in 2025	Energy Carrier Consumption (MWh / year)
			liters or m³ per 100 km	liters per year, m³ per year		
Passenger Cars	Gasoline	9 000	12.3	1,682.640	1 500	15,480.288
	Diesel Fuel	9 000	6.5	696.150	1 190	6,961.500
	CNG	12 000	6	9,909.360	13 763	93,346.171
	LPG	11 000	8.5	1,496.000	1600	10,920.800
Total Passenger Cars					18 053	126,708.759
Trucks	Gasoline					
	Diesel Fuel	6 000	14	1,384.320	1 648	13,843.200
	CNG	3 000	12	477.360	1 326	4,496.731
	LPG					
Total Trucks					2 974	18,339.931

The analysis of the data presented in Table 21 allows for assessing the fuel structure of Talin Community's private and commercial vehicle fleet, as well as the key energy consumption trends arising from it. The data indicate that in 2025, the majority of passenger vehicles operated on compressed natural gas and gasoline, with their combined share accounting for approximately 86%. In particular, the share of CNG reached 74%, while gasoline represented 12%. The number of passenger vehicles operating on liquefied petroleum gas (LPG) remains relatively small.

Within the fuel structure of freight vehicles, diesel fuel predominates, accounting for approximately 75%, while the remaining 25% is used by vehicles operating on compressed natural gas (CNG).

The comprehensive analysis of the data is presented in Table 22, with the overall distribution illustrated in Figure 6. These data enable the formation of an integrated view of the community's transport energy consumption, the identification of the dominant fuel structure, and the evaluation of prospects for energy efficiency improvements.

Table 22. Characteristics of the Private and Commercial Vehicle Fleet by Fuel Type

Type of Fuel	Passenger Cars		Trucks		Total Subsector	
	MWh	%	MWh	%	MWh	%
Gasoline	15,480.288	12%			15,480.288	11%
Diesel Fuel	6,961.500	5%	13,843.200	75%	20,804.700	14%
CNG	93,346.171	74%	4,496.731	25%	97,842.902	67%
LPG	10,920.800	9%			10,920.800	8%
Total	126,708.759	100%	18,339.931	100%	145,048.690	100%

The analysis indicates that Talin's transport sector is undergoing an energy transition. The high share of gaseous fuels, particularly compressed natural gas (CNG), reflects the local transport fleet's adaptive

capacity and transformation potential. This represents not only an economically advantageous solution but also an environmentally preferable option in the context of lower carbon emissions.
This dynamic constitutes an important baseline for Talin Community in developing and orienting its sustainable mobility strategy and policy.

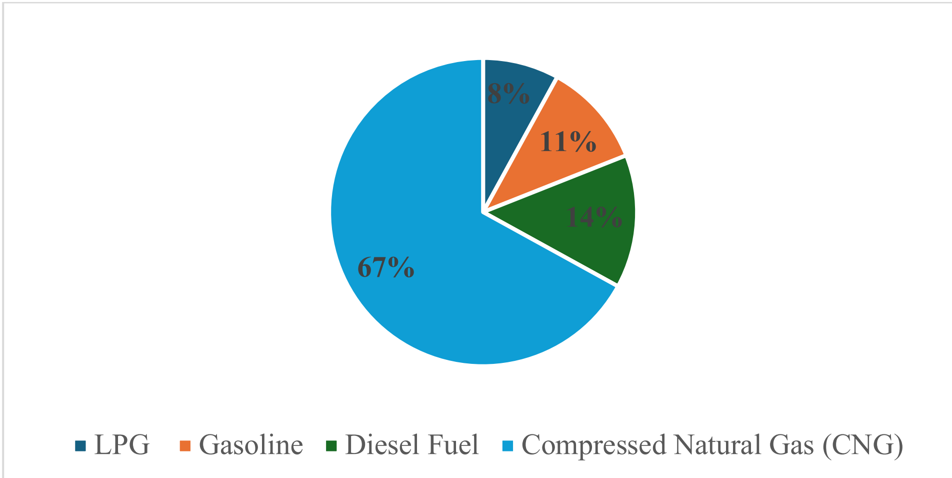


Figure 6. Overall Characteristics of the Private and Commercial Vehicle Fleet

Chapter 7. Street Lighting System

The analysis of the data provided by Talin Municipality covers the electricity consumption indicators of the external street lighting system exclusively. These data do not include the volumes of electricity consumed by advertising, informational, or other lighting elements installed in public spaces. At the same time, it should be noted that the analysis incorporates only the data from settlements where street lighting expenditures are metered separately and are disaggregated from the consumption of other municipally owned entities. This implies that the presented data do not reflect the full energy budget of the lighting sector and may therefore somewhat underestimate its actual share within the overall community energy consumption structure.
In recent years, Talin Community has witnessed the gradual development of the street lighting system, reflected in the expansion of illuminated areas and the technical modernization of lighting fixtures. The corresponding electricity consumption indicators for street lighting are presented in Table 23.

Table 23. Street Lighting Consumption Indicators in Talin Community

No	Name of Institution	Electrical Energy, kWh / year	
		2023	2024
1	Street Lighting of Talin Settlement	310	1,634
2	Street Lighting of Ashnak Settlement	2,415	1,811
3	Street Lighting of Arteni Settlement	14,008	5,855
4	Street Lighting of Garnahovit Settlement	6,188	5,419
5	Street Lighting of Getap Settlement	9,563	6,868
6	Street Lighting of Dashtadem Settlement	47,131	46,087
7	Street Lighting of Zainja Settlement	13,490	11,849
8	Street Lighting of Zovasar Settlement	3,705	3,258
9	Street Lighting of Tatul Settlement	7,062	4,138
10	Street Lighting of Talin City	25,072	33,840

11	Street Lighting of Lusakn Settlement	4,890	4,152
12	Lighting of Kakavadzor Cross	1,834	5,254
13	Street Lighting of Hatsashen Settlement	2,142	1,952
14	Street Lighting of Mastara Settlement	39,836	32,923
15	Street Lighting of Nerkin Bazmaberd Settlement	30,232	21,289
16	Street Lighting of Nor Artik Settlement	3,720	3,913
17	Street Lighting of Shgharshik Settlement	4,674	3,730
18	Street Lighting of Partizak Settlement	4,044	4,270
19	Street Lighting of Tsamakasar Settlement	4,999	4,074
	Total	**234,094**	**205,120**

During the period 2022–2024, Talin Community recorded measurable progress in developing the street lighting system, both in expanding illuminated areas and improving the technical quality of lighting fixtures. In particular, the number of lighting units installed in Talin town amounted to 2,100 in 2023 and 2,125 in 2024. At the same time, the technical indicators of the street lighting systems in rural settlements are as follows: in 2023, the number of lighting units totaled 3,592, whereas in 2024 it amounted to 2,827. The installed LED lighting fixtures have a nominal capacity of 60 W.
The community receives an average of 10 hours of lighting per day during the summer (215 days) and 7–8 hours during the winter (150 days). This reflects the ongoing implementation of LED technologies to improve energy efficiency. The total length of illuminated streets in Talin town was approximately 60 km in 2023 and 61 km in 2024, while in rural settlements the respective values were 97 km and 106 km. The technical indicators of Talin town's street lighting system are presented in Table 24, and those of the rural settlements are provided in Table 25.
Despite the progress achieved, the street lighting system of Talin continues to face certain challenges. In particular, in some sections, the modernization has been implemented only partially.

Table 24. Technical Indicators of the Street Lighting System of Talin Town

Indicator Name	Unit of Measurement	Indicator Value		Notes
		2023	**2024**	
Number of Poles	units	1 500	1 520	
Number of Luminaires	units	2 100	2 125	
LED Lamps	units	0	3 165	
	W	60	60	
	units	2100	2125	
	W			
Total Installed Capacity	kW	126	127	Calculated value
Annual Electricity Consumption	MWh / year	264	266	
Electricity Consumption Index	%	100	100.7	Calculated value
Number of Annual Operating Hours	hours / year	2 098	2 098	Calculated value
Total Length of Illuminated Streets	km	60	61	
Average Summer Operating Hours	hours / day	506	506	
Average Winter Operating Hours	hours / day	782	782	

Table 25. Technical Indicators of the Street Lighting Systems in the Rural Settlements of Talin Community

Indicator Name	Unit of Measurement	Indicator Value		Notes
		2023	2024	
Number of Poles	units	3582	3815	
Number of Luminaires	units	3592	3827	
LED Lamps	units	2201	3044	
	W	60	50	
	units			
	W			
Total Installed Capacity	kW	35	114.5	Calculated value
Annual Electricity Consumption	MWh / year	130	158	
Electricity Consumption Index	%	100	121.5	Calculated value
Number of Annual Operating Hours	hours / year	47232	47232	Calculated value
Total Length of Illuminated Streets	km	97	106	
Average Summer Operating Hours	hours / day	10/215	10/215	
Average Winter Operating Hours	hours / day	8/150	8/150	

Nevertheless, it is worth noting that the introduction of light-emitting diode (LED) technologies and the expansion of illuminated areas reflect the community's consistent, strategic atoaimed at improving energy efficiency and reducing the overall carbon footprint.

Chapter 8. Collection and Disposal of Municipal Solid Waste

According to the information provided by the municipality, during 2023–2024, the average annual volume of municipal solid waste transported to the landfill amounted to 2,732.8 tons, while the total area occupied by landfills was 8.85 hectares. This indicator characterizes the volume of waste generated in Talin Community and serves as an important basis for assessing the effectiveness of the waste management system, as well as for calculating greenhouse gas emissions from waste, particularly methane, within the framework of the SECAP.

In Talin Community, the collection and transportation of municipal solid waste are organized and implemented by the "Talin Communal Service" SNCO. For this purpose, waste containers of appropriate capacity are installed throughout the community's administrative territory, including streets, courtyards, areas adjacent to residential buildings, and public spaces. These containers ensure the regular collection, temporary storage, and subsequent transportation of municipal solid waste to the landfill. The existing organization of the waste collection system significantly contributes to maintaining sanitary and hygienic conditions, ensuring the cleanliness of public spaces, and reducing adverse environmental impacts. At the same time, its continuous improvement is considered an important prerequisite for enhancing waste management efficiency and supporting the community's environmental sustainability.

No	Location (Administrative Area)	Landfill Area, ha	Annual Waste Volume, tons
1	Partizak Settlement	0.40	320
2	Katnaghbyur Settlement	0.22	712.8
3	Mastara Settlement	0.45	370
4	Talin City	3.00	610
5	Aragatsavan Settlement	4.78	720
	Total	**8.85**	**2732.8**

The main waste streams are generated from households, administrative buildings, commercial establishments, and educational institutions. A seasonal increase in waste volumes is observed, particularly during the summer months, driven by intensified agricultural activities.
At present, separate waste collection and recycling practices are not implemented in Talin Community, and the existing landfill sites do not comply with modern environmental standards. The majority of waste is accumulated in open areas without preliminary sorting or treatment. This situation contributes to risks of soil, water, and air pollution, as well as the generation of greenhouse gas emissions, particularly methane.
Considering the above, it is necessary to design and implement a waste management improvement program, which should include:

- ✓ optimization of waste collection schedules and frequency,
- ✓ renewal or expansion of waste collection vehicles and containers,
- ✓ rehabilitation of the landfill site and introduction of a monitoring system,
- ✓ pilot introduction of separate waste collection, starting with municipal institutions and schools,
- ✓ implementation of public awareness and educational programs aimed at promoting waste reduction and recycling practices.

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 subsector on the community's overall emissions balance should be assessed. In the future, where feasible, it is advisable to implement a pilot project for landfill gas capture and utilization to support small-scale local energy generation.

Chapter 9. Development of the Baseline Emissions Inventory

For the purpose of developing the SECAP of Talin Community, the year 2023 was adopted as the baseline year, as the information available for this period is the most complete, reliable, and consistent with the methodological requirements of the Covenant of Mayors. During 2023-2024, data collection and processing were conducted to prepare the energy balance and the Baseline Emissions Inventory. The selected period enables a more objective representation of the community's current energy consumption and greenhouse gas emissions, as well as the socio-economic factors that influence them.
The selection of the baseline year is justified by the following considerations:

- ✓ The completeness and reliability of the energy consumption and emissions data provided by Talin Community,
- ✓ compliance with the EU Covenant of Mayors (CoM) guidelines, which stipulate that the baseline year should be the most reliable and representative period in terms of data availability.

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

9.1. Main Sources of Greenhouse Gas Emissions

In accordance with the methodological guidelines of the Covenant of Mayors for Climate and Energy, the Baseline Emissions Inventory 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 is intended to ensure a comprehensive analysis of the community's energy and climate system and a balanced approach, enabling the identification of effective intervention areas, enhancing

the coherence and impact of policy actions, and contributing to the achievement of sustainable development and climate objectives.
This requirement is important, as it ensures a holistic assessment of the community's energy and climate system, encompassing both the principal sources of energy consumption and the main emission pathways.
Such an approach enables a comprehensive analysis of the community's energy consumption structure, the identification of key emission sources, and the formulation of more effective policies aimed at sustainable energy development, emission 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) – include all energy consumption systems, namely heating, cooling, ventilation, lighting, and household electricity use.
🚗 Transport – includes the consumption of energy carriers by municipal, public, private, and commercial vehicles.
💡 External (street) lighting – includes the energy consumption of municipal infrastructure, including street lighting, traffic signals, and other external systems.
🗑️ Waste management system – includes the collection, transportation, and processing of municipal, industrial, and other types of waste, as well as emissions generated during thermal and organic decomposition processes.
These sectors encompass the principal energy-consuming infrastructures and major emission sources within the community, thereby ensuring a comprehensive and coherent structure of the SECAP.
The Baseline Emissions Inventory quantitatively assesses the CO_2 or CO_2-equivalent greenhouse gas emissions generated by energy consumption within the community's territory for the selected baseline year. It enables the identification of the main anthropogenic emission sources and supports the formulation of targeted mitigation measures.
Greenhouse gas emissions were calculated on a sector-by-sector basis 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 factors were applied:
- conversion factors for transforming the consumption volumes of different energy carriers into energy units, as presented in Table 15;
- CO_2 emission factors used for estimating greenhouse gas emissions are presented in Table 26.

Table 26. CO_2 Emission Factors for the Estimation of Greenhouse Gas Emissions[14]

Energy Carrier	Emission Factor
Electrical Energy	0.241 t CO_2 / MWh
Natural Gas	0.202 t CO_2 / MWh
Motor Gasoline	0.249 t CO_2 / MWh
Diesel Fuel	0.267 t CO_2 / MWh
Liquefied Petroleum Gas (LPG)	0.227 t CO_2 / MWh

[14] 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.)

Firewood (non-sustainable) [15]	0.403 t CO_2 / MWh
Firewood (sustainable)[16]	0 t CO_2 / MWh
Firewood (actual)	0.121 t CO_2/MWh In the present SECAP, the firewood emission factor was calculated by combining the emission factors defined for sustainable and unsustainable forest management approaches, as a result of which a factor of 0.121 t CO_2/MWh was adopted.
Livestock Biomass (manure)	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 the present program.

9.2. Baseline Emissions Inventory

For the baseline year, the absolute indicators of energy carrier consumption in Talin Community are presented by sector.

The data include the energy consumption of municipal facilities, the residential sector, transport, and street lighting, thereby reflecting the overall energy profile of the community. Accordingly, the data presented in Table 27 serve as the basis for evaluating the community's energy structure and for planning subsequent mitigation measures.

Table 27. Energy Carrier 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	16,167.367	2,369.740	–	234.094	18,771.201
Natural Gas	44,749.427	850.428	–	–	45,599.855
CNG	–	–	98,271.145	–	98,271.145
LPG	–	–	11,571.008	–	11,571.008
Gasoline	–	–	15,490.224	–	15,490.224
Diesel Fuel	–	–	21,016.730	–	21,016.730
Total	60,916.794	3,220.168	146,349.107	237.094	210,720.163
Total (%)	28.9	1.53	69.4	0.10	100

The analysis of the data presented in Table 27 indicates that the transport sector accounts for a significant share of Talin Community's energy consumption structure, representing approximately 69.4% of total community energy use in the baseline year. A clear predominance of gaseous fuels is observed in this sector, where compressed natural gas (CNG) with a 67.1% share remains the most widely used energy carrier, primarily due to its affordability and widespread use. At the same time, diesel fuel maintains a notable role, accounting for 14.3% (particularly in freight transport), while gasoline (10.5%) and liquefied petroleum gas (LPG) (7.9%) collectively complement the community's transport fuel mix.

The transport sector is followed by the residential sector, which represents 28.9% of total community energy consumption. The principal sources of energy use in this sector are natural gas (73.5%) and electricity (26.5%). The obtained data indicate that the majority of household energy demand in Talin is

[15] Firewood obtained as a result of unsustainable forest management (where harvesting volumes exceed the natural growth of forests), which constitutes a non-renewable resource and whose combustion results in carbon dioxide emissions.

[16] Firewood derived from the natural growth of biomass, which is classified as a renewable resource obtained under sustainable forest management conditions (where, on average, forest growth equals or exceeds harvesting volumes). In the calculations, emissions resulting from the combustion of biomass belonging to this category are considered zero, in accordance with the requirements of the Covenant methodological guidelines.

met through natural gas and electricity, while no data are available regarding the use of biomass (firewood, manure).

Energy consumption by municipal facilities accounts for approximately 1.5%, whereas street lighting systems account for only 0.10%, a characteristic of small and medium-sized settlements where public infrastructure energy demand remains relatively limited.

The energy consumption structure of the sectors included in the BEI is presented in Figure 7.

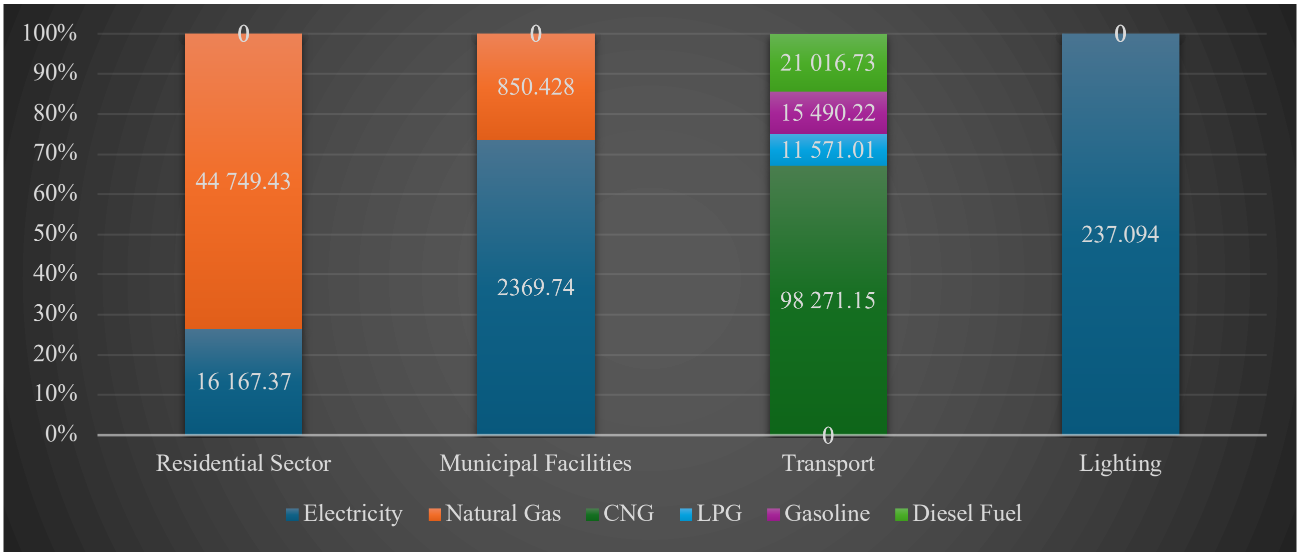


Figure 7. Energy Carrier Consumption Indicators by Sector in Talin Community, 2023

As noted, greenhouse gas emissions for the baseline year are calculated by multiplying the absolute energy consumption data presented in Table 27 by the corresponding CO_2 emission factors provided in Table 26.

Despite the fact that firewood is not currently used as an energy carrier in Talin Community, the following should be considered in the event of its potential future use. A specific methodological approach is used to estimate carbon dioxide (CO_2) emissions from firewood utilization. According to the methodological guidelines of the Covenant of Mayors and the IPCC 2006 accounting principles, if firewood is sourced under conditions of sustainable forest management, where annual forest growth equals or exceeds harvesting volumes, it is considered a renewable energy resource.

In such cases, the CO_2 emissions generated from firewood combustion are considered carbon neutral, as the emitted quantity corresponds to the carbon absorbed from the atmosphere during biomass growth. Consequently, CO_2 emissions from the combustion of sustainably sourced firewood are accounted for as zero (0 t CO_2/MWh), reflecting the balance of the natural carbon cycle.

At the same time, if firewood is obtained through unsustainable forest exploitation, where harvesting exceeds the forest's regeneration capacity, it is treated as a non-renewable resource, for which an emission factor of 0.403 t CO_2/MWh is applied.

The calculated CO_2 emissions resulting from the use of energy carriers included in the BEI are presented in Table 28.

