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GREEN STANDARDS

National Mortgage Company RCO CJSC

Republic of Armenia • 2024

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Introduction

The contents outlined herein offer a comprehensive exploration of critical factors influencing energy consumption and efficiency within the residential housing stock. Subsequent sections dissect building typology and its impact on final energy consumption, providing valuable insights into optimizing residential energy usage.

Moreover, this compilation includes an overview of emissions assessment within the building sector, highlighting the environmental implications of energy consumption patterns. Additionally, the discussion extends to the influence of energy prices and climatic data, highlighting their role in shaping energy management strategies.

This document outlines eligible energy efficiency measures and assumptions integral to baseline definitions for "Renovation & House Construction" and “Acquisition” loans. It also delineates the eligibility criteria for both loan products, emphasizing the importance of energy-efficient building practices in the lending process.

Lastly, attention is directed towards the existing certification system for buildings' energy performance and the process of obtaining an Energy passport for a building, underscoring the significance of regulatory frameworks in promoting sustainable building practices.

This comprehensive compilation serves as a valuable resource for stakeholders seeking to enhance energy efficiency and sustainability within the residential sector lending.

The climatic conditions defined, baseline assumptions in building typology, energy prices and tariffs, energy consumption mix and breakdowns, CO2 reduction factors, as stated in the document and embedded in the logic of the platform are subject to revision upon necessity on an annual basis.

Residential sector and specific energy consumption patterns in housing stock

The building sector is recognized as the most significant energy consumer in Armenia. The officially issued energy balances show the households are the main and largest final consumers of energy (33% -38%; 2015-2018), mainly including the natural gas and electricity.

According to the summary data of the reports received from the Cadastre Committee, RA communities, condominiums, authorized and accredited managers and other legal entities, the total area of the Republic's housing stock at the end of 2022 was 105.7 mln. m^2, of which- urban areas- 59.8 mln. m^2 (56.6%), rural areas- 45.9 mln. m^2 (43.4%)[1].

[1] https://www.armstat.am/file/article/housing_stock__2022_1_en.pdf

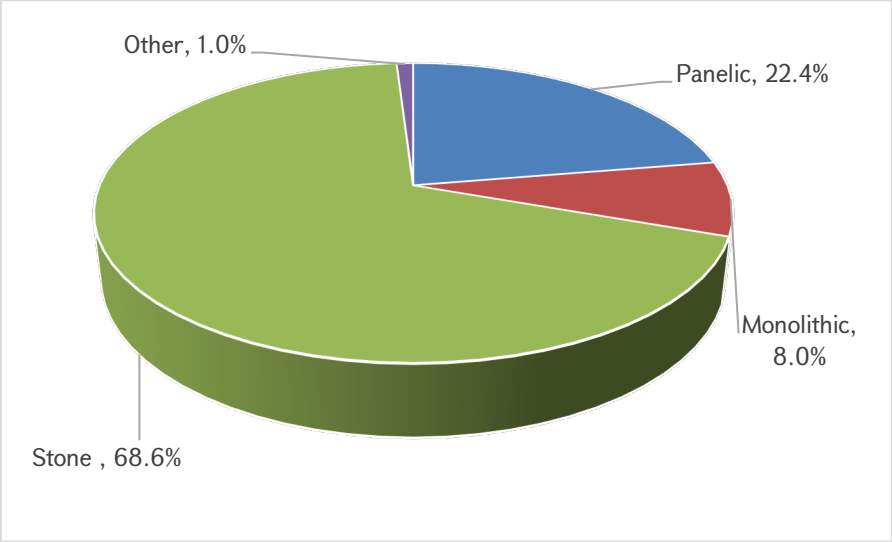
Regions	Multi-apartment Buildings			Single family Houses	
	Number of buildings	Quantity of apartments	Total area, m^2	Quantity	Total area, m^2
Yerevan	5,168	250,872	17,122,395	64,843	12,785,283
Regions	14,171	209,931	13,034,863	362,620	62,463,415
Total	**19,339**	**460,803**	**30,157,258**	**427,463**	**75,248,698**

The residential landscape reveals a total of 19,339 multiple dwelling units, consisting of a remarkable 460,803 individual apartments or units. Collectively, these units occupy an extensive expanse, totaling 30,157,258 square meters. The landscape of dwelling houses is characterized by a substantial count of 427,463 individual units. These houses collectively span an expansive area of 75,247,698 square meters. As illustrated in above table, around 28.6% of the total housing stock in Armenia is in residential buildings and the remaining 71.4% residential area is in single family houses.