Table 28. Baseline Emissions Inventory of Talin Community. Greenhouse Gas Emissions 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		
Electricity	3,896.335	627.524	–	94.924	–	4,618.783
Natural Gas	9,039.384	171.786	–	–	–	9,211.170
CNG	–	–	19,850.771	–	–	19,850.771
LPG	–	–	2,479.022	–	–	2,479.022
Gasoline	–	–	3,857.066	–	–	3,857.066
Diesel Fuel	–	–	5,611.467	–	–	5,611.467
Landfill	–	–	–	–	61.9 tCH_4/year (1,733.2 tCO_2/year)	1,733.200
Total (tCO_2)	12,935.719	799.310	31,798.326	94.924	1,733.200	47,361.479
Total (%)	27.3	1.69	67.1	0.2	3.61	100

The analysis of the data presented in Table 28 indicates that the transport and residential (population) sectors represent the dominant sources within Talin Community's greenhouse gas emissions structure, accounting for the largest share of total emissions.

In the baseline year, the combined activities of Talin Community's population, economy, and transport system resulted in approximately 47,361.48 tons of CO_2-equivalent (tCO_2) greenhouse gas emissions into the atmosphere.

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

9.3. Target Volume of Greenhouse Gas Emission Reductions by 2030

In accordance with the procedures of the Covenant of Mayors, local self-government authorities of communities in Eastern Partnership countries are authorized to independently define their 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 by 2030 is determined on the basis of the emissions calculated for the baseline year.
2. Business-as-usual scenario, under which the emission reduction target by 2030 is established by taking into account population growth, expansion of economic activity, development of transport and infrastructure, as well as the corresponding projected natural increase in emissions.

Under the first scenario, the greenhouse gas emission reduction target for 2030 is defined as 35% of the baseline year emissions (the principal commitment of the community within the Covenant of Mayors framework), and therefore will amount to:

$$47{,}361.48 \times 0.35 = 16{,}576.5 \text{ tons } CO_2 \text{ / year}$$

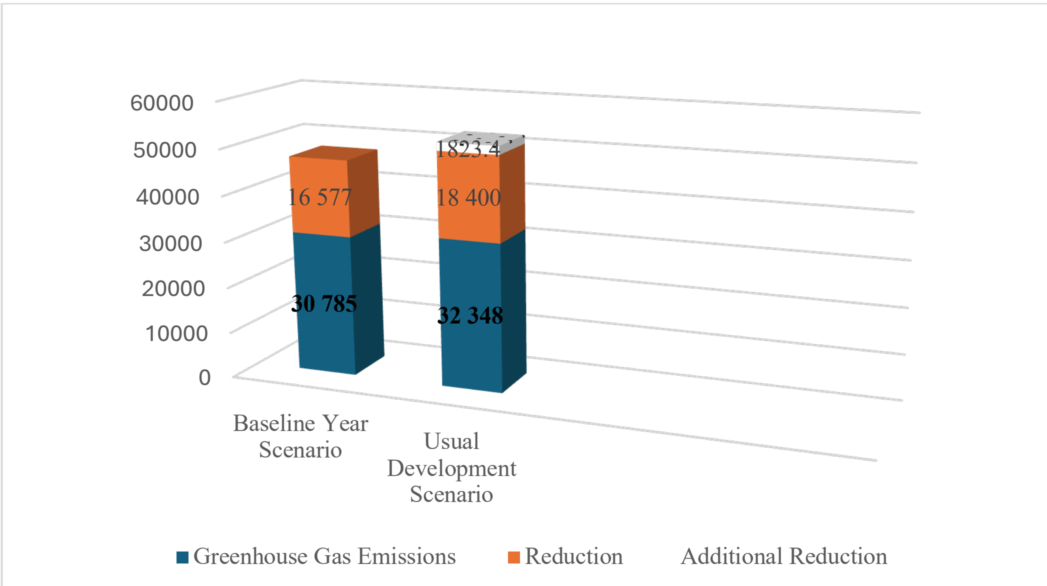
Under the second, business-as-usual scenario, the greenhouse gas emission reduction target by 2030 is calculated based not on baseline-year emissions, but on the community's projected emissions level by 2030. This approach assumes that socio-economic development, population growth, and the expansion of transport systems and energy infrastructure will inevitably lead to a natural increase in emissions by 2030.

To adequately account for this increase, an economic growth factor greater than 1 is applied, reflecting the community's economic and demographic dynamics. For Armenia, the average growth factor

recommended by the Joint Research Centre[17] for 2023 is 1.11, representing a moderate yet stable development scenario.
Accordingly, under this scenario, the greenhouse gas emission reduction volume for Talin Community by 2030 will amount to:

$$47{,}361.48 \times 1.11 \times 0.35 = 18{,}399.9 \text{ tons } CO_2 \text{ / year},$$

resulting in 1,823.43 tons CO_2 more than under the baseline year scenario.



The analysis of data collected during the preparation of this document (Table 29) indicates that during 2023-2024, Talin Community recorded a significant positive trend in energy carrier consumption volumes.

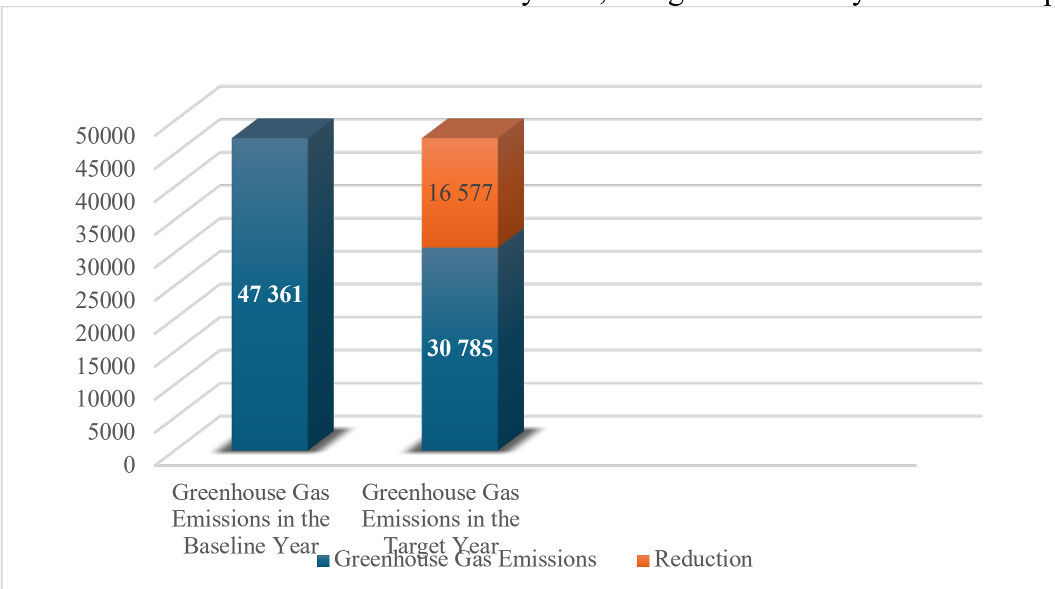
Table 29. Energy Carrier Consumption Indicators in Talin Community Expressed in Energy Units (MWh) and Greenhouse Gas Emission Volumes.

Energy Carrier Type	Energy Consumption (MWh/year)		GHG Emissions (t CO_2/year) 2023	
	2023	2024	2023	2024
Electricity	18,771.201	18,281.384	4,430.003	4,314.406
Natural Gas	45,599.855	51,720.377	9,211.170	10,447.516
CNG	98,271.145	98,271.145	19,850.771	19,850.771
LPG	11,571.008	11,571.008	2,626.618	2,626.618
Firewood	0	0	0	0
Manure	0	0	0	0
Gasoline	15,490.224	15,490.224	3,857.065	3,857.065
Diesel Fuel	21,016.730	21,016.730	5,611.466	5,611.466
Total	58,561.328	70,914.877	45,587.096	46,707.845

The greenhouse gas emission volumes presented in Table 29 were calculated using the emission factors defined by the Joint Research Centre (JRC) of the European Commission for different energy carriers, along with their localized normative values adapted for Armenia, as presented in Table 15. This

[17] The guidelines developed by the Joint Research Centre (JRC) propose corresponding “economic development” coefficients for different countries. For Armenia, when selecting 2023 as the baseline year, a coefficient of 1.11 is defined.

calculation approach ensures the comparability of emission data with European standards while simultaneously reflecting national specificities and the structure of local energy carrier consumption.
As previously noted, under the business-as-usual scenario, Talin Community's greenhouse gas emission reduction obligations by 2030 increase by approximately 1,823.43 tons compared to the baseline scenario. The calculations indicate that achieving such an additional reduction may be difficult for the community, as it would require substantial financial, technical, and administrative resources, including investments in infrastructure improvements, modernizing the transport system, and implementing large-scale energy efficiency measures.
Considering the above, it is advisable that Talin Community's greenhouse gas emission reduction targets for 2030 be determined based on the 2023 inventory data, using the baseline year scenario approach.



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

$$47,361.48 \times 0.35 = 16,576.5 \text{ tons } CO_2 \text{ / year.}$$

This calculation implies that Talin Community must ensure an annual reduction of at least 16,576.5 tons of CO_2 equivalent emissions by 2030, 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 a principal benchmark for planning measures related to energy efficiency, renewable energy development, and greenhouse gas emission mitigation within the community.

Chapter 10. Climate Change Mitigation Actions

By joining the Covenant of Mayors, Talin Community has committed to reducing community-wide greenhouse gas emissions by at least 35% by 2030. To ensure fulfilment of this obligation, the present SECAP has been developed, incorporating a comprehensive package of measures comprising investment-intensive "hard" measures and organisational, non-investment "soft" measures. The planned actions are presented in detail in the subsequent sections of this chapter, respectively structured as "hard" and "soft" steps aimed at emission reductions. The full implementation of the measures envisaged by 2030 will enable Talin Community to reduce CO_2 emissions by at least 17,095.619 tonnes annually, exceeding the Covenant's reduction target by approximately 519 tonnes. At the same time, the proposed measures are aligned with Armenia's national energy and climate policy framework, sectoral legislation requirements, and decisions and development programmes adopted at national and local levels. The measures proposed in the renewable energy sector 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 governing electricity generation and consumption established by the Public Services Regulatory Commission (particularly those applicable to grid-connected PV plants and autonomous power producers).

It is noteworthy that the Action Plan takes into account the recent trends in the development of "green" technologies within the Republic of Armenia, including the widespread deployment of solar photovoltaic systems and the annual growth in electric vehicle imports under favourable tax incentives. Within this supportive policy and regulatory environment, the Community is better positioned to implement energy efficiency and renewable energy programmes more effectively, thereby reducing emissions and enhancing resilience to climate change.

The total investment volume required to implement the energy efficiency, energy-saving, and renewable energy promotion measures under the SECAP's climate mitigation component is estimated at approximately AMD 3.6 billion. Of this amount, around AMD 891 million (approximately 24.7%) is allocated to projects involving renewable energy sources, underscoring the strategic role of solar and other renewable technologies within the Community's energy transition pathway.

Chapter 11 of the present SECAP defines the package of investment-based "hard" measures designed to deliver substantial energy savings and tangible CO_2 emission reductions within the Community. These measures cover the principal sectors, including municipal (budgetary) buildings and infrastructure, public (street) lighting, the residential sector, and transport. Although these interventions require financial investments, the expected outcomes are significantly greater, with visible energy savings and emission reductions achieved through their implementation, compared to those generated by "soft" measures.

Chapter 12 of the SECAP presents the "soft" measures, which comprise organisational, educational, capacity-building, and policy-support actions. While these measures do not require major financial expenditures, they play a critical role in ensuring the effective implementation and long-term sustainability of the Action Plan. Such measures can be implemented relatively easily by the municipality in cooperation with relevant stakeholders and are primarily aimed at increasing public and professional awareness, strengthening institutional capacities, and creating enabling conditions for the efficient implementation of investment-oriented "hard" measures. Consequently, the Action Plan does not provide quantified CO_2 reduction estimates for the "soft" measures, as they are considered supportive interventions without direct emission-reduction calculations, yet essential for establishing the necessary framework and driving achievement of the SECAP objectives.

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

To mitigate the adverse impacts of global climate change and fulfil Talin Community's commitments under the Covenant of Mayors to reduce greenhouse gas emissions by at least 35%, this section presents measures requiring capital investments. These measures ensure more tangible, stable, and long-term results in terms of emission reductions.

Measures of this type are proposed for the key sectors included in the SECAP's Baseline Emission Inventory: municipal buildings, public lighting, residential buildings, and public and communal transport.

The proposed actions are consistent with the provisions of the documents referenced in the SECAP that define the Republic of Armenia's energy and climate policy priorities and strategic directions, as well as with decisions and development programmes adopted at national and local levels.

The measures envisaged for municipally 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 Improving Energy Saving and Energy Efficiency in Facilities Constructed (Reconstructed, Repaired) at the Expense of State Funds." According to this decision, in order to reduce thermal and electrical energy consumption in buildings, decrease operational costs, and ensure normative comfort conditions, the following measures shall be implemented:

- application of façade cladding, plaster, and water-resistant as well as heat-resistant paint mixtures designed to protect external wall surfaces;
- adoption of space-planning and volumetric solutions ensuring the minimum feasible surface area of enclosing structures;
- thermal insulation of enclosing structures, including external walls, entrances, roofs, and basements;
- installation of energy-efficient windows and entrance doors;
- sealing of openings and joints between structural elements, external walls, and coverings;
- use of certified thermal insulation construction materials;
- installation of energy-efficient heating, ventilation, air conditioning, hot water supply, and lighting systems and equipment;
- where cost-effectiveness is justified, the application of alternative energy systems, including solar water-heating, photovoltaic installations, and heat pumps.

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

In accordance with the regulations established by the legislation of the Republic of Armenia and the relevant subordinate regulatory acts, both natural and legal persons may install autonomous solar power plants with a capacity of up to 150 kW to meet their own electricity needs, with the possibility of selling surplus electricity in the wholesale electricity market.

In recent years, the deployment and utilisation of this technology in the Republic of Armenia have been characterised by stable, rapid growth, 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, approximately 12,000-15,000 electric vehicles have been imported into the Republic annually since 2022. These vehicles are exempt from value-added tax and customs duties, contributing to emission reductions in the transport sector and promoting the adoption of electric mobility.

The above-mentioned national trends and development dynamics have also been considered as a priority context for the development of Talin Community's SECAP. The objectives of the "Five-Year Development Programme of Talin Community of Aragatsotn Marz of the Republic of Armenia for 2023–2027" have likewise been taken into account.

11.1. Measures in Budgetary Institutions and Municipal Operations

As previously noted, within the framework of Armenia's policy promoting renewable energy generation, a favourable legislative and regulatory environment has been established for natural and legal persons to construct autonomous solar installations to meet their own energy needs.

Autonomous systems operate in integration with the distribution network, meaning they are connected to the grid via a bidirectional commercial electricity meter that allows surplus electricity generated by the installations to be delivered to the distribution network. Local generation of "green" energy will enable a significant reduction (or even full elimination) of greenhouse gas emissions in the "Municipal Buildings" sector (Chapter 4).

The municipality is responsible for implementing this measure. Potential financing sources may include the municipal budget, state budget support (for example, through subvention programmes or state funds), the Renewable Resources and Energy Efficiency Fund, and funding from the European Union.
The scope of works for the energy-efficiency modernisation of municipally owned buildings and the application of renewable energy sources has been estimated based on technical information provided by municipal staff. The calculations and financial assessments presented are preliminary (indicative) in nature.

MEASURE 1.1.1 Installation of PV systems for the administrative residences of the heads of Talin Community's 24 settlements and other municipally owned entities consuming electricity jointly with them.

Given the climate conditions of Talin Community, characterised by high solar radiation intensity[18], the utilisation of RENEWABLE ENERGY resources is of critical importance for electricity supply reliability and emission reductions. Accordingly, based on the above considerations, it is proposed to install PV systems with a total installed capacity of 187.5 kW and an estimated annual electricity generation of approximately 303 MWh. Implementing the measure will require an investment of approximately AMD 37,500,000.
The results for energy savings and GHG emission reductions are presented in the table below.

Measure 1.1.1 Installation of photovoltaic (PV) systems for administrative buildings of settlement heads across 24 settlements of Talin Community and other municipal entities with associated electricity consumption						
Settlement / Name of community-owned entity	**Implementing bodies**	**Cost, thousand AMD**	**Installed capacity, kW**	**Energy savings / generation, MWh/year**	**CO_2 reduction, t/year**	**Investment period**
Construction of a PV power plant supplying the administrative residence of Arteni settlement head and the street lighting system	SB, R2E2, MP, EU	1,400.0	7.0	11.332	2.722	2026–2030
Construction of a PV power plant supplying the administrative residence of Getap settlement head and the street lighting system	SB, R2E2, MP, EU	1,400.0	7.0	11.332	2.722	2026–2030
Construction of a PV power plant supplying the administrative residence of Dashtadem settlement head + "Dashtadem Kindergarten" SNCO + street lighting system	SB, R2E2, MP, EU	6,400.0	32.0	51.805	12.445	2026–2030
Construction of a PV power plant supplying the administrative residence of Davtashen settlement head and the street lighting system	SB, R2E2, MP, EU	1,000.0	5.0	8.95	1.944	2026–2030
Construction of a PV power plant supplying the administrative residence of Dian settlement head and the street lighting system	SB, R2E2, MP, EU	600.0	3.0	4.856	1.166	2026–2030
Construction of a PV power plant supplying the administrative residence of Yegnik settlement head + Kindergarten + street lighting system	SB, R2E2, MP, EU	1,600.0	8.0	12.951	3.111	2026–2030

[18] According to data from the Global Solar Atlas, the solar irradiation intensity is approximately **1,966 kWh/m²**, while the expected electricity generation from **1 kW of installed peak PV capacity** is approximately **1,558 kWh per year**.
https://globalsolaratlas.info/detail?c=38.702659,42.341309,7&s=40.383707,43.873599&m=site&pv=small,180,35,1

Construction of a PV power plant supplying the administrative residence of Zarinja settlement head + House of Culture + street lighting system	SB, R2E2, MP, EU	2,000.0	10.0	16.185	3.888	2026–2030
Construction of a PV power plant supplying the administrative residence of Zovasar settlement head and the street lighting system	SB, R2E2, MP, EU	2,000.0	10.0	16.185	3.888	2026–2030
Construction of a PV power plant supplying the administrative residence of Tatul settlement head + House of Culture + street lighting system	SB, R2E2, MP, EU	1,200.0	6.0	9.703	2.333	2026–2030
Construction of a PV power plant supplying Irind House of Culture + administrative residence + library + health post + street lighting system	SB, R2E2, MP, EU	1,000.0	5.0	8.095	1.944	2026–2030
Construction of a PV power plant supplying the administrative residence of Lusakn settlement head and the street lighting system	SB, R2E2, MP, EU	800.0	4.0	6.475	1.555	2026–2030
Construction of a PV power plant supplying the administrative residence of Katnaghbyur settlement head and the street lighting system	SB, R2E2, MP, EU	1,600.0	8.0	12.951	3.111	2026–2030
Construction of a PV power plant supplying the administrative residence of Karmrashen settlement head + assembly hall + street lighting system	SB, R2E2, MP, EU	1,200.0	6.0	9.703	2.333	2026–2030
Construction of a PV power plant supplying the administrative residence of Kakavadzor settlement head and the street lighting system	SB, R2E2, MP, EU	1,000.0	5.0	8.095	1.944	2026–2030
Construction of a PV power plant supplying the administrative residence of Nerkin Bazmaberd settlement head and the street lighting system	SB, R2E2, MP, EU	3,600.0	18.0	29.140	7.000	2026–2030
Construction of a PV power plant supplying the administrative residence of Nerkin Sasnashen settlement head + House of Culture + health post + street lighting system	SB, R2E2, MP, EU	1,400.0	7.0	11.332	2.722	2026–2030
Construction of a PV power plant supplying the administrative residence of Shgharshik settlement head + House of Culture + health post + Kindergarten + library + street lighting system	SB, R2E2, MP, EU	1,200.0	6.0	9.703	2.333	2026–2030
Construction of a PV power plant supplying the administrative residence of Vosketas settlement head and the street lighting system	SB, R2E2, MP, EU	1,000.0	5.0	8.095	1.944	2026–2030
Construction of a PV power plant supplying the administrative residence of Partizak settlement head + health post + street lighting system	SB, R2E2, MP, EU	800.0	4.0	6.475	1.555	2026–2030
Construction of a PV power plant supplying the administrative residence of Soser settlement head +	SB, R2E2, MP, EU	1,000.0	5.0	8.095	1.944	2026–2030

House of Culture + Kindergarten + street lighting system						
Construction of a PV power plant supplying the administrative residence of Verin Bazmaberd settlement head + House of Culture + street lighting system	SB, R2E2, MP, EU	2,200.0	11.0	17.807	4.278	2026–2030
Construction of a PV power plant supplying the administrative residence of Verin Sasnashen settlement head + House of Culture + street lighting system	SB, R2E2, MP, EU	1,000.0	5.0	8.095	1.944	2026–2030
Construction of a PV power plant supplying the administrative residence of Tsamakasar settlement head + House of Culture + street lighting system	SB, R2E2, MP, EU	1,000.0	5.0	8.095	1.944	2026–2030
Garnahovit settlement administrative residence	SB, R2E2, MP, EU	1,100.0	5.5	8.903	2.139	2026–2030

MEASURE 1.1.2 Installation of PV systems for 11 municipally owned cultural and sports facilities of Talin Community.

Within the frames of the measure, it is proposed to install PV systems for electricity supply to 11 municipally owned facilities, with a total installed capacity of 233.4 kW and an estimated annual electricity generation of approximately 377.8 MWh. Implementing the measure will require an investment of approximately AMD 46,680,000.

MEASURE 1.1.2 Installation of PV systems for 11 municipally owned cultural and sports facilities of Talin Community						
Settlement and Name of Municipal Entity	**Implementing / Financing Sources**	**Cost (thousand AMD)**	**Installed Capacity (kW)**	**Energy Savings / Generation (kWh/year)**	**CO_2 Reduction (t/year)**	**Year of Investment**
Construction of a PV power plant supplying the Agharakavan House of Culture + Kindergarten + Street Lighting System	MP, R2E2 Fund, SB, EU	2,000.0	10.0	16,185	3.888	2026–2030
Talin Children's Art School SNCO	MP, R2E2 Fund, SB, EU	2,200.0	11.0	17,807	4.278	2026–2030
Talin House of Culture SNCO	MP, R2E2 Fund, SB, EU	7,600.0	38.0	61,518	14.779	2026–2030
Talin Sports Centre SNCO	MP, R2E2 Fund, SB, EU	2,800.0	14.0	22,664	5.445	2026–2030
Irind Ceremony Hall	MP, R2E2 Fund, SB, EU	1,000.0	5.0	8,095	1.944	2026–2030
Arteni House of Culture	MP, R2E2 Fund, SB, EU	2,000.0	10.0	16,185	3.888	2024
Vosketas House of Culture	MP, R2E2 Fund, SB, EU	2,000.0	9.9	16,027	3.850	2026–2030
Zovasar House of Culture	MP, R2E2 Fund, SB, EU	2,000.0	9.9	16,027	3.850	2026–2030
Karmrashen House of Culture	MP, R2E2 Fund, SB, EU	2,000.0	9.9	16,027	3.850	2026–2030

Nerkin Bazmaberd House of Culture	MP, R2E2 Fund, SB, EU	9,900.0	49.5	80,135	19.251	2026–2030
Aragatsavan House of Culture	MP, R2E2 Fund, SB, EU	11,880.0	59.4	96,162	23.102	2026–2030

MEASURE 1.1.3 Installation of a PV system to meet the electricity demand of the deep wells of the Arteni, Getap, and Aragatsavan settlements.

To meet the electricity demand of the deep wells in the Arteni and Getap settlements, it is proposed to construct PV power plants with installed capacities of 95.0 kW and 6.0 kW, respectively. The estimated investment cost for these installations is approximately AMD 20,200,000.

For the deep well in the Aragatsavan settlement, a PV system with an installed capacity of 250.0 kW was installed in 2024.

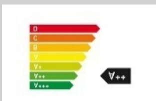
MEASURE 1.1.3 Installation of a PV system to meet the electricity demand of the deep wells of the Arteni, Getap, and Aragatsavan settlements					
Settlement	**Implementing / Financing Sources**	**Cost (thousand AMD)**	**Energy Savings / Generation (MWh/year)**	**CO_2 Reduction (t/year)**	**Year of Investment**
Arteni	MP, R2E2 Fund, SB, EU	19,000.0	153.795	36.2956	2026–2030
Getap	MP, R2E2 Fund, SB, EU	1,200.0	9.708	2.291	2026–2030
Aragatsavan	MP, R2E2 Fund, SB, EU	50,000.0	404.7	95.51	2024

MEASURE 1.1.4 Installation of PV systems for 5 kindergartens of Talin Community.

Within the framework of the measure, it is proposed to install PV systems to meet the electricity demand of 5 kindergartens, with a total installed capacity of 265.8 kW and an estimated annual electricity generation of approximately 430.3 MWh. Implementing the measure will require an investment of approximately AMD 53,160,000.

MEASURE 1.1.4 Installation of PV systems for 5 kindergartens of Talin Community						
Kindergarten	**Implementing / Financing Sources**	**Cost (thousand AMD)**	**Installed Capacity (kW)**	**Energy Savings / Generation (kWh/year)**	**CO_2 Reduction (t/year)**	**Year of Investment**
Talin Kindergarten No. 2 SNCO	MP, R2E2 Fund, SB, EU	23,760.0	118.8	192,325	46.204	2026–2030
Talin Kindergarten No. 3 SNCO	MP, R2E2 Fund, SB, EU	1,400.0	7.0	11,332	2.722	2026–2030
Nerkin Sasnashen	MP, R2E2 Fund, SB, EU	6,000.0	30.0	48,567	11.667	2025

Kindergarten SNCO						
Aragatsavan Kindergarten SNCO	MP, R2E2 Fund, SB, EU	11,000.0	55.0	89,039	21.390	2026–2030
Mastara Kindergarten SNCO	MP, R2E2 Fund, SB, EU	11,000.0	55.0	89,039	21.390	2026–2030



MEASURE 1.1.5 Improvement of energy efficiency of the Houses of Culture in the Aragatsavan, Katnaghbyur, Nerkin Bazmaberd, Vosketas, and Suser settlements.

Within the framework of the measure, energy efficiency interventions are proposed for the Houses of Culture located in the Aragatsavan, Katnaghbyur, Nerkin Bazmaberd, Vosketas, and Suser settlements. The combined electricity consumption of these buildings in the baseline year amounted to 34.864 MWh. The following energy efficiency measures are proposed:

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

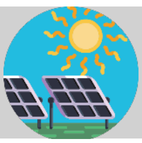
Assuming that 10% of electricity consumption and approximately 80% of gas consumption are used for heating purposes, and considering that the proposed measures will reduce thermal losses and consequently decrease heating demand by approximately 40%, the total annual energy savings for heating after implementation of the measures are estimated at 3.48 MWh/year.

MEASURE 1.1.5 Improvement of energy efficiency of the Houses of Culture in the Aragatsavan, Katnaghbyur, Nerkin Bazmaberd, Vosketas, and Suser settlements					
Implementing / Financing Sources	**Cost (thousand AMD)**	**Energy Savings / Generation (MWh/year)**		**CO_2 Reduction (t/year)**	**Year of Investment**
MB, SB	50,000.0	Electricity	∑		2026–2030
		3.48	3.48	0.823	

During the implementation of the proposed measures, it is advisable to also provide for the additional capital expenditures required for the major renovation and structural reinforcement (seismic resilience improvement) of the respective buildings, ensuring that the scope of works is clarified within the framework of detailed energy and technical audits.

11.2. LOCAL ELECTRICITY GENERATION

With the objective of strengthening the economic, environmental, and social sustainability of the enlarged Talin Community, the municipality intends to cooperate with international donor organisations to develop and implement programmes that promote an energy-efficient, low-emission development model, improve energy efficiency, and expand local energy generation from renewable energy resources. Talin Community plans to construct a municipal commercial PV power plant with a capacity of 0.5 MW. The electricity generated by the plant will be sold to the distribution network, and the revenues obtained will be accumulated in a municipal savings fund. In accordance with the applicable regulatory requirements, for the purposes of construction and operation of the power plant, the municipality shall establish a municipal non-commercial organisation.



MEASURE 2.1.1 Construction of a municipal commercial PV power plant.

Within the framework of this measure, during 2026–2030, Talin Community plans to construct and operate a municipal commercial PV power plant with a capacity of 0.5 MW. The plant's annual electricity generation is estimated at approximately 809 MWh.

Implementing the measure will require an investment of approximately AMD 100 million. The municipality is responsible for implementation. Potential financing sources may include the municipal budget, state financial support (for example, through subvention programmes or state funds), and financial support from international organisations.

The results of the calculations related to renewable electricity generation and greenhouse gas emission reductions are presented in the table below.

MEASURE 2.1.1 Construction of a municipal commercial PV power plant				
Implementing / Financing Sources	**Cost (thousand AMD)**	**Energy Savings / Generation (MWh/year)**	**CO_2 Reduction (t/year)**	**Year of Investment**
MP, R2E2 Fund, SB, EU	100,000.0	809.000	190.924	2026–2030

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 principal sectors whose energy consumption and associated greenhouse gas emissions may be included in the Baseline Emission Inventory 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 envisaged that individual autonomous PV systems will be installed on the roofs of a portion of private houses, or in adjacent or other suitable areas meeting technical requirements. Each system will have a peak capacity of 2.5 kW, which, under the climatic conditions of Talin, is sufficient to meet the annual energy demand of an average statistically representative private household in the Republic of Armenia.

One of the key enabling factors for household owners implementing this measure will be the demonstration effect created by pilot projects installing PV systems on the roofs of municipally owned buildings.

It is assumed that by 2030, at least 30% of private homeowners within the Community will possess the financial capacity to participate in this measure and install autonomous PV systems with an average peak capacity of 2.5 kW per household, aimed at fully or partially covering household electricity demand. Each system installation will require up to 20 m² of space. The combined annual electricity generation of the installed PV systems is estimated at approximately 4,320.5 MWh/year, while the associated reduction of greenhouse gas emissions is projected at 629.83 tCO_2/year.

The estimated investment cost of the programme amounts to approximately AMD 533,760,000. The responsibility for implementation lies with private homeowners. Potential financing sources may include household budgets, state financial support mechanisms, and donor organisations and international programmes.

The results of the calculations related to renewable electricity generation and greenhouse gas emission reductions are presented in the table below.

MEASURE 3.1.1 Installation of PV systems in private houses by homeowners				
Implementing / Financing Sources	**Cost (thousand AMD)**	**Energy Savings / Generation (MWh/year)**	**CO_2 Reduction (t/year)**	**Year of Investment**
HH	533,760.0	4,320.5	629.83	2026–2030

MEASURE 3.1.2 Improvement of energy efficiency of private houses in Talin Community.

Local self-government bodies do not have direct mechanisms to influence residents' and property owners' decision-making regarding the implementation of energy-saving measures in the residential sector. Nevertheless, within the framework of this measure, it is expected that, in the context of gradually increasing energy prices, improved availability of energy-efficient technologies, the existence of various financing mechanisms (including subsidies and concessional targeted loans), and enhanced public awareness, the number of energy efficiency interventions in the residential sector will steadily increase.

Within the scope of the proposed action, it is anticipated that a portion of private homeowners in Talin Community will implement the following measures aimed at reducing energy consumption, lowering associated expenditures, and improving comfort conditions:

- Replacement of roof coverings 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 full thermal insulation of external walls using polystyrene foam or mineral wool boards (50–100 mm thickness);
- Thermal insulation of basement ceilings, where basements are present, using polystyrene foam or mineral wool boards (50 mm thickness);
- Installation of artificial lighting systems using LED luminaires;
- Replacement of heating systems with natural gas condensing boilers and improvement of heat supply schemes.

In the baseline year, the residential sector of Talin Community consumed 16,167.3 MWh of electricity and gas, equivalent to 44,749.4 MWh. Assuming that approximately 10–15% of electricity consumption and around 80% of gas consumption were used for heating purposes, and considering that the proposed measures will reduce thermal losses and consequently decrease heating demand by approximately 40%, the total annual energy savings for heating after implementation of the measures are estimated at 21,804.720 MWh/year.

MEASURE 3.1.2 Improvement of energy efficiency of private houses in Talin Community						
Implementing / Financing Sources	**Cost (thousand AMD)**	**Energy Savings / Generation (MWh/year)**			**CO_2 Reduction (t/year)**	**Year of Investment**
Private	1,000,000.0	Electricity	Natural Gas	∑		
		1,996.4	19,808. 32	21,804.720	8,394.478	2026-2030

11.4. MEASURES IN THE TRANSPORT SECTOR

According to the Talin Community's Baseline Emission Inventory, calculated for 2023, road transport is the largest energy-consuming sector and a major source of greenhouse gas emissions within the Community.

Talin Community operates vehicles using all the principal types of motor fuels widely utilised in the Republic of Armenia, including CNG, LPG, petrol, and diesel.

The principal measure proposed for this sector is the gradual replacement of conventional passenger vehicles operating on fossil fuels with electric vehicles. The conversion of petrol-fuelled vehicles to CNG has not been considered as a separate measure within the framework of this Action Plan.

MEASURE 4.1.1 Replacement of municipal passenger and freight vehicles with electric vehicles.

Taking into account the expected reduction in market prices and increasing affordability of electric vehicles, this measure envisages that, from 2026 to 2030, municipal vehicles will be gradually replaced with electric vehicles, alongside the construction of charging infrastructure.

In order to promote the use of electric vehicles, the municipality, in cooperation with relevant beneficiaries and partners, shall undertake a number of enabling actions, including:

- Construction of municipal electric vehicle charging stations (subject to financial feasibility), or provision of municipal land under preferential conditions for private charging infrastructure;
- Organisation of preferential (free) parking arrangements for electric vehicles in central urban areas;
- Establishment of requirements for the installation of electric vehicle charging facilities as a precondition for granting construction permits, and other similar measures.

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								
Implementing / Financing Sources	**Cost (thousand AMD)**	**Energy Savings/Production (MWh/year)**					**CO_2 Reduction (t/year)**	**Year of Investment**
MP	650,000.0	Petrol	Diesel	CNG	LPG	∑		
		64.4	300.0	800.7	-	1,165.1	**257.**8	2026-2030

MEASURE 4.1.2 Replacement of 20% of private and commercial passenger vehicles with electric passenger vehicles.

Taking into account the trends of declining market prices of electric vehicles and their gradually increasing accessibility, this measure envisages that during 2026–2030, approximately 20% of the private and commercial passenger vehicle fleet will be replaced with electric vehicles.
The results of the calculations 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 vehicles								
Implementing / Financing Sources	**Cost (thousand AMD)**	**Energy Savings/Production (MWh/year)**					**CO_2 Reduction (t/year)**	**Year of Investment**
Private	1000,000.0	Petrol	Diesel	CNG	LPG	∑		
		15,480.28	20,804.70	97,842.70	10,920.80	145,048.69	6,330.539	2026-2030

11.5. MEASURES IN THE STREET LIGHTING SYSTEM

MEASURE 5.1.1 Installation of PV systems for street lighting in 5 settlements of the Community

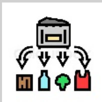
Based on available data on the annual energy consumption of street lighting systems in settlements during the baseline year, this measure envisages, for the purpose of reducing greenhouse gas emissions, providing electricity to street lighting systems through small-capacity autonomous PV power plants.
The PV systems are planned for installation in five settlements of the Community. Their installed capacities and estimated annual electricity generation volumes are presented in the table below.

Settlement	PV Plant Capacity (kW)	Annual Electricity Generation (kWh/year)
Aragatsavan	9.0	14,570.000
Garnahovit	3.0	4,856.000
Talin	21.0	34,000.000
Kakavadzor Cross Lighting	3.0	4,856.000
Mastara	20.0	32,378.000

The municipality is the responsible authority for implementing this measure. Potential financing sources may include the municipal budget, state financial support (particularly through subvention programmes and various state funds), and financial support from international organisations and donor institutions.
The results of the calculations related to renewable electricity generation and greenhouse gas emission reductions are presented in the table below.

MEASURE 5.1.1 Installation of PV systems for street lighting in 5 settlements of the Community				
Implementing / Financing Sources	**Cost (thousand AMD)**	**Energy Savings / Generation (MWh/year)**	**CO_2 Reduction (t/year)**	**Year of Investment**
MP, R2E2 Fund, SB, EU	18,320.0	90.660	21.396	2026-2030

11.6. MEASURES IN THE MUNICIPAL SOLID WASTE MANAGEMENT SECTOR



MEASURE 6.1.1 Introduction of a MSW sorting system

Municipal solid waste (MSW) sorting is a process by which waste is separated into individual components based on their type and potential for further treatment. Sorting may be carried out manually or using automated sorting lines.

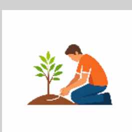
Within the framework of this measure, it is envisaged to install waste containers of different colours designated for separate waste fractions. The waste components identified through sorting that are suitable for recycling will be transferred to appropriately licensed recycling companies.

The implementation of this measure will reduce the volume of waste disposed of in landfills, thereby lowering greenhouse gas emissions generated during waste decomposition. Analysis of international experience indicates that the introduction of waste sorting systems can result in approximately a 50% reduction in landfill disposal volumes.

The municipality is the responsible authority for implementing this measure. Potential financing sources may include the municipal budget, state financial support (particularly through subvention programmes), and financial support from international organisations and donor institutions.

MEASURE 6.1.3 Introduction of a MSW sorting system				
Implementing / Financing Sources	**Cost (thousand AMD)**	**Waste Reduction (t/year)**	**CO_2 Reduction (t/year)**	**Year of Investment**
Municipal Communal Service	16,000.0	1,366.4	866.6	2026–2030

11.7. MEASURES FOR THE EXPANSION OF FOREST AREAS



MEASURE 7.1.1 Measures for the expansion of forest areas

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

- Forest Land Remaining Forest Land (3B1a), referring to land areas that have not undergone land-use change for more than 20 years preceding the reporting year;
- Land Converted to Forest Land (3B1b), referring to land areas in transition that have been converted to forest land as a result of land-use change within the 20 years preceding the reporting year.

It is proposed that, over the next five years, measures be implemented to expand forest land areas, including, within this category, greening areas within settlements. Although this approach differs to some extent from the formal classifications above, it reflects the underlying environmental outcome - namely, carbon dioxide sequestration.

Using the coefficients presented in Table 4.64[19] of the National Greenhouse Gas Inventory Report of the Republic of Armenia (1990–2019), an average CO_2 sequestration factor of 0.493 t CO_2/ha is obtained.

Assuming the additional greening of 10 hectares, the corresponding reduction of carbon dioxide emissions can be estimated as follows:

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

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

The municipality is the responsible authority for implementing this measure. Potential financing sources may include the municipal budget, as well as various grant programmes and external financing mechanisms.

Implementing / Financing Sources	Cost (thousand AMD)	CO_2 Sequestration (t/year)	CO_2 Reduction (t/year)	Year of Investment
Municipal Services, Civil Society Organisations	21,000.0	4.9	4.9	2026–2030

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

Given that, for low-cost, so-called "soft" measures, the quantitative estimation of greenhouse gas emission reductions 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 emission impacts. They are considered enabling, guiding, and supportive actions that facilitate the implementation of the SECAP.

MEASURE 6.1.1 Participation in events on climate and energy organised by international organisations

Various international organisations, including the German Agency for International Cooperation (GIZ), the World Bank, the United Nations Development Programme (UNDP), and other partner institutions, regularly organise events, workshops, and awareness campaigns addressing climate change mitigation and adaptation, improvement of energy efficiency, and promotion of renewable energy sources. Participation of municipal staff in such initiatives is particularly important for professional capacity development, knowledge exchange, and the improvement of local policy approaches.

As an example, the community's participation in the global "Earth Hour" initiative organised by the World Wide Fund for Nature (WWF) can be highlighted. This initiative is held annually (typically on the last Saturday of March) and calls upon 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 commitment to the planet.

Another example is the "EU Sustainable Energy Week" (EUSEW), organised by the European Commission, which represents the largest annual event dedicated to promoting sustainable and renewable energy in Europe. Within the framework of EUSEW, "Energy Days" are organised in approximately 60 countries worldwide and across more than 10,000 municipalities that are signatories to the Covenant of Mayors. These events aim to raise awareness among local populations and stakeholders about energy conservation, renewable energy resources, energy-efficient technologies, green development, and climate change mitigation and adaptation.

Such events typically include workshops, exhibitions, open days, educational and cultural initiatives, competitions, and other public activities, primarily intended to increase awareness among citizens and stakeholders and to encourage rational consumption and savings of electricity, natural gas, and other energy carriers.

MEASURE 6.1.2 Engagement of young people in the community's sustainable energy development processes

As stated in this document, the effective implementation of the programme objectives is largely conditioned by the level of population engagement.
Within the framework of this measure, it is envisaged to disseminate informational and educational materials on energy conservation and energy efficiency among young people, particularly school students. It is expected that, through the active promotion of green and sustainable development concepts by the participating students, a segment of the community population, notably the students' families, will undertake and implement energy-saving actions in their apartments and private houses.
These actions may include, in particular, the installation of photovoltaic panels, the acquisition of electric vehicles and energy-efficient household appliances, and the implementation of energy-efficiency renovation works.
To ensure the effective implementation of this measure, the daily, consistent, and coordinated efforts of the municipal staff responsible for energy management, along with the engagement of the entire municipal administration, are considered essential.

MEASURE 6.1.3 Development of the energy management system within the Municipality

It is envisaged that the Talin community will introduce a Community Energy Management System (CEMS), through which the parameters of energy flows within the community, technological, economic, social, and environmental, will be subject to systematic and continuous monitoring and management, covering the entire chain from energy procurement and production to transformation and final consumption.
Within the system, 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 primary objective of the CEMS implementation is to ensure the stability and effectiveness of community energy management, while minimising the negative environmental impacts of existing systems and generating substantial economic benefits through more rational and efficient management of municipal budget resources.
For the purpose of system implementation and its continuous improvement, the following actions are envisaged within the municipal administration:

- establish a clear list of responsibilities and targets for the energy management unit or the designated responsible person, and define practical steps for their achievement,
- develop, regularly review, and refine the operational programmes of the CEMS,
- define criteria and mechanisms for selecting buildings requiring energy-efficiency upgrades,
- organise energy audits and monitoring of public buildings under municipal authority to identify and control key energy performance indicators,
- ensure the calculation and analysis of core thermal-technical and energy-efficiency indicators of buildings, including baseline energy consumption, specific energy use, comfort levels, and other relevant parameters,
- assess required investments, energy-saving potential, greenhouse gas emission reduction potential, and other energy-related and financial-economic indicators for buildings subject to modernisation,
- ensure the participation of all responsible personnel involved in the CEMS in capacity-building and training programmes, including those organised by international institutions,

- 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,
- organise and conduct internal discussions, seminars, workshops, and study visits, as necessary, with the participation of all relevant stakeholders involved in the CEMS, including members of the coordinating committee, the energy manager, and responsible representatives of municipally owned public buildings,
- undertake practical steps to ensure the targeted use of financial resources generated from expected energy savings, including by establishing and operationalising a Revolving Fund mechanism.