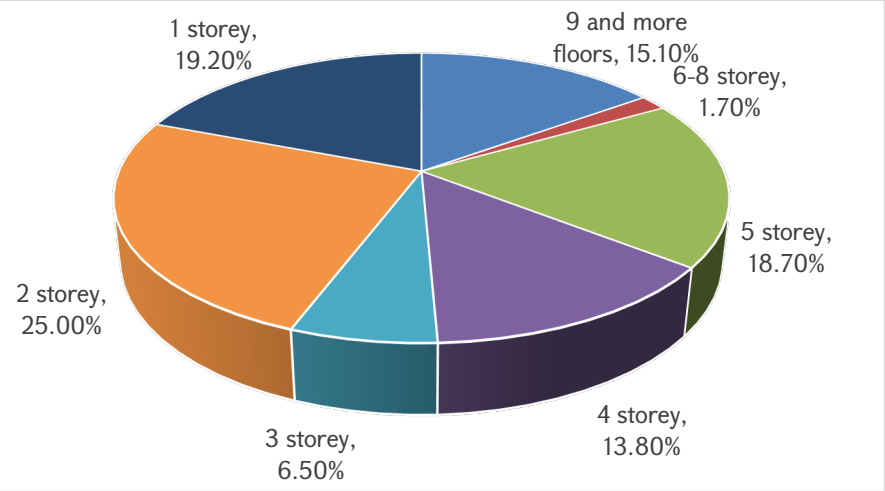
The total number of housing stock by regions of RA and Yerevan city at the end of the year 2022, broken down to residential buildings and single-family houses, and their respective shares are as follows:

Region	Multi-apartment Buildings				Single family Houses		
	Number of buildings	Quantity of apartments	Total area, m^2	Share, %	Quantity	Total area, m^2	Share, %
Yerevan	5,168	250,872	17,122,395	56.78%	64,843	12,785,283	16.99%
Aragatsotn	1,066	8,074	558,611	1.85%	32,634	5,738,525	7.63%
Ararat	1,018	15,584	869,449	2.88%	50,452	8,355,875	11.10%
Armavir	2,584	22,037	1,336,467	4.43%	45,846	7,832,810	10.41%
Gegharkunik	489	12,295	751,826	2.49%	42,249	6,781,847	9.01%
Iori	2,203	39,158	2,496,134	8.28%	45,228	7,202,392	9.57%
Kotayk	2,025	44,279	2,807,718	9.31%	45,119	8,903,643	11.83%
Shirak	2,524	31,010	1,981,584	6.57%	40,279	5,684,501	7.55%
Syunik	902	21,254	1,240,980	4.12%	19,662	3,395,597	4.51%
Vayots Dzor	507	5,080	324,945	1.08%	10,261	2,194,084	2.92%
Tavush	853	11,160	667,149	2.21%	30,890	6,373,141	8.47%
Total	**19,339**	**460,803**	**30,157,258**	**100%**	**427,463**	**75,247,698**	**100%**

About 70% of the multi-apartment buildings are made of stone. Percentage distribution of the number of multiple dwellings by exterior wall materials at the end of the year 2022 is illustrated below:



Similarly, the percentage distribution of the number of multiple dwellings by floors at the end of the year 2022 is as follows:



Most of Armenia's 19,000 buildings (with around 461,000 apartment units) were built during the Soviet era, 35 to 60 years ago, without any energy efficiency in mind, especially not having any embedded energy efficiency measures (thermal insulation) in the construction phases, nor enforced code requirements.

Many of these buildings are in a dilapidated condition and do not provide the minimum hygienic and comfortable living conditions. According to preliminary studies conducted by different donor-funded projects and local assessments, energy consumption for heating can be reduced by at least 40% through efficient thermal insulation of residential buildings.

According to some energy audits conducted by R2E2 Fund[2], AE Consulting, Energy Saving Foundation, as well as those carried out by international stakeholders such as World Bank,

[2] https://r2e2.am/map?type=efficiency&view=List

UNDP[3], Habitat for Humanity Armenia Foundation and similar entities, average specific residential energy consumption (average thermal energy consumption for space heating) is **185** kWh/m^2 per year[4] and varies between 171 kWh/m^2 per year[5] and 218 kWh/m^2 per year for stand-alone buildings.