It is expected that the introduction of the Community Energy Management System may enable a reduction in greenhouse gas emissions at municipally owned facilities of approximately 5–15 percent.

Chapter 13. Summary of measures aimed at reducing GHG emissions

Within the framework of the Talin Community SECAP, the package of measures to reduce greenhouse gas emissions by 2030 includes both low-cost (so-called “soft”) and investment-intensive (“hard”) measures to be implemented by the community authorities.

Overall, the comprehensive implementation of the planned measures, requiring estimated investments of approximately AMD 3,596.5 billion, enables the fulfilment of the quantitative commitments undertaken by the Talin Community under the Covenant framework, namely a reduction of at least 35 percent in the volume of emissions accounted for in the Baseline Emission Inventory (BEI) by 2030 compared to the baseline year.

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 30. Greenhouse gas emissions in 2023 and 2030 by target sectors (t CO_2/year)

Indicator	Municipal buildings	Residential sector	Transport	Public lighting	Waste management and greening
BEI – 2023	637.11	18,267.8	26,746.9	21.396	
Reductions from measures	588.06	9,024.31	12,918.8	21.396	873.51
Emissions in target year – 2030	49.05	9,243.52	13,828.19	0	-873.51
Reduction (%)	92.3	49.4	48.3	100	

Figures 8 and 9 present the shares of the main sectors in the total volume of greenhouse gas emissions calculated in the Baseline Emission Inventory (BEI), as well as each sector's contribution to the achieved emission reductions.

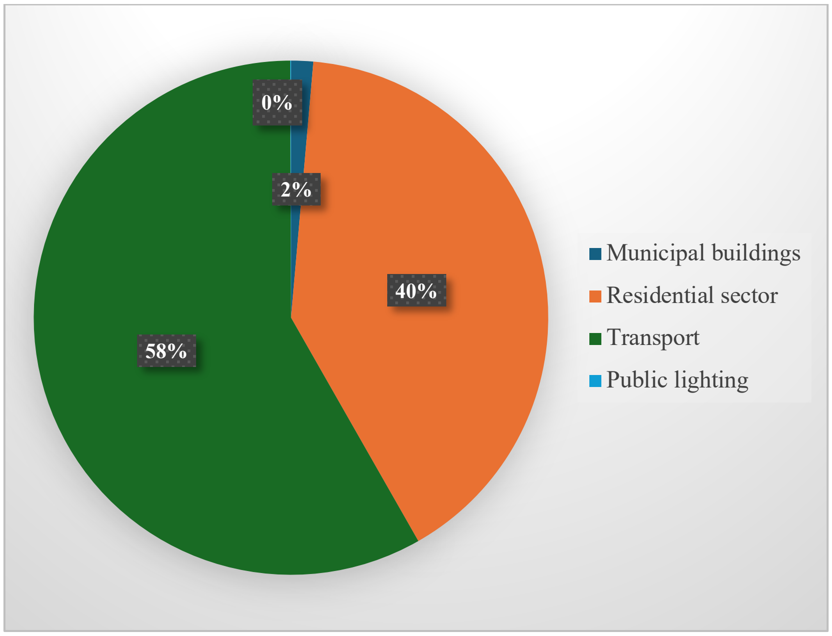


Figure 8. Share of main sectors in the Baseline Emission Inventory (BEI) – 2023

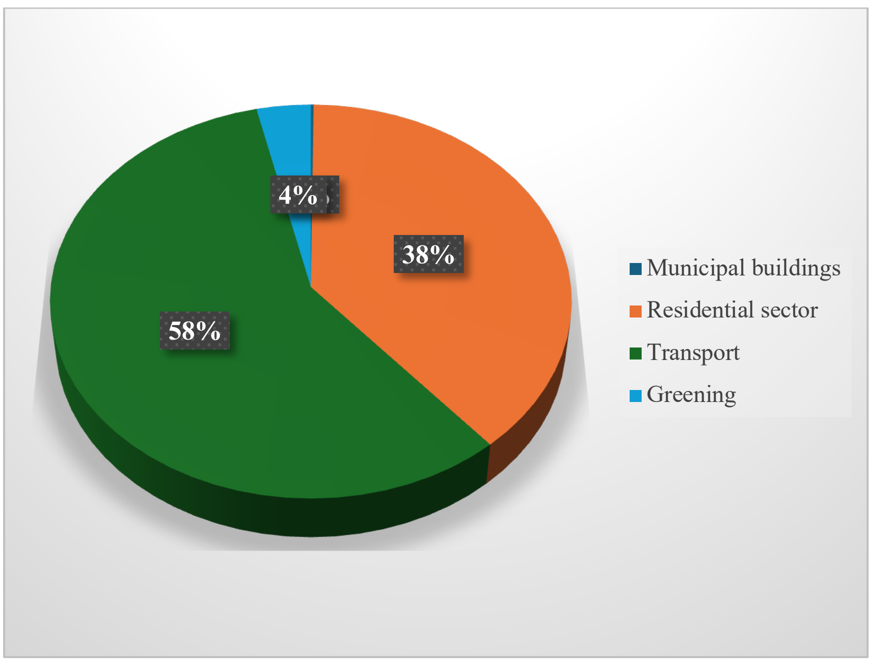


Figure 9. Share of main sectors in GHG emission reductions – 2030

The comparison of greenhouse gas emissions between the baseline and target years, by sectors and by energy carriers, is presented in Figures 10 and 11.

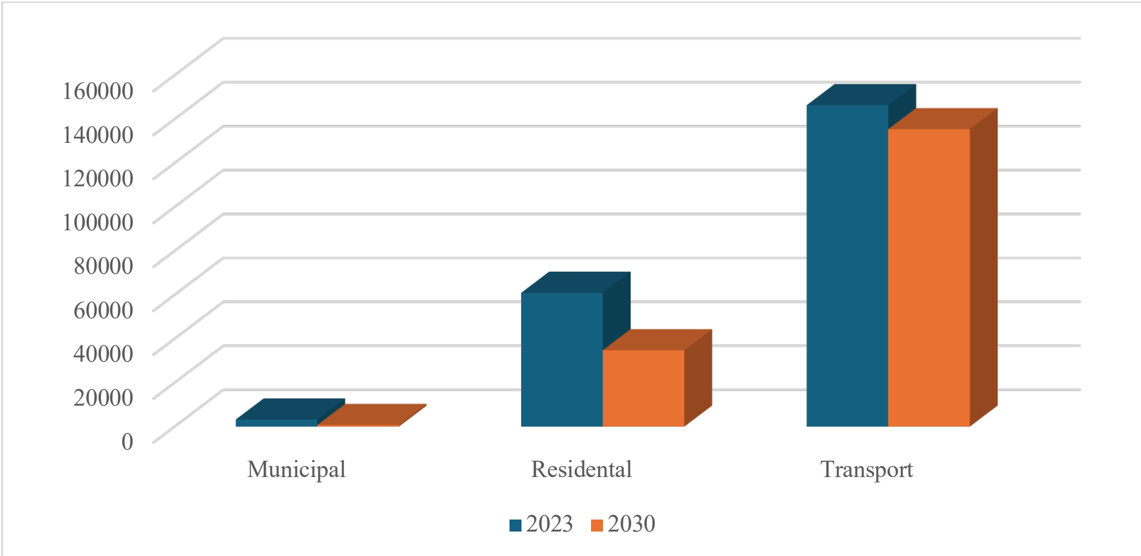


Figure 10. Comparison of energy consumption in the main sectors between the baseline and target years (MWh/year)

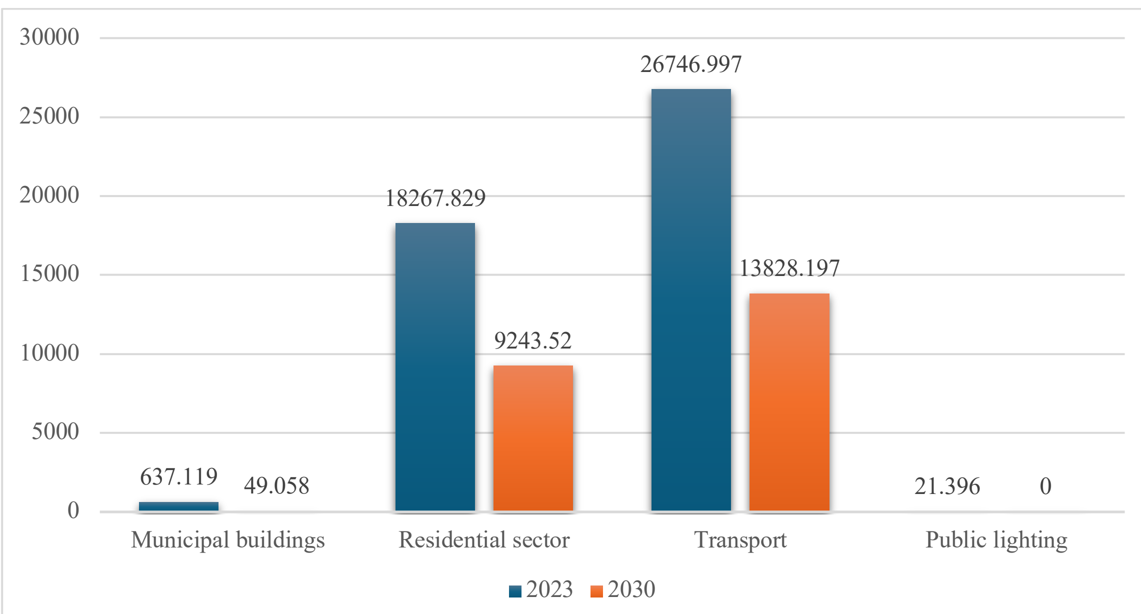


Figure 11. Comparison of greenhouse gas emissions between the baseline and target years (t CO_2/year)

The distribution of financing required to implement the proposed measures across the main sectors is presented below.

Table 31. Financial investments are required for the implementation of mitigation measures, and the specific costs of GHG emissions.

Sector	Investments		Specific cost of reducing 1 t CO_2 (thousand AMD / t CO_2)
	1000 AMD	Share (%)	
Municipal buildings	257.504	7.16	648.4
Local energy production	100.000	2.78	523.7
Residential sector	1,533.760	42.64	169.9
Transport	1,650.000	45.88	127.7
Public lighting	18.320	0.51	856.2
Municipal solid waste management	16.000	0.44	18.46
Afforestation	21.000	0.58	4,259.6
Total	3,596.5	100%	6,604

According to the table, investments of AMD 3,596.5 billion are required to achieve a reduction of 17,095 t CO_2 emissions through the implementation of the SECAP. As indicated in the table, the average cost of reducing 1 kg of CO_2 amounts to AMD 6,604 thousand.
The highest specific mitigation costs are observed in the afforestation sector, amounting to approximately AMD 127.7 thousand per kg of CO_2. In cases where the financing requirements of the proposed measures exceed the municipal budget's financial capacity, it is advisable to consider revising investment scenarios, including adopting more cost-effective alternatives, such as the acquisition of used or lower-capacity electric vehicles, and adopting phased implementation approaches.
Overall, the relatively high specific costs of mitigation measures are largely explained by the fact that such interventions often pursue objectives beyond greenhouse gas emission reductions (which may, in some cases, represent a secondary benefit), including improvements in urban mobility, enhancement of air quality, and other socio-economic development priorities.
In this context, it is recommended that measures be implemented in a strategic sequence, prioritising energy efficiency interventions first, followed by the deployment of renewable energy solutions, thereby enabling the full or partial coverage of the already reduced energy demand.
The summary table of measures envisaged under the Sustainable Energy and Climate Action Plan is presented in Table 32. The table also includes indicative implementation timelines, which will be finalised by the municipal authorities, taking into account the availability of financial resources, investment priorities, and other objective factors.

Table 32. Summary table of investment-intensive measures envisaged under the SECAP for the Talin Community, Aragatsotn Marz

No Brief description of the measure		Financing volume, thousand AMD	Energy savings / production, MWh/year						GHG emissions reduction, t CO_2/year						Year of implementation
			Electricity	Natural gas	Gasoline	Diesel	LPG	∑	Electricity	Natural gas	Gasoline	Diesel	LPG	∑	
Budgetary institutions and municipal sector															
1.1.1	Installation of PV systems for the administrative residences of 24 settlements of the Talin Community and other municipally owned entities consuming electricity	37,500.0	303.0	0	0	0	0	303.0	71.508	0	0	0	0	71.508	2026–2030
1.1.2	Installation of PV systems for 11 municipally owned cultural and sports facilities of the Talin Community	46,680.0	377.8	0	0	0	0	377.8	89.161	0	0	0	0	89.161	2024–2030
1.1.3	Installation of a PV system to supply the electricity demand of deep wells in Arteni, Getap, and Aragatsavan settlements	70,200.0	568.20	0	0	0	0	568.203	134.095	0	0	0	0	134.095	2024–2030
1.1.4	Installation of PV systems for 5 kindergartens of the Talin Community	53,160.0	430.3	0	0	0	0	430.3	101.55	0	0	0	0	101.55	2022–2030
1.1.5	Energy efficiency improvement of cultural centres in Aragatsavan, Katnaghbyur, Nerkin Bazmaberd, Vosketas, and Suser settlements	50,000.0	3.48	0	0	0	0	3.48	0.823	0	0	0	0	0.823	2026–2030
Total		**257,504.0**	**1,682.78**	**0**	**0**	**0**	**0**	**1,682.78**	**397.137**	**0**	**0**	**0**	**0**	**397.13**	
Local electricity production															
2.1.1	Construction of a community-scale commercial PV power plant	100,000.0	809.0	0	0	0	0	809.0	190.924	0	0	0	0	190.924	2026–2030
Total		**100,000.0**	**809.0**	**0**	**0**	**0**	**0**	**809.0**	**190.924**	**0**	**0**	**0**	**0**	**190.92**	
Residential sector															
3.1.1	Installation of PV systems in private houses by homeowners	533,760.0	4,320.5	0	0	0	0	4,320.5	629.83	0	0	0	0	629.83	2026–2030

3.1.2	Energy efficiency improvement of private houses in the Talin Community	1,000,000.0	1,996.4	19,808.32	0	0	0	21,804.47	471.150	7,923.32	0	0	0	8,394.47	2026–2030
Total		**1,533,760.0**	**6,316.9**	**19,808.32**	**0**	**0**	**0**	**26,124.97**	**1,100.98**	**7,923.32**	**0**	**0**	**0**	**9,024.30**	
Transport															
4.1.1	Replacement of municipal passenger and freight vehicles with electric vehicles	650,000.0	0	800.7	64.4	300.0	0	1,165.1	0	161.7	16.03	80.1	0	257.8	2026–2030
4.1.2	Replacement of 40% of private and commercial passenger vehicles with electric vehicles	1,000,000.0	0	97,842.70	15,480.28	20,804.700	10,920.800	145,048.690	0	3,952.845	770.918	1,110.971	495.804	6,330.539	2026–2030
Total – Transport		**1,650,000.0**	**0**	**98,643.4**	**15,544.68**	**21,104.7**	**10,920.800**	**146,213.79**	**0**	**4,114.545**	**786.948**	**1,191.071**	**495.804**	**6,588.33**	
Public lighting															
5.1.1	Installation of PV systems for public lighting in 5 settlements of the community	18,320.0	90.660	0	0	0	0	90.660	21.396	0	0	0	0	21.396	2026–2030
Total – Public lighting		**18,320.0**	**90.660**	**0**	**0**	**0**	**0**	**90.660**	**21.396**	**0**	**0**	**0**	**0**	**21.396**	
6.1	Introduction of a MSW sorting system	16,000.0	0	0	0	0	0	0	0	0	0	0	0	866.6	2026–2030
Total – Municipal solid waste management		**16,000.0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**866.6**	
Increase of forested areas															
7.1	Afforestation	21,000.0	0	0	0	0	0	0	0	0	0	0	0	4.93	2026–2030
Total – Increase of forested areas		**21,000.0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4.93**	
Grand Total		**3,596,584.0**	**8,899.34**	**118,451.72**	**15,544.68**	**21,104.7**	**10,920.80**	**174,921.00**	**1,710.43**	**12,037.87**	**786.949**	**1,191.07**	**495.805**	**17,095.61**	

Chapter 14. Vulnerability Assessment of the Talin Community to Climate Change and Adaptation Measures

14.1 The Adaptation Component within the Covenant

Within the framework of the EU *Covenant of Mayors for Climate and Energy* initiative, adaptation to climate change has become a core component of SECAPs. This implies that local authorities should not only implement measures to reduce greenhouse gas emissions but also be prepared to address the impacts of climate change. By joining the Covenant, the Talin community has committed to systematically assessing climate risks and implementing adaptation measures within its SECAP.

In practice, alongside mitigation actions, this entails conducting a Risk and Vulnerability Assessment (RVA) and developing a local adaptation plan. The adaptation commitment aligns with broader European efforts on resilience (e.g., the EU Climate Adaptation Mission), emphasizing that enhancing climate resilience by 2030 is a shared objective among EU partner communities.

14.2 Armenia's Policy on Climate Change

Adaptation planning in the Talin community 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 an action plan for 2021–2025), which defines medium-term adaptation objectives and priorities. The NAP identifies the country's most significant climate hazards and outlines measures to reduce risks and strengthen resilience across different levels of governance and sectors. Notably, it emphasizes the roles of communities and local authorities, aiming to integrate adaptation into local development planning.

For the Talin community, this national strategy is highly relevant, as many of the NAP's priority sectors, e.g., agriculture, water resources, health, infrastructure, and disaster risk management, directly correspond to local needs in Talin. The community's adaptation efforts are grounded in the NAP framework, enabling the translation of national priorities into local actions. This ensures that the Talin SECAP aligns with Armenia's climate commitments (in accordance with Article 7 of the Paris Agreement on adaptation) and enables the community to access potential support for adaptation measures (e.g., state programs and the Green Climate Fund). Thus, climate adaptation planning in the Talin community is grounded in both the Covenant of Mayors methodology and Armenia's NAP, ensuring coherence and continuity of objectives at both local and national levels.

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

1. **Identification of climate risks.** The principal climate risks associated with climate change were identified, and their impacts on the Talin community were assessed.
2. **Vulnerability assessment.** An analysis was conducted to determine the extent to which different sectors are sensitive to and vulnerable to the identified risks and climate change, as well as their adaptive capacity.
3. **Development of priority adaptation measures.** Practical and targeted measures to increase resilience were proposed, and a preliminary assessment of the financial and institutional requirements for their implementation was conducted.

The analysis was based on theoretical and statistical evidence from various sources, including data from the Hydrometeorology and Monitoring Center of the Republic of Armenia, the National Statistical Service of the Republic of Armenia, the World Bank, databases of the Talin community, as well as stakeholder consultations conducted within the framework of SECAP preparation.

Vulnerability scores were generated by combining risk magnitude with sectoral exposure and adaptive capacity, using both quantitative indicators and qualitative expert assessments.

In accordance with the JRC (2024) guidance, a combined assessment system was applied. Impact, vulnerability, and adaptive capacity were assessed on a 1–3 scale, where 1 = low, 2 = medium, and 3 =

high. Quantitative indicators (e.g., the share of vulnerable population groups) were used where data were available, whereas qualitative assessments were derived from stakeholder consultations. Final vulnerability scores were calculated using an integrated approach that combined these criteria to identify the sectors exposed to the highest risk.

14.3 Climatic Conditions of Talin

Geographical and climatic characteristics. The Talin community is located in Aragatsotn Province of Armenia, on the southern slopes of the Aragats mountain massif, near Mount Arteni. It is situated at an altitude of 1,585 m above sea level and is characterized by a continental mountainous climate with pronounced semi-arid features. Summers are generally hot and sunny, whereas winters are cold; steppe zones are characterized by pronounced daily temperature fluctuations. The community's high-altitude location partially mitigates extreme heat relative to lower valleys; however, during the summer months, air temperatures often exceed 30°C, whereas in winter, nighttime temperatures frequently fall well below 0°C.

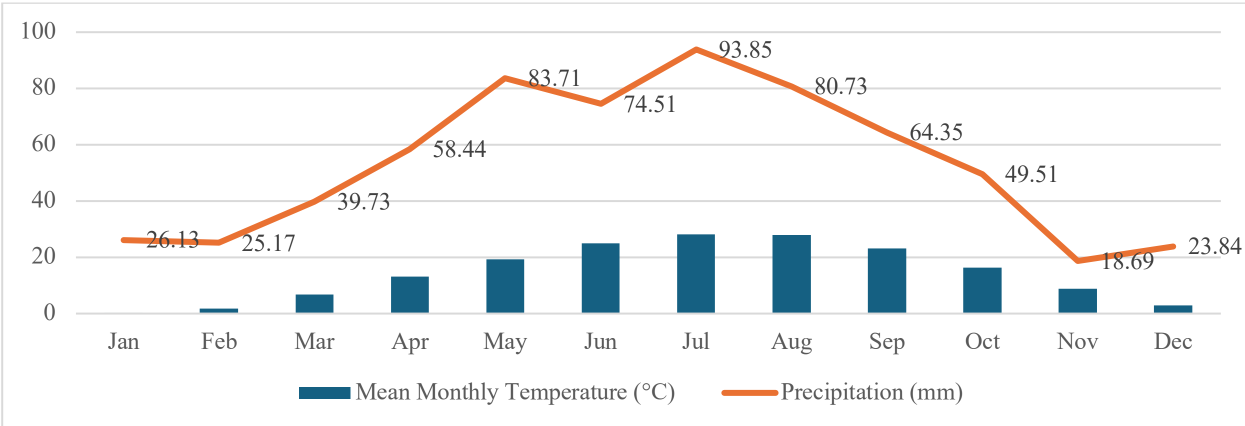
Temperature. Winters in the Talin community are cold, with a stable snow cover, while summers are relatively hot. In July, the average temperature ranges from 23–25°C, and in January from –4 to –5°C. Annual precipitation is below average and unevenly distributed, typically 300–400 mm (according to some sources, local averages may be even lower). The highest precipitation levels are observed from late spring to the first half of summer. Prevailing westerly winds on the plateau can often be quite strong, and the treeless steppe landscape contributes to increased risks of soil erosion and dust dispersion.

Overall, the main climatic background of Talin is characterized by water scarcity and temperature extremes, which significantly determine the community's vulnerability to climate change.

Table 33. Weather by Month in Talin

Month	Record high °C	Average high °C	Daily mean °C	Average low °C	Record low °C
Jan	10.98	3.72	0.03	-5.69	-18.96
Feb	13.97	5.44	1.71	-4.4	-18.96
Mar	24.95	10.48	6.81	-0.48	-12.57
Apr	27.94	17.02	11.87	4.23	-2.99
May	31.93	23.7	17.81	9.68	2.69
Jun	38.92	29.25	22.89	14.2	7.98
Jul	40.91	31.63	24.94	17.81	8.98
Aug	39.92	29.83	23.16	16.04	9.96
Sep	36.92	26.17	20.25	12.79	5.99
Oct	28.94	19.61	13.17	7.13	-1.79
Nov	24.95	12.61	6.47	1.73	-7.98
Dec	18.96	6.46	2.38	-2.38	-18.96
Year	40.91	16.54	10.45	4.24	-18.96

Source: https://weatherandclimate.com/armenia/aragatsotn/talin?utm_source=chatgpt.com#google_vignette



Source: https://weatherandclimate.com/armenia/aragatsotn/talin?utm_source=chatgpt.com#google_vignette

Figure 12. Mean Monthly Temperature and Precipitation in Talin

Figure 12 presents the seasonal climatic characteristics of the Talin community, which are characterized by hot and prolonged summers, cold winters, and pronounced annual temperature variability. The data indicate that the community is characterized by a continental, mountainous climate, with pronounced temperature fluctuations and sharp seasonal transitions.

The warm period lasts approximately four months, from June to September, during which the daily mean temperature consistently exceeds 18°C. The hottest month is July, with an average daily temperature of around 24.9°C and an average maximum reaching 31.6°C.

The cold period lasts approximately 3–3.5 months, from December to February, during which the daily mean temperature remains at or below 2–3°C. January is the coldest month: the average daily temperature is about 0°C, the average minimum is –5.7°C, and the record low temperature reaches –18.9°C. Winter months are also characterized by severe nighttime frosts, which significantly affect energy demand and infrastructure resilience.

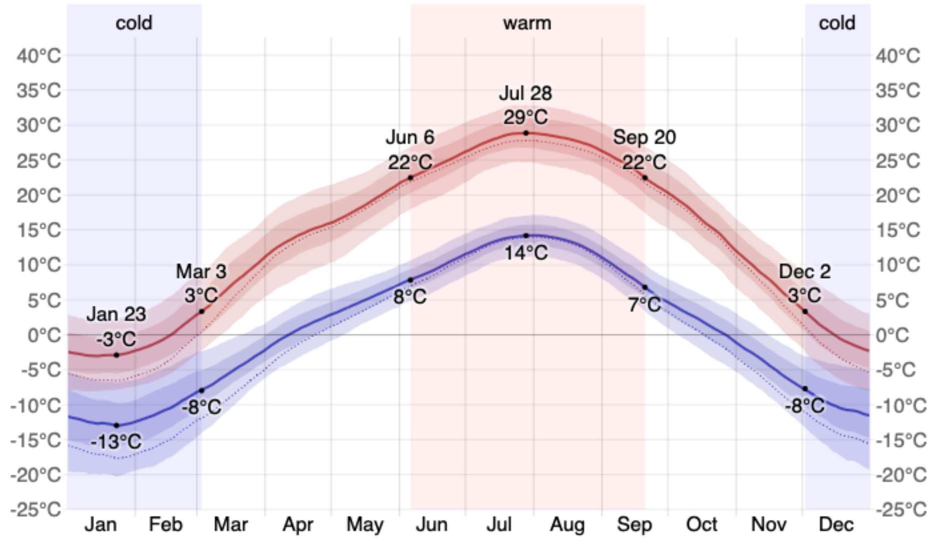
The transitional seasons of spring and autumn are relatively short but are characterized by rapid temperature changes. In spring, temperatures increase sharply, with daily averages rising from 6.8°C to 17.8°C, often accompanied by the highest levels of precipitation. In autumn, a gradual cooling is observed, with the daily mean temperature decreasing from 20.3°C to 6.5°C.

Overall, the climate of Talin is characterized by significant seasonal and daily temperature variability, as well as the frequency of extreme thermal events, which under conditions of climate change may exacerbate the community’s vulnerability, particularly in the sectors of water resources, agriculture, and public health.

Figure 13 illustrates the seasonal temperature regime of the Talin community, highlighting the clear distinction between warm and cold periods. The data show that during the summer months, the difference between average maximum and minimum temperatures is significant, indicating large diurnal temperature fluctuations. At the same time, the winter period is characterized by persistently low temperatures and frequent frosts, resulting in a high thermal contrast throughout the year.

Precipitation. Based on monthly observations, the annual average precipitation in the Talin community is relatively low, at approximately 58.96 mm per month, typical of a continental mountainous climate. Precipitation is unevenly distributed throughout the year, with a clear seasonality: maximum values in spring and early summer, and minimum levels in late autumn and winter.

Spring is a relatively active precipitation period in Talin. In March, precipitation averages 39.7 mm, increases to 58.4 mm in April, and reaches 83.7 mm in May. During these months, the number of precipitation days is also substantial, averaging approximately 15.5 in April and 22 in May, thereby contributing to a temporary increase in soil moisture.



Source: Weather Spark, https://weatherspark.com/y/102801/Average-Weather-in-T'alin-Armenia-Year-Round

Figure 13. Average High and Low Temperature in Talin

During the summer months, precipitation levels remain relatively high, while relative humidity decreases and sunshine hours increase. In June, precipitation amounts to 114.5 mm, in July to 93.9 mm, and in August to 80.7 mm. At the same time, relative humidity decreases to approximately 46–50%, while the average number of sunshine hours peaks at approximately 14 hours, resulting in increased evaporation and limiting the effectiveness of soil moisture retention.

Table 34. Monthly Climatic Indicators of the Talin Community

Month	Average precipitation mm	Average precipitation days (≥1.0 mm)	Average relative humidity (%)	Mean monthly sunshine hours
I	26.13	6.99	72.92	8.98
II	25.17	6.81	71.4	10.22
III	39.73	9.71	62.34	11.14
IV	58.44	15.52	55.8	11.26
V	83.71	21.95	57.78	10.64
VI	114.51	18.69	49.77	14.38
VII	93.85	18.69	48.62	14.23
VIII	80.73	19.84	46.57	11.52
IX	64.35	14.33	48.2	11.49
X	49.51	10.16	55.06	10.93
XI	18.69	4.81	65.29	8.61
XII	23.84	4.81	56.86	8.22
Year	58.96	12.93	56.86	11.26

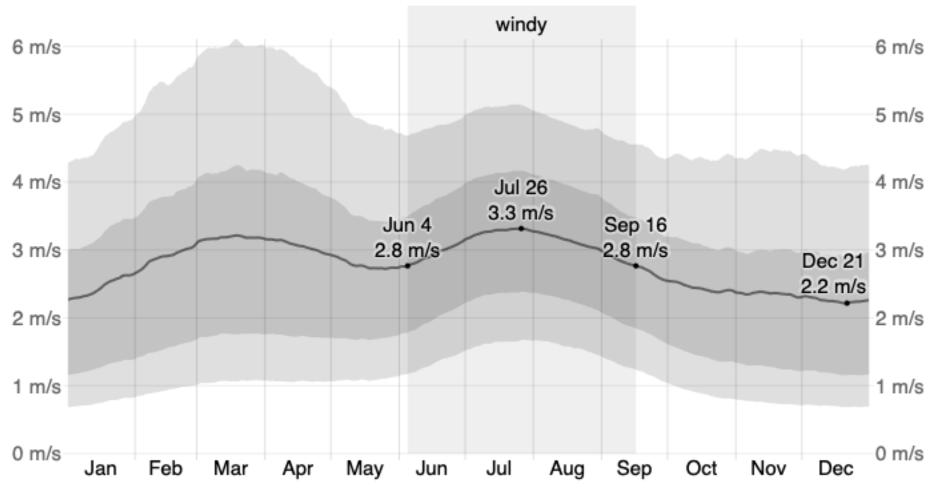
Source. https://weatherandclimate.com/armenia/aragatsotn/talin?utm_source=chatgpt.com#google_vignette

During autumn, precipitation gradually decreases. In September, average precipitation amounts to 64.4 mm, decreases to 49.5 mm in October, and drops sharply to 18.7 mm in November. November also records the fewest precipitation days, averaging about 4.8, indicating the driest period of the year.

During the winter months, precipitation remains relatively low. In December, average precipitation is about 23.8 mm, in January, 26.1 mm, and in February, 25.2 mm. In this period, relative humidity is high and the number of sunshine hours is at its minimum, resulting in low evaporation and the accumulation of precipitation mainly as snow.

The data presented in Table 34 indicate that the Talin community is characterized by relatively low annual precipitation, pronounced seasonal variability, and high summer evaporation. These characteristics are of key importance for water resources management, agricultural activities, and climate risk assessment.

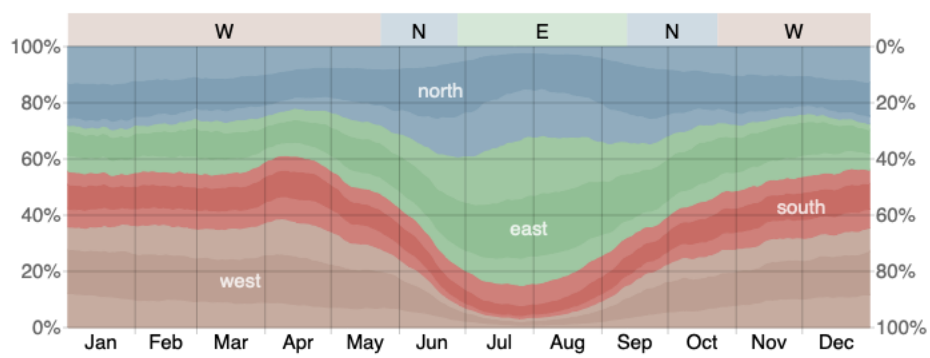
*Wind and humidity***.** In Talin, the average hourly wind speed exhibits mild seasonal variability throughout the year. The windy period lasts for approximately 3.4 months, from 4 June to 16 September, when the average hourly wind speed exceeds 2.8 m/s. The windiest month of the year is July, during which the average hourly wind speed is about 3.3 m/s.



Source: Weather Spark, https://weatherspark.com/y/102801/Average-Weather-in-T'alin-Armenia-Year-Round

Figure 14. Average Wind Speed in Talin

The calmer period lasts for approximately 8.6 months, from 16 September to 4 June. The calmest month of the year is December, when the average hourly wind speed is about 2.3 m/s.



Source: Weather Spark, https://weatherspark.com/y/102801/Average-Weather-in-T'alin-Armenia-Year-Round

Figure 15. Wind Direction in Talin

Humidity data confirm the pronounced continental, semi-arid climatic character of the Talin community. During the winter months, relative humidity remains high (approximately 80%), which is attributable to low temperatures and limited evaporation. From spring onward, humidity gradually decreases, reaching its lowest values in mid-summer (July–August), at approximately 50%.

This seasonal dryness, combined with high summer temperatures and strong winds, contributes to rapid soil moisture loss and increases the risks of droughts and dust formation. In autumn, the gradual increase in relative humidity indicates a transition to cooler, more humid conditions. These fluctuations demonstrate the significant influence of topography and seasonal air-mass circulation on the local climatic regime of Talin and help explain the timing of the principal pressures affecting agriculture and water resources in the community.

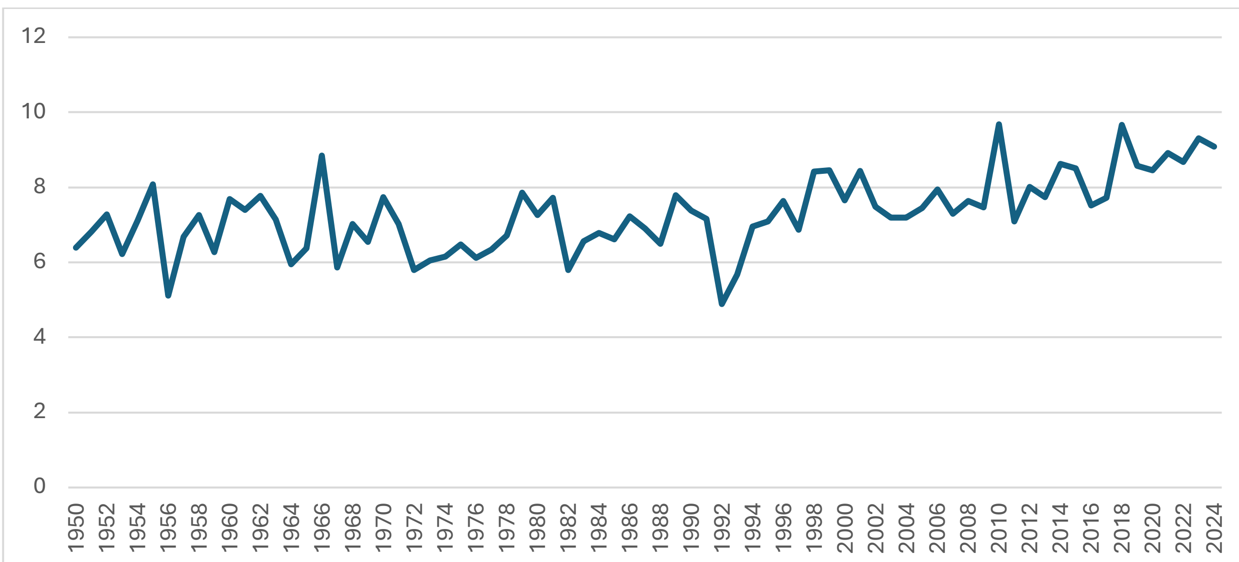
14.4. Climate Change in Talin

14.4.1 Observed Climate Change in Talin

Air temperature

Long-term data recorded by meteorological stations in Aragatsotn Province indicate that, since the 1950s, average annual air temperature has increased steadily, despite fluctuations from year to year. Compared with the 1950–1960 average, air temperatures during 2020–2024 increased by 1.9°C, indicating overall warming in the region.

These trends are significant for the Talin community, as such temperature increases may lead to changes in the growing season, increased evaporation intensity, and higher summer heat stress. The provincial-level warming trend, combined with local observations, confirms that the Talin community is already experiencing the impacts of climate change, which, in the coming years, may further exacerbate existing vulnerabilities across water resources, agriculture, and public health.



Source: World Bank, *Climate Change Knowledge Portal*
https://climateknowledgeportal.worldbank.org/country/armenia/trends-variability-historical

Figure 16. Annual Average Air Temperature in Aragatsotn Province

Atmospheric precipitation

The distribution of precipitation days in the Talin community shows a clearly pronounced seasonality, which is characteristic of a continental mountainous climate. According to Table 35, most precipitation occurs in the second half of spring and the beginning of summer, whereas during winter months, precipitation is limited and mainly falls as snow.

During the winter, the total number of precipitation days is relatively low, averaging 2.5–3 per month. In these months, precipitation predominantly occurs as snow. In January and December, the number of snow days is 2.3 and 2.1, respectively, indicating that snow cover forms during short, not always stable, periods. Mixed precipitation (rain and snow) in winter is limited, and the number of rainy days is almost negligible. These conditions limit the potential for accumulation of water resources through snowfall.

In spring, a sharp increase in precipitation days is observed. In March, the total number of precipitation days reaches 3.7, in April 6.3, and in May 8.5 days, which is the highest value of the year. During this period, precipitation is almost entirely rainfall, which replenishes soil moisture but may also increase the risk of surface runoff and soil erosion, particularly given the community's steppe and treeless landscape.

Table 35. Average Monthly Days of Precipitation in Talin

Month	Rain (days)	Mixed (days)	Snow (days)	Any (days)
Jan	0.2	0.3	2.3	2.8
Feb	0.3	0.5	1.7	2.5
Mar	2.0	0.8	0.9	3.7
Apr	5.9	0.3	0.1	6.3
May	8.5	0.0	0.0	8.5
Jun	6.4	0.0	0.0	5.4
Jul	4.6	0.0	0.0	4.6
Aug	3.2	0.0	0.0	3.2
Sep	2.9	0.0	0.0	2.9
Oct	4.0	0.2	0.1	4.3
Nov	1.9	0.7	0.7	3.2
Dec	0.3	0.7	2.1	3.0

Source: https://weatherandclimate.com/armenia/aragatsotn/talin?utm_source=chatgpt.com#google_vignette

During the summer months, the number of precipitation days gradually decreases. In June, about 5.4 rainy days are recorded; in July, 4.6; and in August, 3.2. Although summer precipitation is entirely rainfall, the limited number of precipitation days, combined with high temperatures and strong winds, contributes to rapid soil moisture loss and may increase the risk of short-term dry periods.

In the autumn months, the number of precipitation days remains relatively low. In September and October, the total number of precipitation days is 2.9 and 4.3, respectively, and in November, 3.2. During this period, mixed precipitation and the first snow days also occur, indicating a seasonal transition.

Overall, the distribution of precipitation days in the Talin community reveals two main vulnerabilities: first, limited and unstable snow accumulation during the winter period, which reduces the potential for the formation of natural water reserves; and second, the concentration of precipitation in late spring and early summer, which may increase the risks of spring surface runoff and summer water stress. These characteristics are important for water resources management and the design of climate adaptation measures.

Extreme weather events

With regard to extreme weather events, the risk profile in the Talin community has not undergone sharp changes in recent decades; however, the impacts of several hazards have become more pronounced. According to the data presented in Table 36, droughts, heatwaves, hail, and strong winds continue to occur periodically, maintaining a largely stable frequency, but in the context of overall warming and water scarcity, their socio-economic impacts are intensifying.

Table 36. Frequency of Extreme Weather Events in the Talin Community[20]

Event	Frequency (until 2000)	Current situation	Significant impacts
Drought	Extreme droughts were mainly observed in exceptionally dry years and were more characteristic of lowland areas. In foothill zones, drought occurred approximately in half of the years.	In recent decades, drought conditions have become almost annual, also affecting foothill and high-altitude areas. The number of dry days during the year has increased significantly compared to 1961–1990, and the drought season starts earlier and lasts longer.	Chronic water scarcity and soil drying. In some villages, springs and small reservoirs have dried up, reducing the availability of irrigation water. Crop yields have declined, and pasture degradation in some communities has led to a significant reduction in livestock numbers.
Hail	In late spring and summer, hailstorms were regular and historically	In recent decades, the intensity and damaging impact of hailstorms have increased, and in	Recurrent damage to orchards and field crops. In Talin, farmers report frequent losses of fruit (apricots,

[20] The table was compiled on the basis of data from the Hydrometeorology and Monitoring Center of the Republic of Armenia and climate assessments (including reports of the Center, EU studies, and local expert analyses).

	considered one of the most frequent damaging phenomena, periodically damaging crops.	some areas they are recorded almost every year. Hail seasonality has largely remained unchanged, concentrating in the spring–summer months.	berries) and cereals, negatively affecting incomes and necessitating the application of anti-hail measures.
Heavy rainfall and mudflows	Previously observed rarely and mainly during exceptionally strong storms or rapid spring snowmelt. Major floods were considered events occurring once every several decades.	Over the last 10–20 years, an increase in the frequency of heavy precipitation has been observed, leading to rapid flooding. Warmer winters and early spring thaws contribute to rapid snowmelt, while short but intense rainfall concentrates large volumes of water within a few hours.	Floods and mudflows periodically inundate fields and settlements. In Talin, heavy rainfall can flow through dry channels, cause erosion of the topsoil, and damage infrastructure by washing away rural roads, bridges, and fertile land.
Frost	Frost events have historically been regular. Late spring and autumn frosts were considered predictable risks, for which farmers were generally prepared.	Overall, the number of frost days has decreased due to general warming; however, in recent years unexpected and out-of-season frosts have been observed, often following warm periods.	Untimely frosts damage orchards and other crops. For example, sudden frosts in April can destroy apricot blossoms, while early autumn frosts can damage late crops, reducing yields and the incomes of rural households.

In this regard, the vulnerability of the Talin community is driven not so much by an increase in the frequency of extreme weather events, but rather by their cumulative impacts, which makes the planning of adaptation measures a critical prerequisite.

Climate change outlook and increasing climate risks

Short-term assessments of climate risks in the Talin community indicate that the community is currently in a relatively low-risk position; however, over time, several climate hazards exhibit a clear upward trend, with a high probability of occurrence and potentially severe negative consequences. In the short term, most climate hazards are assessed as minor (risk level), indicating that at present, Talin's climate system remains in a state of relative balance.