The residential buildings have a higher heat energy demand due to poor insulation and building aging. The results of documented and monitored pilot projects implemented by UNDP-GEF Building Energy Efficiency Improvement project estimated that the average heating energy demand in typical multi-apartment residential buildings is 185 kWh/m^2 per year and with cost-effective energy efficiency improvements the energy use can be cut by 38-40% and the demand can go down to 111 kWh/m^2 per year[6]. Hence, this average specific residential final energy consumption figure (**185 kWh/m^2 per year**) is set as the baseline for energy saving and CO2 reduction calculations for the loans under the Green Bond Framework.

Building typology and final energy consumption in residential buildings

In Armenia, around 70% of all existing apartment buildings are stone buildings (tuff walls or double layer stone with concrete filling). All of these buildings were constructed in urban areas during the 40's, 50's and partly 60's. Brick apartment buildings have at least three or up to five upper floors and a basement. That type of apartment buildings is made from masonry of classical metric perforated stones (usually local stones like tuff or basalt). The standard thickness of the outdoor wall is 40 / 50 cm, depending on the level of the floor. The walls have exterior lime-cement render with paint finish or exposed masonry. Additional, thermal insulation is almost not practiced at all. The heat energy consumption of that type of residential buildings varies from 150 to 180 kWh/m^2 per year[7].

Around 23% of the overall number of apartment buildings in Armenia is built with concrete prefabricated panels. All of these buildings were constructed in urban areas during the 60's, 70's and 80's. About 8 % of all panel buildings are a "tower" type with about 10 to 14 floors. The remaining 92 % of panel buildings are a "line-type", which have between five and 12 floors. During the 60's and 70's mostly "line-type" buildings with a number of floors from six to eight were built. Later constructions built during the 70's and 80's have eight to 12 floors. Major problems of panel apartment buildings are related to the sticks and joints of

[3] https://nature-ic.am/en/projects
[4] https://erc.undp.org/evaluation/documents/download/6957
https://unece.org/sites/default/files/2021-06/National_Study-for_Armenia_ENG.pdf
[5] http://www.undp.org/content/dam/undp/documents/projects/ARM/MTE-Report_Buildings_Armenia_FINAL.pdf, p. 34.
[6] https://erc.undp.org/evaluation/evaluations/detail/6782
[7] https://www.oe-eb.at/dam/jcr:9455949c-a65e-4194-9ea4-fb67efc79b7b/OeEB-Study-Energy-Efficiency-Finance-Armenia.pdf

panels. Most of these buildings were raised quickly under low construction quality and with the use of cheap materials. Nowadays, the cover of the panel joints is in obsolete condition and needs rehabilitation. Other problems are related to the state of windows and transparent constructions. These have high rate of infiltration and poor thermal resistance values in building shell components, which increases the energy demand of panel buildings. The heat energy consumption of that type of residential buildings varies from 140 to 210 kWh/m^2 per year[8].

6.6% of the overall number of apartment buildings in Armenia is built with monolithic concrete or concrete frame. All of these buildings have been constructed in urban areas from the 70's up to now. Those constructed from the 90's up to now have a skeleton structure with block wall filling. About 60% of all monolith buildings are a "tower" type with about ten to 14 floors. The remaining 40% are a "line-type" with eight to 12 floors. Outdoor walls have a thickness of approximately 35 cm.

Major problems of monolithic concrete apartment buildings are related to the low insulation value of different building shell components, which results in a thermal property lower than initially designed.

New buildings, which make up about 10 to 12 percent of all buildings, are mostly private and are often built with limited funding, leading to inadequate use of building materials. Building heating, domestic hot water and the use of various equipment are the biggest consumers in buildings. The private sector has been delivering substantial new housing construction, which has reduced during the financial crises, but recovering steadily.

Most of these new buildings are consisted of 9-18 floors, with reinforced concrete structure typology, where exterior walls are made with hollow core blocks (varying from 200 to 400 mm), with different (Expanded polystyrene (EPS), or Extruded polystyrene (XPS), Mineral wool boards, varying from 20 mm to 100 mm) or no insulation layer and covered with a stone cladding (typically with locally tuff stone with a thickness of 30-35 mm). Heating in these buildings is mainly carried out by individual gas boilers (combi boilers), and is some exceptions through main central heating system (often rooftop boilers).