In the short term (Table 37), hail is considered likely to have significant impacts and is expected to affect the Talin community, particularly rural and low-income households, whereas the assessed risks of drought and extreme heat are medium. At the same time, the short-term risk levels of heatwaves, water scarcity, erosion, and fires are assessed as minor, attributable to their still-limited intensity.

Table 37. Climate Risk Assessment in the Short Term

Hazard	**Risk Level**
Thunderstorm / Lightning	Insignificant
Flash Floods / Mudflows caused by heavy rain	Insignificant
Fires (forest or grassland)	Insignificant
Strong Winds / Storms / Tornadoes	Insignificant
Frost	Insignificant
Severe Winter / Cold Waves	Insignificant
Heatwaves	Insignificant
Soil Erosion	Insignificant
Water Scarcity	Insignificant
Industrial Dust	Insignificant
Periods of Very High Temperature (lasting several days or weeks)	Minor
Extreme Heat	Moderate
Droughts	Moderate
Hailstorms	Significant

In the medium term, the structure of climate risks changes significantly. The data presented in Table 38 show that several hazards pose a higher risk. Heatwaves, fires, and frosts are assessed as medium-level risks, while periods of very high temperatures, extreme heat, and hail are assessed as significant risks. Of particular concern is that droughts and water scarcity are already assessed as severe risks in the medium term, indicating a high level of exposure of water resources to climate-related hazards.

Table 38. Climate Risk Assessment in the Medium Term

Hazard	Risk Level
Thunderstorm / Lightning	Insignificant
Flash Floods / Mudflows caused by heavy rain	Insignificant
Strong Winds / Storms / Tornadoes	Insignificant
Severe Winter / Cold Waves	Insignificant
Soil Erosion	Insignificant
Soil Salinization	Insignificant
Impact of Increased CO_2 Concentration in the Atmosphere	Insignificant
Industrial Dust	Minor
Fires (forest or grassland)	Moderate
Heatwaves	Moderate
Frost	Moderate
Extreme heat	Significant
Hail	Significant
Periods of very high temperatures (several days, weeks)	Significant
Water scarcity	Severe
Droughts	Severe

In the long term, the structure of climate risks in the Talin community becomes more complex and multidimensional. According to Table 39, extreme heat, heatwaves, prolonged periods of very high temperatures, droughts, water scarcity, hail, and fires are assessed as risks at a severe level. This indicates that in the future Talin may face not only intensified thermal and water stress, but also significant pressures on agricultural production, ecosystem stability, and public health.
At the same time, certain hazards, such as floods and mudflows resulting from heavy rainfall, as well as soil salinization and groundwater depletion, continue to be assessed as minor in the long-term perspective. This suggests that Talin's geographical location and natural conditions partially mitigate water-related extreme hazards.

Table 39. Climate Risk Assessment in the Long Term

Hazard	Risk Level
Flash Floods / Mudflows caused by heavy rain	Insignificant
Soil Salinization	Insignificant
Loss of Groundwater	Insignificant
Biological Hazards (insect outbreaks, airborne, waterborne, and vector-borne diseases)	Insignificant
Strong Winds / Storms / Tornadoes	Minor
Thunderstorm / Lightning	Moderate
Frost	Moderate
Severe Winter / Cold Waves	Moderate
Soil Erosion	Moderate

Impact of Increased CO_2 Concentration in the Atmosphere	Moderate
Industrial Dust	Significant
Extreme Heat	Severe
Droughts	Severe
Hailstorms	Severe
Periods of Very High Temperature (lasting several days or weeks)	Severe
Fires (forest or grassland)	Severe
Heatwaves	Severe
Water Scarcity	Severe
Frost	Severe

Overall, the development of climate risks in the Talin community is characterized by a clear shift toward increased thermal, water-related, and soil-related risks over the medium- and long-term. These trends highlight the necessity of planning adaptation measures at an early stage, particularly in water resources management, agricultural stabilization, soil conservation, and thermal risk reduction.

14.4.2. Main Climate Hazards and Risk Assessment of the Talin Community

Within the framework of SECAP preparation, a detailed climate risk assessment was conducted to identify the most critical climate hazards for the Talin community and to assess their likelihood of occurrence and potential impacts. The assessment considered both current impacts and possible developments in the short term (0–5 years), medium term (6–14 years), and long term (15+ years). For each hazard, its frequency, intensity, and impacts on the population, the economy, and ecosystems were presented, in line with the Covenant of Mayors and the NAP.

As shown in Table 40, droughts, extreme heat and heatwaves, frost, hail, fires, strong winds, and soil erosion are identified as the main climate hazards for the Talin community. Some of these are currently assessed as medium-level risks, with significant but still manageable impacts for the community. At the same time, the intensification of soil erosion is assessed as a high-risk hazard due to its accelerating impacts on the natural environment and agricultural land.

Table 40. Current Climate Hazards for the Community[21]

			Current risk		Expected impacts					
	Change / aggravation of the issue since 2010 (e.g. erosion, etc.)	**Change in frequency since 2010**	**Change in intensity since 2010**	**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)**
Extreme heat	Unchanged	Unchanged	Unchanged	Medium	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged

[21] **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.

Droughts	Unchanged	Unchanged	Unchanged	Medium	Will decrease	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged
Thunderstorms / lightning	Decreased	Decreased	Decreased	Low	Will decrease	Will decrease	Will decrease	Will decrease	Will decrease	Will decrease
Floods / mudflows caused by heavy rainfall	Decreased	Decreased	Decreased	Low	Will decrease	Will decrease	Will decrease	Will decrease	Will decrease	Will decrease
Hail	Unchanged	Unchanged	Unchanged	Medium	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged
Periods of very high temperatures	Decreased	Decreased	Decreased	Low	Will decrease	Will decrease	Will decrease	Will decrease	Will decrease	Will decrease
Fires (forest, grassland)	Unchanged	Unchanged	Unchanged	Medium	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged
Strong winds / storms / tornadoes	Unchanged	Unchanged	Unchanged	Medium	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged
Frost	Unchanged	Unchanged	Unchanged	Medium	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged
Heatwaves	Unchanged	Unchanged	Unchanged	Medium	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged
Erosion	Increased	Increased	Increased	High	Will increase	Will increase	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged
Water scarcity	Increased	Increased	Increased	High	Will increase	Will increase	Will remain unchanged	Will increase	Will increase	Will increase
Dust from mining / industrial facilities	Unchanged	Increased	Increased	Medium	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged	Will remain unchanged

Thus, in the medium- and long-term, water scarcity is the most significant hazard. At the same time, soil erosion is considered a growing risk that threatens the community's natural resource base and agricultural productivity. This outlook highlights the need for targeted, timely adaptation measures to support sustainable water resource management, promote climate-resilient agriculture, and enhance community preparedness. Relevant measures are presented in detail in Sections 14.5 and 14.6.

14.5. Local perceptions of climate risks

During the assessment of climate vulnerability in the Talin community, particular importance was given to the involvement of local representatives through surveys. This enabled understanding which climate hazards are most visible and disruptive in everyday life. The surveys conducted constitute a valuable input for climate risk assessment; however, the adaptation measures proposed by us were also developed taking into account other documents (the community development plan, reports related to the community, the structure of the community's industrial production, etc.) in order to propose a more comprehensive set of measures. Perceptions of climate risks (risk ratings) are considered qualitative assessments, which may differ to some extent from quantitative risk assessments.

From the perspective of the Talin community, extreme heat and drought are perceived as climate hazards with a medium level of risk, whereas hail is expected to have significant consequences, particularly for households engaged in agriculture, should such events occur.

In the medium term, concerns about climate hazards are expanding, as are risk ratings. The analysis shows that, for a number of climate hazards, under conditions of high probability of occurrence, the severity of potential impacts leads to risk levels assessed as medium or higher. At the same time, a severe risk rating in the medium term primarily pertains to water scarcity and drought. Thus, in the medium term, under global warming, the probability of drought will increase. Droughts are assessed as highly likely to occur and may have severe negative impacts on the Talin community, particularly on the rural population. Farming households have limited capacity to cope with the consequences of droughts, especially under conditions of increasing water scarcity risks. For this reason, in the medium term, the risk level of droughts and water scarcity is assessed as the highest. Consequently, if these hazards occur, their impacts will be highly negative. This underscores the necessity of developing effective adaptation measures for the water system and of securing alternative sources of income.

Under conditions of global warming, droughts are expected to occur with very high probability in the Talin community in the long term, accompanied by heatwaves, water scarcity, and increased fire frequency. Under these conditions, climate impacts will be particularly severe for the rural population. In the context of land degradation, yield losses may become severe, while the combined effects of hailstorms and spring frosts may lead to widespread crop losses.

Although the overall threats are largely perceived, knowledge regarding specific preparedness measures may vary; therefore, priority should be given to targeted awareness-raising and the development of targeted capacities within the Talin community's adaptation programme.

Thus, perceptions in the Talin community are consistent with the risks expected from climate change, which are quantitatively assessed in other developed countries.

14.6 Sectoral Vulnerability Analysis

Based on the identified climate hazards, an assessment of vulnerability, sensitivity, and adaptive capacity was carried out for the main sectors of the Talin community. The analysis shows that the impacts of climate change manifest differently across sectors, depending on resource availability, infrastructure condition, and governance capacity (Table 41). Overall, agriculture and forestry were identified as the most vulnerable sectors, followed by the energy system, given their exposure to a range of climate hazards and environmental and biodiversity risks. Dependence on agriculture makes rural households particularly vulnerable, as they constitute the majority of the community's population.

Agriculture and forestry. Agriculture is the sector most vulnerable in the Talin community, owing to its direct dependence on climatic conditions. Droughts and water scarcity disrupt irrigation opportunities for farming households, reduce crop yields, and limit water availability for livestock breeding. Heatwaves and extremely high temperatures cause heat stress, accelerate soil moisture loss, and reduce productivity. Hailstorms and frosts can rapidly destroy entire crops, particularly in orchards and early-yield crops.

In addition, soil erosion and land degradation, driven by both heavy precipitation and land-use challenges, gradually deteriorate soil quality. The agricultural sector is highly sensitive, while adaptive capacity is constrained by outdated irrigation systems, limited financial resources, and the absence of risk-management mechanisms (e.g., insurance). Without targeted adaptation measures, this sector will continue to be one of the most vulnerable in Talin, threatening local incomes and food security.

Water resources (water supply and management). The water system in Talin is highly vulnerable to droughts and rising temperatures. Droughts and water scarcity reduce the capacity to cope with climate hazards, while heatwaves increase water demand and simultaneously increase network losses, thereby disrupting regular water supply. This is further affected by the fact that irrigation may be carried out using drinking water. In recent years, groundwater levels have declined, increasing the risk of water scarcity.

Water supply infrastructure is partially outdated, resulting in losses before water reaches final consumers. Higher temperatures increase evaporation, meaning that the same amount of precipitation yields less effective water resources. The water sector's sensitivity is evident: even a single dry year can lead to irrigation restrictions and social tensions. Adaptive capacities are currently quite low due to the lack of storage facilities, efficient water use practices, and alternative sources. For this reason, water scarcity is considered a priority strategic issue for Talin.

Health. The health sector in Talin has a medium level of vulnerability; however, under conditions of increasing climate stress, risks are intensifying due to heatwaves, extreme heat, and industrial dust in combination with strong winds. Extreme heat and heatwaves pose direct threats to public health, particularly for the elderly, children, and people with chronic diseases. During very hot days, the risk of exacerbation of cardiovascular, respiratory, and renal diseases may increase, while the limited capacity of healthcare facilities / outpatient clinics may be insufficient to adequately serve the population seeking medical assistance.

Water scarcity may also negatively affect hygiene and sanitary conditions. Although primary healthcare services operate in the community, their adaptive capacities remain limited.

Buildings and structures. Although this sector is assessed as not exceeding a medium level of vulnerability, vulnerability may increase significantly when multiple hazards occur simultaneously. Strong winds, storms, and hail can damage roofs and building exteriors (e.g., broken windows), while heatwaves may create problems in poorly insulated buildings. A portion of buildings has been constructed without consideration of contemporary climate hazards, thereby increasing sectoral vulnerability due to limited maintenance and the near absence of energy-efficient technologies.

Energy system. The energy system is vulnerable to strong winds, hail, thunderstorms/lightning, and very high temperatures, which have resulted in power outages. Overall, the sector's vulnerability to climate hazards is considered medium to moderately high, as these hazards may reduce the efficiency of substations and transformers, increase the likelihood of overloads and technical failures, damage overhead lines, and lead to interruptions in electricity supply. This, in turn, negatively affects other sectors by disrupting water supply, ICT systems, and other services. Sources of vulnerability include the predominance of overhead lines and the limited protection of substations against climatic impacts.

Information and Communication Technologies (ICT). The vulnerability of the ICT sector can generally be assessed as medium; however, under certain climate hazards, it becomes strategic. Fires, extreme temperatures, strong winds, and other climate hazards may damage cables, antennas, and optical routes, resulting in communication disruptions. The sources of vulnerability include the physical exposure of overhead cables and open infrastructure, as well as the limited availability of alternative routes.

Tourism. The tourism sector has low vulnerability. Water scarcity and fires may reduce the tourism attractiveness of the Talin community, while ecosystem degradation may, in the long term, negatively affect visitor numbers. One explanation is that industrial activities, including mining, play a more significant role in the community, whereas tourism accounts for a relatively small share of the community's value added. The development of tourism, especially in rural areas and their surroundings, may reduce the vulnerability of rural households to a range of climate hazards and can serve as an alternative source of income to agriculture.

Environment and biodiversity. The environment and biodiversity sector is vulnerable to a range of climate hazards. Drought reduces vegetation vitality, fires destroy forest and grassland areas, while erosion and industrial dust accelerate land degradation. Sources of vulnerability are linked to the limited regenerative capacity of ecosystems and the resulting challenges, which, in the long term, may undermine landscape stability and increase vulnerability across other sectors.

Overall, sectoral vulnerability in the Talin community is driven by the intensity and frequency of climate hazards, but above all by infrastructure conditions, dependence on natural resources, and limited adaptive capacity. This highlights the need for a systemic, cross-sectoral, and long-term adaptation approach at the community level. Therefore, planning of adaptation programmes in Talin should be comprehensive and multi-sectoral, simultaneously aimed at strengthening water and food security, protecting public health, and developing infrastructure, thereby reducing the community's overall vulnerability.

Table 41. Sectoral Vulnerability Heat Table for Talin Community

Climate Hazard	Agriculture, Forestry	Water System	Energy System	Health	Environment, Biodiversity	Infrastructure, Buildings	ICT	Tourism	Land Use	Industry	Education
Drought	Yellow	Yellow	Green	Green	Yellow	Green	Green	Green	Orange	Green	Green
Extreme Heat	Orange	Yellow	Yellow	Orange	Green	Green	Green	Green	Green	Green	Green
Water Scarcity	Orange	Orange	Green	Green	Orange	Green	Green	Yellow	Orange	Yellow	Green
Erosion	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green	Green
Hailstorms	Orange	Green	Yellow	Green	Green	Yellow	Orange	Green	Green	Green	Green
Frost	Orange	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Wildfires	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Yellow	Green	Green	Green
Strong Winds	Yellow	Green	Red	Green	Yellow	Orange	Orange	Green	Green	Green	Yellow
Thunder	Green	Green	Red	Green	Green	Green	Red	Green	Green	Green	Green
Mudflows	Yellow	Green	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
Industrial Dust	Yellow	Green	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green	Green

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

14.7. Vulnerable Population Groups

The impacts of climate hazards on residents of the Talin community are not evenly distributed. Within the community, socially vulnerable households and households engaged in agriculture are more exposed due to their health status, sources of income, employment conditions, and place of residence. The main vulnerability factors are linked to water scarcity, droughts, hailstorms, heatwaves (periods of very high temperatures), strong winds, fires, and industrial dust, which simultaneously affect both livelihoods and health.

Rural households and those dependent on agriculture, especially low-income households, are considered among the most vulnerable groups. Water scarcity and drought lead to limited irrigation water availability, disruption of irrigation schedules, and reduced crop yields, resulting in direct financial losses for these population groups. In addition, risks related to food security and reduced agricultural procurement may affect labor demand and income levels within the community. The vulnerability of this group is further increased when losses are not compensated by insurance and/or when there are no financial reserves for recovery.

Women and girls are also identified as a vulnerable group, particularly in the context of hailstorms and heatwaves. This is due to the fact that during periods of climate stress, the additional burden of water use, caregiving, and health maintenance within households often falls on women, while in rural areas, women are also involved in agricultural work. Consequently, crop losses or disruptions in water availability may directly affect not only incomes but also overall household resilience.

The elderly and people with chronic diseases constitute a particularly vulnerable group under conditions of heatwaves, the spread of industrial dust, and water scarcity. Health impacts include increased risks of cardiovascular and respiratory complications, as well as exacerbation of other chronic conditions, particularly during periods of extreme heat. At the same time, dust dispersion and deterioration of air quality are considered potential long-term health risk factors, increasing healthcare costs and reducing work capacity.

Another vulnerable group is children. They are particularly vulnerable to heatwaves and exposure to ultraviolet radiation. During periods of high temperatures, children dehydrate more quickly and tolerate heat less effectively, and if the water supply becomes irregular, health risks may increase more rapidly.

In addition, during strong winds or storms, the risk of roof atdamage of educational institutions may disrupt the regular course of instruction, thereby indirectly affecting children.

People with disabilities and residents living in poor housing conditions are also identified as vulnerable groups. In the event of hailstorms and strong winds, damage to roofs and windows of houses may create a significant financial burden, particularly when property is uninsured. For these groups, the challenge is often not only the extent of the damage but also the limited capacity for rapid recovery.

People working outdoors (e.g., agricultural workers, herders, construction workers, and others in similar occupations) are vulnerable to water scarcity and heatwaves. The combination of heat and dryness increases the risks of heat stress, dehydration, and reduced work capacity, while seasonal water shortages may create additional challenges for work organization and productivity.

Thus, climate vulnerability in the Talin community is shaped by three main interrelated dimensions:

1. financial (income-related) and food security risks resulting from disruptions in agricultural production,
2. increased health vulnerability of the population under conditions of extreme heat and deteriorating air quality,
3. risks related to infrastructure damage and limited capacity for its recovery, particularly for low-income and socially vulnerable households.

Therefore, in planning adaptation measures, it is important to adopt an inclusive approach, ensuring access to awareness-raising and early-warning systems and strengthening social support and economic resilience mechanisms during periods of climate stress.

14.8 Talin 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 the Talin community. The proposed measures address the identified priority hazards and sectors (in particular 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 an emphasis on integration, cost-effectiveness, and the gradual strengthening of capacities. Adaptation actions have been designed following a sectoral logic and envisage three implementation horizons: short term (0–5 years) for urgent and system-stabilising investments, medium term (6–14 years) for expanding coverage and strengthening efficiency, and long term (15+ years) for systemic change and ensuring high resilience. Implementation of the actions is proposed through cooperation among municipal authorities, responsible state bodies, and the private sector, with diversification of financing sources (Annex 2).

Agriculture and forestry. In Talin, key adaptation measures focus on improving water management and enhancing agricultural resilience. The logic of the measures highlights that under conditions of droughts, heatwaves, hailstorms, and frosts, water scarcity, and other hazards, the implementation of adaptation measures is a priority. The measures combine infrastructure, technological, ecosystem-based, and organisational solutions, ensuring the long-term resilience of agricultural production and rural livelihood systems, and are proposed along the following directions:

- water resources management and irrigation, aimed at reducing water losses and expanding irrigation coverage,
- protection from climate hazards to reduce financial losses,
- soil protection and agro-ecological sustainability,
- introduction of digital solutions and early warning systems,
- technological modernisation of agricultural production,
- economic protection and financial resilience through the reduction of financial risks,
- seed and biodiversity adaptation, etc.

In the short term, a priority is the efficient management of water resources, including the rehabilitation and renovation of irrigation canals, the construction of rainwater-harvesting reservoirs, and the promotion of drip irrigation systems. At the same time, measures are aimed at the physical protection of agricultural production from climate extremes. For this purpose, the installation of eco-sustainable anti-hail stations is envisaged, as is the provision of hail-, sun-, frost-, and wind-protection covers to farming households. Measures also include promoting crop rotation and mulching, establishing shelterbelt forest strips, rehabilitating perennial plantations, and introducing sustainable pasture management systems, which will contribute to soil moisture retention, reduce erosion, and enhance overall ecosystem stability. Agro-technological and digital solutions will be aimed at modernising production and preventing risks. The construction of smart livestock facilities and greenhouses, as well as the creation of a community digital application for early warning, will enable increased productivity, reduce the impacts of climate risks, and provide timely information to farming households about anticipated hazards. To enhance the resilience of farming households, support for the adoption of agricultural insurance and awareness-raising measures is proposed to mitigate financial losses resulting from climate-related disasters.

Overall, the proposed measures form a phased adaptation strategy that, in the short term, will reduce water and crop losses; in the medium term, will increase the efficiency of agricultural systems and insurance coverage; and in the long term, will lead to the development of smart, eco-sustainable, and highly productive agriculture, significantly strengthening the resilience of the Talin community to climate change.

In the short term, a reduction in water losses of approximately 20%, a 15% decrease in crop losses, a 15% increase in insurance coverage, and an awareness of climate risks among approximately 90% of the population are expected.

In the medium term, it is planned to expand the coverage of irrigation and hail protection systems to 40%, which will reduce water and crop losses by approximately 40% and increase insurance coverage to 35%. At the same time, the share of smart livestock facilities and greenhouses is expected to increase to approximately 40%. In the long-term phase, the programme aims to ensure a full transition to smart irrigation networks and eco-sustainable anti-hail systems. As a result, water and crop losses are expected to be reduced by up to 90%, insurance coverage is expected to increase to 90%, and the widespread adoption of smart livestock facilities and greenhouses in the community is expected, with shares of approximately 80% and 70%, respectively.

Energy. The energy sector in the Talin community is vulnerable to heatwaves/periods of very high temperatures, lightning, industrial dust (especially during strong winds, from the perspective of solar energy), strong winds and storms, thunderstorms and lightning, fires, and hailstorms, which may cause overloads, substation failures, and power supply interruptions, particularly in rural areas. Adaptation measures aim to enhance the resilience of electrical infrastructure and the reliability of the energy supply.

In the short term, it is proposed to construct or protect two substations against climatic impacts, waterproof five substations and ten transformer units, and replace low-voltage lines with insulated cables. In parallel, the installation of surge limiters and improvements of grounding systems in five rural settlements are proposed, along with the replacement of overhead lines supplying residential areas and pole reinforcement. At this stage, a reduction in the number of overloads and outages and an increase in the reliability of the electricity supply in rural areas are expected.

In the medium-term perspective, it is planned to increase the number of climate-protected substations by about 25% and to expand the coverage of insulated cables, which will allow outages to be reduced by around 40% and reliability to be increased by approximately 70%. As a result, overloads and outages are expected to be reduced by up to 80%, and the reliability of electricity supply in rural areas is expected to increase to 90%, as a safer, more reliable, and climate-resilient energy system is formed in the Talin community.

Information and Communication Technologies. ICT infrastructure in the Talin community is vulnerable to fires, heatwaves (very high temperatures), lightning, hail, strong winds, and storms, which may cause cable damage, communication disruptions, and temporary loss of internet coverage. As ICT systems play a critical role in both emergency management and the continuity of public services, enhancing their climate resilience is considered a priority.

In the short-term phase, it is proposed to replace approximately 20 km of cables with non-flammable cable sheaths and to install temperature and smoke sensors for the early detection of fires and overheating. It is also proposed to add at least 20–25 antenna masts and to introduce backup optical routes along two corridors with an automatic rerouting system. These measures will help reduce communication outages and increase the security of ICT systems in high-risk areas.

In the medium term, the gradual replacement of approximately 40% of the required cables in the community is planned, which is expected to reduce internet service disruptions by up to 60%. In the long term, the programme aims to achieve the complete replacement of ICT cables with non-flammable, resilient systems, resulting in a reduction in communication and internet service disruptions of up to 90% and a significant strengthening of the community's digital resilience.

Buildings and structures. The building stock of the Talin community is vulnerable to floods caused by heavy rainfall, strong winds and storms, hailstorms, as well as heatwaves and extreme heat. Older residential buildings and houses are particularly at risk, as climate extremes may cause significant material damage. The measures proposed here will be implemented through pilot programmes, focusing on residential buildings and houses identified by the community as the most vulnerable.

In the short-term phase, the programme proposes to reinforce the roofs of 20 residential buildings and/or houses with wind-resistant anchoring systems and to provide flood protection for 20 buildings/houses. In addition, the replacement of roofs on 10 buildings with hail-resistant roofing materials is envisaged, along with the implementation of "cool roof" coatings and wall thermal insulation for 20 multi-apartment buildings/houses to reduce heat impacts. As a result of these measures, a reduction in cases of roof damage and a decrease in flood-related damages are expected.

In the medium term, scaling up the pilot solutions will increase roof reliability by about 50%, the number of flood-protected residential buildings by around 30%, and the number of buildings with heat-protective roofs and insulated walls by approximately 35%. In the long term, the programme aims to increase the climate resilience of the building stock to up to 90%, with flood-protected residential buildings covering up to 80%. As a result, a significant reduction in climate-related damage to buildings and a substantial improvement in housing safety for the population are expected.

Water system. The water supply system of the Talin community is vulnerable to droughts, heatwaves (periods of very high temperatures), water scarcity, and other climate hazards. In the short-term phase, the programme proposes installing three mobile pumping units, a 3,000 m^3 drinking-water storage tank, and smart pressure meters in two high-pressure zones to reduce water losses and ensure an uninterrupted water supply for at least 48 hours during droughts or emergencies. In addition, the cleaning and rehabilitation of mudflow channels are envisaged to ensure regular and effective drainage operations. At this stage, an increase in water discharge capacity of at least 20% is expected, as well as an increase in uninterrupted water supply of 48 hours for 20–30% of the population. In the medium term, the implemented measures will increase drainage efficiency and water availability by approximately 50%, and in the long term by up to 90%. As a result, the community may have a more efficient, responsive, and climate-resilient water system, improving both water security for the population and overall emergency management capacities in the Talin community.

Transport. In the Talin community, comprehensive measures are proposed to mitigate risks associated with floods, mudflows, adverse conditions, and road degradation. In the short-term phase, it is proposed to rehabilitate the most vulnerable flood-prone roads and road sections in Talin by installing side drainage ditches, culverts, and floodwater discharge structures. These measures will reduce road closures caused by flooding by approximately 30–40% and increase the share of passable roads during climate-related disasters. In the medium term, the expansion of alternative routes, the scaling up of drainage solutions, and the use of high-durability, long-service-life asphalt paving in the most vulnerable sections are proposed, which will reduce climate-hazard–induced impassable road sections. In the long term, the phased improvement of transport infrastructure aims to reduce the length of roads rendered impassable by climate hazards by approximately 90%. As a result, community connectivity, emergency response capacity, and access to essential services for the population will be significantly improved.

Health. The healthcare system of the Talin community is vulnerable to extreme heat and related climate hazards, which pose particularly high risks to the elderly, children, and people with chronic diseases, especially under conditions of intensified winds and industrial dust. For this reason, in the short-term phase, the programme prioritises the introduction of telemedicine between the Talin Medical Centre and rural outpatient clinics, enabling rapid and targeted medical consultations and care for residents affected by climate hazards. At the same time, the establishment of three cooling centres based on local cultural centres is envisaged, to serve as temporary shelters for heat-vulnerable groups. It is also proposed to pilot the establishment of three "green centres" to cool and reduce heat stress. These measures will increase the effectiveness of medical assistance provided to patients seeking outpatient care during climate-related events by approximately 40% and the cooling capacity by approximately 30%. In the medium term, the expansion of telemedicine and community cooling infrastructure will ensure full access to healthcare services in rural settlements (up to 100%). It is expected that the capacity to manage heat-related complications among people with chronic diseases will increase by about 50%, while the effectiveness of healthcare response under climate extremes will reach 100%. In the long-term phase, the measures aim to establish a resilient healthcare system in which heat-related health risks are managed in a preventive and systematic manner.

Tourism. To promote the development of ecotourism and agrotourism, it is proposed to establish 3–5 tourist routes in the Talin community, each covering 3–5 rural settlements. These routes are intended not only to present natural and historical–cultural resources to tourists, but also to stimulate consumption of local products from rural areas and of agri-food products processed from these materials, thereby contributing to increased economic activity in the community and higher incomes for rural households. At the same time, the creation of environmental educational trails and eco-guides is envisaged, with particular emphasis on engaging school pupils, students, and hiking groups from Yerevan, in cooperation with schools, educational institutions, and tour operators.

In the short term, the first 3–5 ecotourism and agrotourism routes will be established, forming the core tourism infrastructure in the community. In the medium term, the number of routes and trails is expected to increase, including elements of adventure tourism and the inclusion of new settlements in tourism products. In the long term, an increase of up to 80% in the number of ecotourism and agrotourism routes and trails is expected, through the introduction of additional tourism elements and broader territorial coverage.

Environment and biodiversity. In the Talin community, a set of comprehensive measures is proposed to mitigate the adverse impacts of erosion, industrial dust, and other climate hazards. Priority is given to the short-term expansion of green infrastructure: it is planned to plant 1,200–1,500 trees and to create green corridors and protective belts that will contribute to microclimate improvement, dust reduction, and enhanced landscape stability. To combat soil erosion, it is proposed to rehabilitate erosion-prone lands and to introduce soil-cultivation technologies on agricultural lands to improve soil moisture retention and prevent declines in soil fertility. In addition, it is proposed to develop and implement a dedicated programme to protect aquatic habitats and maintain the resilience of aquatic ecosystems.

In cooperation with the Government of the Republic of Armenia and the Aragatsotn Regional Administration, it is proposed to develop a legislative initiative to establish a framework for cooperation with industrial companies in the state sector, requiring mandatory annual greening activities within and around mining sites and their impact zones. This initiative aims to reduce the negative environmental impacts of industrial activities, particularly dust dispersion, soil degradation, and biodiversity loss, while ensuring the gradual restoration of landscapes and increasing the ecological resilience of communities. In the medium term, further expansion of green infrastructure and a reduction in the share of degraded land are expected. In the long term, the objective is to ensure high resilience of the community's ecosystems and sustainable management of natural resources.

Conclusions

The analytical findings indicate that a significant share of greenhouse gas emissions is associated with activities concentrated within municipal and community territories. This reflects the spatial concentration of population, economic activity, transport flows, and other energy-consuming sectors at the local level. At the same time, under conditions of global climate change, communities are increasingly exposed to extreme climate events and their associated socioeconomic consequences, thereby heightening local vulnerability.

Within this context, local self-government bodies, when supported by adequate political commitment, technical expertise, and financial capacity, can play a decisive role in promoting efficient use of energy resources, advancing climate change mitigation, and strengthening adaptation efforts. Their actions can generate not only local benefits but also measurable contributions at the national level.

To operationalize these objectives, it is essential to develop a strategic framework that incorporates:

- an assessment of annual greenhouse gas emissions in the selected baseline year, derived from energy consumption across key sectors within the community;
- identification of climate risks specific to the municipality and determination of the most vulnerable sectors;
- a coherent set of mitigation measures aimed at reducing emissions, alongside adaptation actions designed to enhance long-term community resilience.

The strategy should explicitly promote the deployment of energy-saving and energy-efficient technologies, the adoption of energy management practices, the expanded use of renewable energy sources, and the active engagement of local stakeholders throughout implementation.

Recognizing the importance of sustainable development, the Talin Municipality has formally decided to join the EU Covenant of Mayors for Climate and Energy initiative. This initiative supports local authorities in designing and implementing sustainable energy and climate policies to reduce dependence on fossil fuels, address energy poverty, mitigate the impacts of extreme climate events, and improve overall quality of life.

By joining the initiative, Talin Municipality has undertaken a voluntary commitment to reduce greenhouse gas emissions within its territory by at least 35% by 2030 and to strengthen resilience to climate change impacts.

This Sustainable Energy and Climate Action Plan constitutes the municipality's principal strategic document guiding local energy and climate policy. The Plan is subject to periodic review and update to incorporate newly justified measures based on economic, technological, and environmental considerations. The outcomes of monitoring and evaluation processes may also serve as grounds for revision.

Climate Change Mitigation

During the preparation of the Sustainable Energy and Climate Action Plan, a comprehensive assessment of final energy consumption and associated greenhouse gas emissions was conducted for the selected baseline year. The analysis covered municipal and community-owned buildings, the residential sector, road transport, and the public street lighting system.

According to the Baseline Emission Inventory, total emissions within the target sectors amount to 47,361.479 tonnes of CO_2 per year. This value serves as the reference level for defining the municipality's emission-reduction commitments and for monitoring future progress.

The sectoral distribution of emissions is as follows:

- Municipal and public buildings: 799.310 t CO_2/year

- Residential sector: 12,935.719 t CO_2/year
- Road transport: 31,798.326 t CO_2/year
- Public street lighting: 94.924 t CO_2/year

The Plan also considers the contribution of the municipal solid waste subsector to the overall emissions balance, particularly given its methane (CH_4) generation potential. The assessment confirms that this subsector represents a relevant source of emissions and has therefore been incorporated into the emissions accounting framework.

In line with the municipality's commitment under the Covenant of Mayors for Climate and Energy, Talin has set a target to reduce greenhouse gas emissions by at least 35% by 2030 compared to the baseline level. This corresponds to an annual reduction of approximately 16,576.5 tonnes of CO_2. To achieve this objective, the Plan includes a combination of low-cost, no-regret measures and capital-intensive investments, whose integrated implementation is expected to deliver the required emission reductions.

Priority is given to improving energy efficiency, promoting energy conservation, and expanding the deployment of local renewable energy. The increased penetration of renewable energy technologies is expected to generate a substantial share of emission reductions by the target year.

Given local climatic conditions and technical feasibility, solar energy has been identified as the municipality's primary renewable energy source. At the same time, the Plan allows for the exploration of additional renewable energy options, subject to appropriate technical and economic justification.

The overall investment requirement for implementing mitigation measures is preliminarily estimated at approximately AMD 3.596 billion.

Climate Change Adaptation

Recognizing the long-term implications of climate change and the importance of integrating resilience into local development planning, Talin Municipality has joined the Covenant of Mayors for Climate and Energy. This step reflects the municipality's commitment to advancing an integrated energy and climate policy framework that simultaneously addresses mitigation and adaptation objectives.

This Sustainable Energy and Climate Action Plan defines Talin's medium-term strategic approach to energy and climate governance. The document establishes measures to reduce emissions while strengthening the municipality's adaptive capacity. The Plan is designed as a dynamic policy instrument and will be periodically reviewed and updated to reflect evolving technologies, financing opportunities, and local priorities.

The climate risk assessment indicates that the primary hazards affecting Talin Municipality include droughts, water scarcity, extreme heat and heatwaves, hail, late spring frosts, wildfires, soil erosion, and strong winds. These hazards already exert tangible pressures on agriculture, water resources, public health, and infrastructure systems, contributing to a risk profile assessed as moderate to high. In contrast, the risks associated with large-scale flooding and severe storms are considered comparatively low.

Based on the vulnerability and risk analysis, risks were classified by potential impact, providing the basis for identifying adaptation priorities. A total of 51 adaptation measures have been proposed across key sectors:

- Agriculture and forestry – 20 measures
- Energy system – 5 measures
- Information and communication technologies – 3 measures
- Buildings and construction – 5 measures
- Water management – 4 measures
- Transport – 4 measures
- Public health – 3 measures
- Tourism – 2 measures
- Environment and biodiversity – 6 measures.

The prioritization, sequencing, and financing of these measures will require further refinement by the municipality, supported by detailed technical and financial analyses and stakeholder consultations. Active involvement of the local population and relevant beneficiary groups is considered essential for ensuring the effectiveness and sustainability of adaptation actions.

Annex 2. Potential Vulnerability of Key Sectors in the Talin 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	Decline in crop yields due to irregular irrigation schedules, leading to financial losses	2	Individuals with chronic diseases	Yes
	Yes	Reduction of groundwater reserves leading to decreased surface water availability and affecting irrigation access		Low-income households	Yes
	Yes	Food security concerns within the community		Outdoor workers	Yes
	Yes	Disruptions in regular irrigation water supply		Rural households	Yes
	Yes	Reduced procurement by the food-processing industry			
Water System	Yes	Risk of irregular drinking-water supply schedules for the population	2		
	Yes	Insufficient water for livestock, leading to industrial dust dispersion			
Industry	Yes	Industrial dust dispersion negatively affects public health and may cause long-term problems	1		
Environment and Biodiversity	Yes	Industrial dust spreading across settlements, contaminating air, water, soil, and vegetation	2		
	Yes	Risk of intensified soil erosion that will further affect agriculture and biodiversity			
Tourism	Yes	Risk of reduced quality of tourism services; community loses attractiveness as a tourist destination, decreasing visitor numbers	1		
Land-Use Planning	Yes	Problems maintaining green and vegetated areas	2		

HAIL					
Vulnerability Sector	**Yes/No**	**Impact**	**Impact Level (1–3)**	**Vulnerable Group**	**Yes/No**
Agriculture / Forestry	Yes	Crop loss causing financial damage, especially when crops are uninsured and anti-hail systems are ineffective	2	Women and girls	Yes
	Yes	Damage to trees and bushes affects future income of rural households if plants acquire diseases as a result of damage		Low-income households	Yes
	Yes	Reduced procurement by food-processing industry, leading to price increases		People living in poor housing conditions	Yes
	Yes	Decrease in crop yields		Rural households	Yes
	Yes	Damage to greenhouses		Elderly people	Yes
	Yes	Decrease in demand for agricultural labor in the community			
Energy System	Yes	Damage to power transmission lines, malfunctioning of stations/substations	1		
	Yes	Disruptions in regular electricity supply			

<table>
<tr><td rowspan="3">Buildings and Constructions</td><td>Yes</td><td>Damage to roofs and windows of residential houses leading to financial losses if property is uninsured</td><td rowspan="3">1</td><td colspan="2" rowspan="5"></td></tr>
<tr><td>Yes</td><td>Damage to roofs and windows of private-sector buildings and structures</td></tr>
<tr><td>Yes</td><td>Damage to roofs and windows of public-sector buildings</td></tr>
<tr><td rowspan="2">ICT (Information and Communication Technologies)</td><td>Yes</td><td>Failure of communication stations</td><td rowspan="2">2</td></tr>
<tr><td>Yes</td><td>Cable damage causing disruption of communication and internet coverage</td></tr>
<tr><th colspan="6">AIR POLUTION</th></tr>
<tr><th>Vulnerability Sector</th><th>Yes/No</th><th>Impact</th><th>Impact Level (1–3)</th><th>Vulnerable Group</th><th>Yes/No</th></tr>
<tr><td rowspan="3">Health</td><td>Yes</td><td>Increase in respiratory and skin diseases and eye-related problems, which may later lead to serious health issues</td><td rowspan="3">1</td><td>Women and girls</td><td>Yes</td></tr>
<tr><td>Yes</td><td>Gradual increase over time in household expenses for maintaining health</td><td>Children</td><td>Yes</td></tr>
<tr><td>Yes</td><td>Gradual decline in human working capacity</td><td>Elderly people</td><td>Yes</td></tr>
<tr><td>Agriculture / Forestry</td><td>Yes</td><td>Deterioration in crop quality and food safety concerns</td><td>1</td><td>People with disabilities</td><td>Yes</td></tr>
<tr><td>Environment and Biodiversity</td><td>Yes</td><td>Industrial dust spreading across settlements, contaminating air and water and settling on soil, plants, and trees</td><td>1</td><td>Individuals with chronic diseases</td><td>Yes</td></tr>
<tr><td>Energy System</td><td>Yes</td><td>Dust accumulation on solar panels reducing energy generation</td><td>1</td><td>Low-income households</td><td>Yes</td></tr>
<tr><th colspan="6">EROSION</th></tr>
<tr><th>Vulnerability Sector</th><th>Yes/No</th><th>Impact</th><th>Impact Level (1–3)</th><th>Vulnerable Group</th><th>Yes/No</th></tr>
<tr><td rowspan="3">Environment and Biodiversity</td><td>Yes</td><td>Increased use of fertilizers results in their entry into water streams, harming the environment</td><td rowspan="3">1</td><td>People with disabilities</td><td>Yes</td></tr>
<tr><td>Yes</td><td>Loss of soil fertility, which may later lead to desertification</td><td>Individuals with chronic diseases</td><td>Yes</td></tr>
<tr><td>Yes</td><td>Disruption of ecosystems, as plants, animals, and microorganisms that depend on healthy soil lose adequate nutrition</td><td>Low-income households</td><td>Yes</td></tr>
<tr><td rowspan="3">Agriculture / Forestry</td><td>Yes</td><td>Decline in crop yields leading to reduced harvest and financial losses</td><td rowspan="3">1</td><td colspan="2" rowspan="3"></td></tr>
<tr><td>Yes</td><td>Excessive use of fertilizers and pesticides may cause food safety problems</td></tr>
<tr><td>Yes</td><td>Reduced procurement by the food-processing industry</td></tr>
<tr><th colspan="6">HEATWAVES / EXTREME HIGH TEMPERATURE</th></tr>
<tr><th>Vulnerability Sector</th><th>Yes/No</th><th>Impact</th><th>Impact Level (1–3)</th><th>Vulnerable Group</th><th>Yes/No</th></tr>
<tr><td rowspan="2">Health</td><td>Yes</td><td>Increase in diseases including cardiovascular, respiratory, and kidney complications</td><td rowspan="2">2</td><td>Women and girls</td><td>Yes</td></tr>
<tr><td>Yes</td><td>Stronger impact of heatwaves in urban areas due to heat retention by hard surfaces (bitumen), creating a “heat island effect” that negatively affects health</td><td>Children</td><td>Yes</td></tr>
</table>