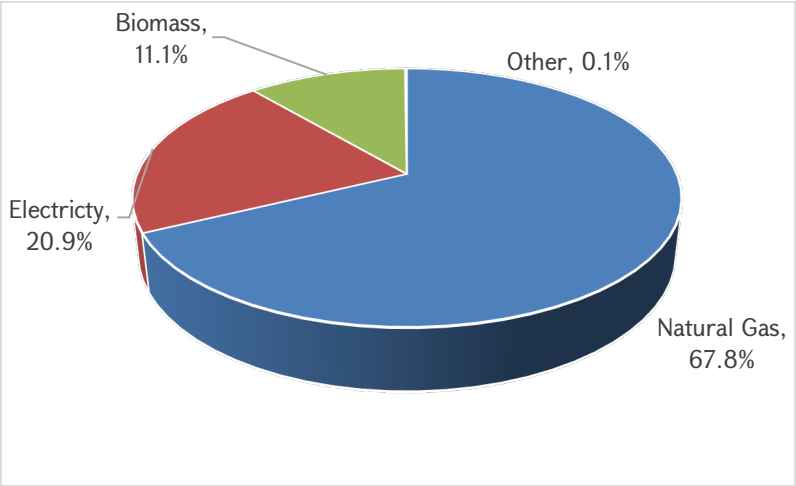
In new buildings, since apartments are being sold in "core and shell" condition (unfinished), and the selling happens gradually within 1–2-year range, most of the real estate developers do not install centralized heat supply systems, leaving the heating system installation to be done by the apartment owners on a later stage, which is always the individual boiler scheme.

If projecting the current trend in new residential building construction and estimating the expected energy consumption at the commonly assessed current heating energy demand, energy efficiency can bring down energy consumption in these new buildings by about 40%

[8] https://www.oe-eb.at/dam/jcr:9455949c-a65e-4194-9ea4-fb67efc79b7b/OeEB-Study-Energy-Efficiency-Finance-Armenia.pdf

as a minimum. The increased energy tariffs and gradually growing market for green lending for individual household and private businesses will support the spill over effect of the energy efficient construction and renovation in the private sector.

Households are the largest consumers of energy, accounted for 35.6% of final energy consumption in 2017. The natural gas predominates in the structure of final energy consumption by households with the share of about 68% in 2017, the share of electricity - about 21% and biomass - about 11%[9].



Accordingly, for defining the final energy consumption patterns and CO_2 emissions within the Green Bond Framework the above presented breakdown is considered, where considering the current market practices and local trends related to main fuel type used in residential buildings, the biomass share is neglected, whereas in single-family houses, the illustrated breakdown is valid.

Overview of Building Sector emissions assessment

Armenia relies on electricity and gas to meet the majority of its energy consumption needs.

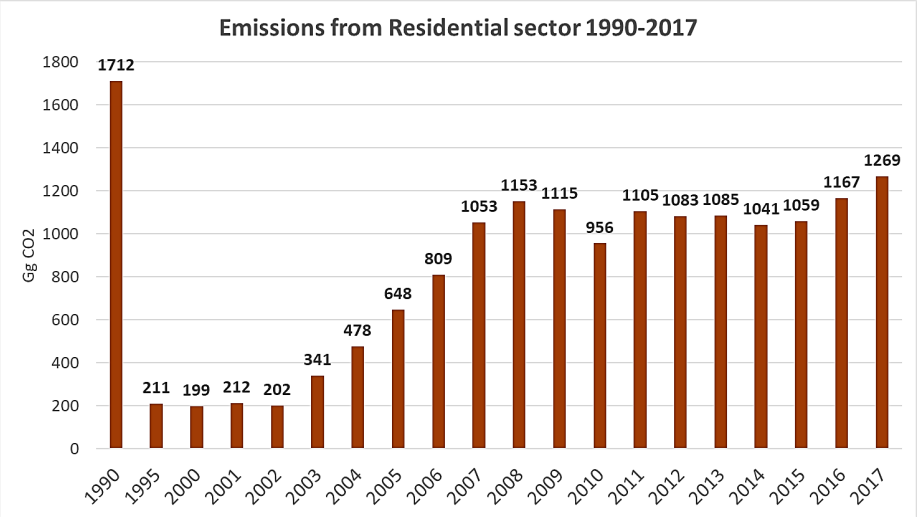
Armenia has no domestic resources of fossil fuel and imports all of its oil and gas. Vast majority of natural gas come from Russia - nearly 84%, Armenia also imports some natural gas from Iran in exchange for Armenia's supply of electricity to Iran.