	Yes	Negative impact of high temperature and ultraviolet radiation on human health		Elderly people	Yes
Agriculture / Forestry	Yes	High daytime temperatures negatively affect plant growth	2	People with disabilities	Yes
	Yes	Heatwaves may increase the risk of droughts and wildfires, negatively affecting agriculture		Individuals with chronic diseases	Yes
Energy System	Yes	Increased demand for electricity may overload transmission lines, reducing power transfer capacity and reliability, leading to outages	1	Low-income households	Yes
Water System	Yes	Irregular water supply to the population due to higher demand for drinking water and use of potable water for irrigation	1		
FROST					
Vulnerability Sector	**Yes/No**	**Impact**	**Impact Level (1–3)**	**Vulnerable Group**	**Yes/No**
Agriculture / Forestry	Yes	Damage to flowering trees and new shoots, loss of buds, and destruction of agricultural crops, leading to income loss if crops are uninsured	2	Low-income households	Yes
	Yes	Increased fuel costs for greenhouse operations			
	Yes	Delayed growth on pastures causing feed shortages for livestock, which may reduce animal husbandry volumes			
	Yes	Food security concerns within the community			
	Yes	Decrease in crop yields			
	Yes	Reduced procurement by food-processing industries			
	Yes	If soil erosion has begun, frost and thaw cycles may intensify the process			
FIRES (GRASSLAND / FOREST)					
Vulnerability Sector	**Yes/No**	**Impact**	**Impact Level (1–3)**	**Vulnerable Group**	**Yes/No**
Environment and Biodiversity	Yes	Emission of greenhouse gases and solid particles into the atmosphere as a result of fires	1		
	Yes	Destruction of vegetation leading to loss of biodiversity			
	Yes	Increased sedimentation in water bodies and deterioration of water quality due to contaminants			
	Yes	Changes in soil pH affecting its chemical and biological properties			
	Yes	Fires may intensify soil erosion and alter nutrient content			
Agriculture / Forestry	Yes	Decline in soil fertility negatively affecting new crops	1		
	Yes	Decrease in beekeeping volumes			
	Yes	Feed shortages due to burned pastures			
	Yes	Crop losses			
	Yes	Food security concerns and rising food prices			
	Yes	Reduction in crop yields			
	Yes	Decline in livestock production volumes			
Energy System	Yes	Possible damage to power transmission lines and substation malfunctions	1		
ICT	Yes	Possible blackouts or power outages in the community	1		
	Yes	Failure of communication stations			

Vulnerability Sector	Yes/No	Impact	Impact Level (1–3)	Vulnerable Group	Yes/No
Buildings and Constructions	Yes	Cable damage leading to communication and internet disruptions	1		
Tourism	Yes	Loss of community attractiveness as a tourist destination and reduction in visitor numbers	1		
DROUGHTS					
Vulnerability Sector	**Yes/No**	**Impact**	**Impact Level (1–3)**	**Vulnerable Group**	**Yes/No**
Agriculture / Forestry	Yes	Crop losses and drying of trees due to irregular irrigation schedules, causing financial damage and requiring possible tree cutting	1	Low-income households	Yes
	Yes	Loss of pastures leading to decreased livestock production		Displaced persons / migrants	Yes
	Yes	Interruptions in regular irrigation water supply		Rural households	Yes
	Yes	Food security issues and risk of price increases		Urban households	Yes
	Yes	Decrease in crop yields			
	Yes	Decline in livestock production volumes			
	Yes	Reduced procurement by food-processing industry leading to higher prices			
	Yes	Decrease in labor demand in the community			
	Yes	Changes in fertilizer demand			
	Yes	Reduction of surface and groundwater resources affecting irrigation water availability			
	Yes	Combined with high temperatures, drought increases the spread of pests and diseases affecting crops, fodder, and livestock			
	Yes	Drought can lead to soil degradation and desertification			
	Yes	Increased fire risk			
	Yes	Decline in beekeeping volumes			
Water System	Yes	Irregular water supply due to growing demand	1		
	Yes	Irregular water supply caused by the use of drinking water for irrigation			
	Yes	Insufficient water for livestock, leading to industrial dust dispersion			
	Yes	Poor water quality and increased pressure on sewage systems due to higher demand			
Environment and Biodiversity	Yes	Increased water resource use leading to scarcity	1		
	Yes	Loss of soil fertility, potentially causing desertification			
	Yes	Disruption of ecosystems — plants, animals, and microorganisms depending on healthy soil lose proper nutrition			
	Yes	Disturbance of climatic cycles and changes in landscapes			
	Yes	Negative effects of pests on vegetation			
Land-Use Planning	Yes	Threats to preservation of green and vegetated areas	2		
STRONG WINDS / STORMS / TORNADOES					
Vulnerability Sector	**Yes/No**	**Impact**	**Impact Level (1–3)**	**Vulnerable Group**	**Yes/No**
	Yes	Crop loss causing financial damage, especially if crops are uninsured	1		

Agriculture / Forestry	Yes	Damage to shoots and broken trees, requiring financial expenses for replanting and orchard restoration, which may take years if crops are uninsured			
	Yes	Damage to barns and food storage facilities causing financial losses if not insured			
	Yes	Decrease in crop yields			
Energy System	Yes	Damage to power transmission lines and malfunction of stations/substations	3		
	Yes	Disruptions in regular electricity supply			
Buildings and Constructions	Yes	Damage to roofs, windows, and walls of residential houses, leading to financial losses if property is uninsured	2		
	Yes	Damage to roofs and windows of private-sector buildings and structures			
	Yes	Damage to roofs of public-sector buildings and structures			
Education	Yes	Damage to roofs of preschool and educational institutions, disrupting the regular teaching process	1		
ICT (Information and Communication Technologies)	Yes	Failure of communication stations	2		
	Yes	Cable damage causing disruption of communication and internet coverage			
Environment and Biodiversity	Yes	Industrial dust spreading across settlements, polluting air and water and settling on soil, plants, and trees	1		
FLOODS / MUDFLOWS					
Vulnerability Sector	**Yes/No**	**Impact**	**Impact Level (1–3)**	**Vulnerable Group**	**Yes/No**
Agriculture / Forestry	Yes	Crop loss due to flooded fields, causing financial losses, especially when crops are not insured	1	Low-income households	Yes
	Yes	Damage to pastures leading to feed shortages for livestock			
Buildings and Constructions	Yes	Risk of foundation weakening of buildings and structures, requiring additional expenses if uninsured, especially for households	1		
	Yes	Damage to roofs and windows of residential houses causing financial losses if property is uninsured			
	Yes	Damage to roofs of private-sector buildings and structures			
THUNDERSTORMS / LIGHTNING					
Vulnerability Sector	**Yes/No**	**Impact**	**Impact Level (1–3)**	**Vulnerable Group**	**Yes/No**
Energy System	Yes	Damage to power transmission lines and malfunction of stations/substations	3		
	Yes	Disruptions in regular electricity supply			
ICT (Information and Communication Technologies)	Yes	Failure of communication stations	3		
	Yes	Cable damage causing disruption of communication and internet coverage			

Annex 3. Adaptation Measures of the Talin Community

Hazard	Adaptation measure	Timeframe	Responsible bodies	Possible funding	Expected result
Agriculture/Forestry					
Drought, hail, frost, heatwaves	• Rehabilitate / reconstruct / renovate 15–20 km of irrigation canals • Construct 4 rainwater harvesting reservoirs • Install 3 eco-sustainable anti-hail stations with high efficiency and protective coverage • Provide support for the installation of 250 drip irrigation systems and train 250 farming households • Provide support for the provision of hail-protection and sun-protection systems to 300 farming households • Support 250 farming households in obtaining agricultural insurance and organise awareness-raising activities • Support the transition to 5 drought-resistant and frost-resistant crops through the provision of seeds • Support 200 farming households in implementing crop rotation and mulching to preserve soil moisture, including training • Develop a community digital application for early warning, to inform households about impending hazards • Support the construction of 3 new smart livestock facilities in the community • Support the construction of 3 new smart greenhouses in the community • Establish 15–20 km of field-protective forest belts (shelterbelts) • Introduce a pasture management system and transition to alternative livestock grazing (rotational grazing) • Restore perennial plantations covering more than 15–20 ha (perennial cover restoration) • Provide support for the provision of 300 frost-resistant protective covers to farming households to protect against frost damage • Provide support for the provision of 300 wind-protection covers to the most vulnerable farming households • Establish 2 fire-protection zones across vulnerable areas • Clean at least 10–15 km of flood drainage	• **0–5 years:** rehabilitate 15–20 km of canals / irrigation channels and construct 4 reservoirs; install 3 eco-sustainable anti-hail stations; develop a community digital application; construct 3 smart livestock facilities; construct 3 smart greenhouses; introduce a pasture management system; provide 300 frost-resistant protective covers against frost damage; provide 300 wind-protection covers; establish 2 fire-protection zones; clean 10–15 km of flood drainage systems; install 3 regulating protection barriers • **6–14 years:** expand irrigation coverage to 40%; expand the coverage of high-efficiency anti-hail systems to 40%; establish 15–20 km of field-protective forest belts (shelterbelts); restore perennial plantations covering more than 15–20 ha • **15+ years:** fully transition to a smart irrigation network; fully transition to eco-	Talin Municipality, MTAI, MoEcon, farming households	Talin Municipality, EU Mission Adaptation (P2R), IFAD, WB/GEF, RA State Budget/ Subvention Programs, GIZ/KfW, Water Committee, MoEcon	**0–5 years** Reduction of water losses by 20% Reduction of crop losses by 15% Increase in insurance coverage by 15% Awareness of climate risks among 90% of the population Share of smart livestock facilities in animal husbandry in the community: 10% Share of smart greenhouses in agriculture in the community: 10% Increase in crop productivity by 15–20% Increase in the effectiveness of pasture management by 15–20% **6–14 years** Reduction of water losses by 40% Reduction of crop losses by 40% Increase in insurance coverage by 35% Share of smart livestock facilities in animal husbandry in the community: 40% Share of smart greenhouses in agriculture in the community: 40% Increase in crop productivity by 35–40% Increase in the effectiveness of pasture management by 50% **15+ years** Reduction of water losses by 90% Reduction of crop losses by 90% Increase in insurance coverage by 90% Share of smart livestock facilities in animal husbandry in the community: 80% Share of smart greenhouses in agriculture in the community: 70% Increase in crop productivity by 60–80% Increase in the effectiveness of pasture management by 80%

	systems annually • Construct / install at least 3 or more debris-flow regulation barriers	sustainable anti-hail stations			
Energy Sector					
Heatwaves / Extremely high temperature Extreme heat, drought, heavy rainfall, lightning	• 2 substations protected against climatic impacts, ensuring electricity supply to residential buildings and houses and their connection to the grid • Construction / waterproofing of 5 substations and 10 transformer units • Conversion of 25 km of low-voltage lines to insulated cables • Installation of surge limiters on lines supplying residential buildings, as well as improvement of grounding systems in substations and transformer units in 5 rural settlements • Replacement of 25 km of overhead lines supplying residential areas with anti-icing conductors, reinforcement of poles, and installation of insulated power lines for residential buildings	**0–5 years** 2 substations protected against climatic impacts Construction / waterproofing of 5 substations and 10 transformer units Installation of surge limiters and improvement of grounding systems in substations and transformer units in 5 rural settlements Installation of 25 km of overhead lines with anti-icing conductors and insulated power lines to buildings and houses Conversion of 25 km of low-voltage lines to insulated cables **6–14 years** Increase in the number of substations protected against climatic impacts by 25% Expansion of insulated cable coverage by 20% **15+ years** Increase in the number of substations protected against climatic impacts by 70% Expansion of insulated cable coverage by 70%	Municipality, ENA, High Voltage Electric Networks (HVEN), MTAI MoE, Public Services Regulatory Commission (PSRC)	WB/GEF, RA State Budget/ Subvention Program, ADB, EIB	**0–5 years** Reduction in overloads and the number of outages by 15% Increase in reliability in rural areas by 35% **6–14 years** Reduction in overloads and the number of outages by 40% Increase in reliability in rural areas by 70% **15+ years** Reduction in overloads and the number of outages by 80% Increase in reliability in rural areas by 90%

ICT (Information and Communication Technologies)					
Grassland and forest fires, heatwaves / extremely high temperature / extreme heat, drought, floods	• Replace 20 km of cables with non-flammable cable sheaths and install temperature and smoke sensors • Reinforce antenna masts, at least 20–25 units • Establish backup optical routes on more than 2 corridors with automatic capacity rerouting (auto failover)	**• 0–5 years** Replacement of 20 km of cables with non-flammable sheaths and installation of sensors Reinforcement of at least 20–25 antenna masts Establishment of backup optical routes on 2 corridors with automatic capacity rerouting **• 6–14 years** Replacement of up to 40% of the required cables in the community and an increase in network reliability by 40–50% **• 15+ years** Complete replacement of cables and an increase in network reliability by 80–90%	Municipality, RA MTID, PSRC, Telecom Armenia CJSC, Viva Armenia LLC, Ucom LLC, and other companies	Telecom Armenia CJSC, Viva Armenia LLC, Ucom LLC, and other companies RA MTID, RA State Budget/ Subvention Programs	**• 0–5 years** Reduction of internet coverage disruptions by 25% **• 6–14 years** Reduction of internet coverage disruptions by 50% **• 15+ years** Reduction of internet coverage disruptions by 90%
Buildings and Constructions					
Floods/flash caused by heavy rainfall, strong winds/storms/ tornadoes, hail, heatwaves/extremely high temperatures /extreme heat, heavy snow	• Through a pilot programme, install wind-resistant anchoring systems and storm ties on the roofs of 20 residential buildings and/or houses identified by the municipality as the most vulnerable, to withstand wind gusts exceeding 100 km/h and reduce the risk of roof damage • Through a pilot programme, implement flood protection measures for 20 residential buildings/houses identified by the municipality as the most vulnerable, by installing backwater valves, waterproof foundation coatings, and related measures • Through a pilot programme, replace the roofs of 10 residential buildings/houses identified by the municipality as the most vulnerable with hail-resistant roofing materials • Through a pilot programme, apply special	**0–5 years** 20 residential buildings/houses with reinforced roofs 20 residential buildings/houses protected against flooding Roofs of 10 residential buildings/houses replaced with hail-resistant roofing materials 20 residential buildings/houses with thermally insulated walls and “cool roof” покрытия Reinforcement of	Municipality, private sector	Municipality, public–private partnership, EU Resilience Fund, RA State Budget/ Subvention Programs, ADB Resilience Bonds, WB Urban Climate Fund	**0–5 years** Reduction in roof damage incidents by 15% Reduction in flood-related damage incidents by 20% **6–14 years** Reduction in roof damage incidents by 50% Reduction in flood-related damage incidents by 60% **15+ years** Reduction in roof damage incidents by 90% Reduction in flood-related damage incidents by 90%

	"cool roof" coatings and carry out wall thermal insulation for 20 multi-apartment buildings/houses • Reinforce the roofs of 10 houses/multi-apartment buildings with appropriate load-bearing solutions and install heated drainage systems to reduce damage to roofs	roofs of 10 houses/multi-apartment buildings with load-bearing solutions and installation of heated drainage systems **6–14 years** Increase in roof reliability by 50% Increase in the number of flood-protected residential buildings/houses by 30% Increase in the number of buildings/houses with heat-protective roofs and thermally insulated walls by 35% **15+ years** Increase in roof reliability by 90% Increase in the number of flood-protected residential buildings/houses by 80% Increase in the number of buildings/houses with heat-protective roofs and thermally insulated walls by 90%			
Water System					
Floods, drought, heatwaves	• Install 3 mobile pumping units (≥300 l/s each), pre-connected via quick-coupling manholes at 3 highest-risk nodes; activation time from alarm should not exceed 60 minutes • Install at least 2 drinking water tanks with a capacity of 3,000 m³ in the most vulnerable settlements and smart pressure meters in 2 high-pressure zones to reduce water consumption/losses and ensure at least 48 hours of emergency water supply	**0–5 years** 3 sets of pumping units At least 2 drinking water tanks with a capacity of 3,000 m³ At least 15–20 km of main water supply pipelines rehabilitated/constructed and sealed	Municipality, RA MTAI	Municipality, RA State Budget/ Subvention Programs, WB, ADB, EIB	**0–5 years** Increase in water discharge capacity by 20% or more Increase in uninterrupted water supply (48 hours) by 20–30% **6–14 years** Increase in water discharge capacity by 50% or more Increase in uninterrupted water supply (48 hours) by 50% **15+ years** Increase in water discharge capacity by 90% or more

	• Rehabilitate/construct and seal at least 15–20 km (or more) of main water supply pipelines • Clean/rehabilitate at least 10 km of debris flow channels to ensure regular and effective drainage	At least 10 km of debris flow channels cleaned/rehabilitated **6–14 years** Increase in drainage efficiency by 50% Increase in water availability by 50% **15+ years** Increase in drainage efficiency by 90% Increase in water availability by 90%			Increase in uninterrupted water supply (48 hours) by 90%
Transport					
Floods/heavy rainfall, erosion, soil degradation	• Rehabilitate 5 km of flood-prone roads in Talin by adding side drainage ditches, culverts, and floodwater discharge facilities, enabling a reduction of road closures caused by flooding by more than 30–40% • Construct 2 alternative routes connecting Talin's medical facility with 2 major settlements • Procure at least 1 new snow-removal vehicle • Apply PMB-type asphalt on at least 10–15 km of road sections identified as the most vulnerable	**0–5 years** Rehabilitation of 5 km of flood-prone roads Construction of 2 alternative routes Procurement of 1 new snow-removal vehicle Application of PMB-type asphalt on the most vulnerable sections, at least 10–15 km **6–14 years** Construction of 2 additional alternative routes Reduction of climate hazard–related impassable roads by 50% Reduction in the recurrence probability of potholes by more than 40% **15+ years** Reduction of climate hazard–related impassable roads by 90% Reduction in the recurrence probability of potholes by more than 90%	Municipality, RA MTAI	Municipality, RA State Budget/ Subvention Programs, WB, ADB, EIB	**0–5 years** Increase in passable road sections during climate-related disasters by 30–40% **6–14 years** Increase in passable road sections during climate-related disasters by 60–70% **15+ years** Increase in passable road sections during climate-related disasters by 90%

Health Sector					
Extremely high temperatures /heatwaves and other climate hazards	• Use of telemedicine between the Talin Medical Center and outpatient clinics to provide appropriate treatment to individuals seeking care as a result of climate-related hazards • Establish 3 community cooling centers by equipping designated areas within local cultural centers as shelters for people vulnerable to climate-related health risks (e.g., heat stress, heatstroke) • Pilot establishment of 3–5 "green centers" for cooling during hot weather	**0–5 years** Introduction of telemedicine at the Talin Medical Center 3 cooling centers established in settlement cultural centers 3–5 green centers established **6–14 years** Increase in coverage of medical services provided by healthcare facilities in rural settlements to 100% Increase in the capacity of people with heat-related chronic conditions to cope with illness by 50% **15+ years** Increase in the capacity of people with heat-related chronic conditions to cope with illness by 80%	Municipality	Municipality, RA State Budget/ Subvention Programs	**0–5 years** Increase in the effectiveness of appropriate medical care provided to people seeking outpatient services during climate-related disasters by 40% Increase in cooling/shelter capacity by 30% **6–14 years** Increase in the effectiveness of appropriate medical care provided to people seeking outpatient services during climate-related disasters by 100% Increase in cooling/shelter capacity by 80% **15+ years** Increase in cooling/shelter capacity by 100%

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԱՐԱԳԱԾՈՏՆԻ ՄԱՐԶԻ ԹԱԼԻՆ ՀԱՄԱՅՆՔԻ ԱՎԱԳԱՆԻ

Հայաստանի Հանրապետության Արագածոտնի մարզի
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<<31>> մարտի 2026 թվական N 42 -Ա

ԹԱԼԻՆ ՀԱՄԱՅՆՔԻ ԿԱՅՈՒՆ ԷՆԵՐԳԵՏԻԿ ԵՎ ԿԼԻՄԱՅԱԿԱՆ ԳՈՐԾՈՂՈՒԹՅՈՒՆՆԵՐԻ ԾՐԱԳԻՐԸ ՀԱՍՏԱՏԵԼՈՒ ՄԱՍԻՆ

Ղեկավարվելով «Տեղական ինքնակառավարման մասին» Հայաստանի Հանրապետության օրենքի 18-րդ հոդվածի 1-ին մասի 42-րդ կետով, հիմք ընդունելով Թալին համայնքի ավագանու 2023 թվականի ապրիլի 28-ի N 52-Ա որոշումը.

Թալին համայնքի ավագանին որոշում է՝

1. Հաստատել ՀՀ Արագածոտնի մարզի Թալին համայնքի Կայուն էներգետիկ և կլիմայական գործողությունների ծրագիրը (ԿԷԿԳԾ)՝ համաձայն կից հավելվածի:
2. Թալին համայնքի ղեկավարին՝ ապահովել ծրագրով նախատեսված միջոցառումների իրականացումը և կազմակերպել ծրագրի իրականացման ընթացքի մշտադիտարկումը:
3. Սույն որոշումն ուժի մեջ է մտնում պաշտոնական հրապարակմանը հաջորդող օրվանից:

Կողմ- 22	Դեմ-0	Ձեռնպահ-2
1. Տավրոս Սափեյան		1.Դավիթ Մանուկյան
2. Սերգե Մկրտչյան		2. Գագիկ Ավետիսյան
3. Բաբկեն Պողոսյան		
4. Արման Կարապետյան		
5. Սարգիս Գրիգորյան		
6. Արտակ Հովհաննիսյան		
7. Գեղամ Ղազարյան		
8. Ավետիս Մինասյան		
9. Հարություն Կարապետյան		
10. Արմեն Ծառուկյան		
11. Նելլի Մարգարյան		
12. Գեղամ Սարգսյան		
13. Արուսիկ Վարդանյան		
14. Նարեկ Գրիգորյան		

15. Միեր Մարգարյան
16. Արմեն Գրիգորյան
17. Հայկ Սահարյան
18. Մնացական Մնացականյան
19. Անի Միկոյան
20. Սարգիս Մուրադյան
21. Վահե Եղիազարյան
22. Կարեն Գրիգորյան

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝ ՏԱՎՐՈՍ ՍԱՓԵՅԱՆ

ք. Թալին
31 մարտի 2026թ.