In Armenia's urban economy, buildings are one of the major sources of greenhouse gas emissions (GHG).

18% of the total GHG emissions is from the fuel combustion in the residential buildings, and 7 % of the total GHG emissions is from the fuel combustion in the commercial institutional buildings. Based on IPCC methodology these mentioned figures do not include GHG

[9] https://unfccc.int/sites/default/files/resource/BUR3_Armenia.pdf

emissions generated for electricity energy consumption in the buildings. Time series GHG emissions by sources in Energy Sector of Armenia for 1990-2017 is presented below:



According to "National Greenhouse Gas Inventory Report of Armenia 1990-2017"[10], country-specific CO_2 emission factors are calculated based on the imported natural gas characteristics, weighted average Net Calorific Value of the natural gas (standard conditions t=20°C, P=101.325 kPa) for the years 2011-2017 is 8,290 kcal/m^3 or 9.64 kWh/m^3. Similarly, the average CO_2 emission factor for the years 2011-2017, is 56,863.3 kg/TJ, or 0.2047 kg/kWh.

Grid emission factor for the electricity system of the Republic of Armenia, according to the standardized baseline[11], sets the emission factor value as 0.39 kg/kWh for the Armenian power system, as a combined margin CO_2 emission factor for the electricity system (for first crediting period), except wind and solar power generation. Similarly, the grid emission factor for wind and solar power generation projects is 0.42 kg/kWh.

Hence, within the Green Bond Framework, the above CO_2 emission factors are applied for calculation of emissions.

[10] National Greenhouse Gas Inventory Report of Armenia 1990-2017
https://unfccc.int/sites/default/files/resource/NIR_2017_Armenia.pdf
[11] Standardized baseline, Grid emission factor for the electricity system of the Republic of Armenia
https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210303100626127/ASB0038-2021.pdf

Energy Prices

The energy tariffs used are based on current tariffs, set by the Public Services Regulation Commission (PSRC). PSRC regulates producer, consumer as well as transmission and distribution prices for natural gas and electricity.

For electricity consumers, the daytime and nighttime tariffs are AMD 53.48 and AMD 43.48 accordingly (households, connected to 0.38 kV, with monthly consumption ≥ 400 kWh). Similarly, the tariff for natural gas is considered as AMD 143.7 per each Nm^3 (annual consumption ≥ 600 m^3).

Climatic data and Heating Degree Days (HDD)

The climatic data and relevant HDDs are compiled based on geographic locations on regional level (10 administrative marzes) and Yerevan city, where weighted average of HDDs per shares of number of buildings and number of single-family houses (per settlements, as defined RACN II-7.01-2011 "Construction Climatology") are considered and factored in.

Additionally, for climate projections, CMIP5 data (Coupled Model Intercomparison Project Phase 5)[12] from "Climate Change Knowledge Portal" for climate model simulations for 30-year term are used (SSP2-4.5/RCP4.5 scenario – multi-model ensemble). The **minimum** figures over the mentioned lifespan versus the normative figures are used in modelling the HDDs for each region. These simulations provide valuable insights into future climate projections based on different greenhouse gas emission scenarios and model assumptions.

The corresponding HDDs and climate projections are available in **Appendix 1** of this document.

Considering the above data, and the 30-year climate projections, the HDDs database per each region and Yerevan has been set as follows:

Regions	HHD, 30-year validity (min.) (°C ·day/year)	HDD, weighted average per region (normative) (°C ·day/year) per RACN II-7.01-2011 "Construction Climatology"
Shirak	3985.7	4145.7
Lori	3473.0	3625.1
Tavush	2664.3	2787.9
Aragatsotn	3444.8	3549.5
Kotayk	3717.1	3829.2

[12] https://climateknowledgeportal.worldbank.org/country/armenia

Armavir	2714.7	2822.4
Ararat	2549.7	2662.9
Gegharkunik	4341.3	4473.7
Vayots Dzor	2684.4	2803.0
Syunik	2707.1	2848.6
Yerevan	2549.2	2660.0

Eligible EE measures and assumptions in baseline definitions for "Renovation" and "House Construction" loans

1. Thermal insulation of roof and walls

Thermal insulation of building shell components, particularly roof and external walls is an eligible measure towards EE improvement of both apartment units and single-family houses. The insulation thickness to be applied, however, is conditionally set; in "new house construction" products, the minimum thickness of insulation, regardless of insulation material type and climatic conditions, shall at least be 50 mm, and for the roof element, the minimum thickness is set as 150 mm. However, in "renovation products", in both apartment units and single-family houses, there is no minimum thickness criteria, due to technicalities & limitations of insulation application in already built and operated housing stock.

The insulation materials, in accordance with local trends and market supplies available are comprised of the following, which are applicable for exterior wall finishing system and flat pitched roofs/attic floors:

1. Expanded polystyrene foam boards - EPS ($\lambda \leq 0.040$ W/m°K)
2. Extruded polystyrene foam boards - XPS ($\lambda \leq 0.037$ W/m°K)
3. Mineral wool (battens and boards) – MW ($\lambda \leq 0.042$ W/m°K)
4. Expanded perlite granules ($\lambda \leq 0.07$ W/m°K)
5. Polyurethane spray foam ($\lambda \leq 0.032$ W/m°K)

The thermal characteristics of the building elements in baseline model are defined as follows:

a) Apartment units

For residential buildings/apartment units the thermal resistance (R) of external walls is considered as 0.89 m^2°K/W, which is a weighted average of the R-value for reinforced concrete panels and solid stone block masonry. Similarly, the thermal resistance of the roof component is taken into account as 1.1 m^2°K/W, as an average figure for flat roofs/attic floors

b) Single-family houses

For single family houses, the thermal resistance (R) of external walls is considered as 1.12 $m^2°K/W$, which is the typical buildup value of solid block walls. Similar to residential buildings, the R-value for the roof component is taken into account as 1.11 $m^2°K/W$, as an average figure for flat roofs/attic floors.

2. Replacement of exterior windows and doors (fenestration)

Installation of new exterior windows and doors in apartment units and single-family houses is eligible. For both cases, the windows and doors shall have the minimum specifications[13] as below:

a) Windows: PVC, uPVC, fiberglass framed with at least 4 chambers, aluminum framed (with embedded thermal breaks), double glazed – thermal transmittance allowance: U-value ≤ 2.08 W/ $m^2°K$.
b) Doors: PVC, uPVC, fiberglass framed with at least 4 chambers, aluminum farmed (with embedded thermal breaks), metal with embedded Styrofoam insulation, solid core wood - double glazed in transparent sections - thermal transmittance allowance: U-value ≤ 2.22 W/ $m^2°K$.

The windows modeled in baseline case are low quality PVC, wooden and aluminum framed single or double pane units with U-value ≥ 2.78 W/ $m^2°K$. Similarly, the doors are defined as low-quality PVC, aluminum, metal, timber, without any insulation in cavity area, with U-value ≥ 3.5 W/ $m^2°K$.

3. Lighting upgrades

Upgrades to enhance lighting efficiency are allowable for artificial lighting systems. The luminous efficacy of the luminaires shall be ≥ 90 lm/W. The baseline luminous efficacy for lighting is considered as 40.5 lm/W, which is the weighted average of incandescent lamps (15 lm/W), compact fluorescent lamps and tubes (50 lm/W) and Light Emitting Diod (LED) luminaires (with 90 lm/W).

4. Solar water heaters (solar thermal) and Solar Photovoltaics (PV)

Solar energy systems, in the form of energy generation devices, are eligible products.

Solar water heaters, with 200, 250 and 300 liter in size (consisted of 20, 25 and 30 evacuated tubes respectively), and corresponding 2.1 m^2, 2.6 m^2, 3.1 m^2 aperture area are

[13] Low-E and insulating gas fill in cavities can further boost the performance of the fenestration units.

enlisted. Average annual solar irradiation for Armenia has been set as 1,600 kWh/m^2, and the yield of the system has been calculated accordingly for each system size.

Solar photovoltaic systems, with a grid tied approach (net-metering scheme), consisting of either monocrystalline or polycrystalline PV modules, equipped with on-grid inverters and corresponding support structures can be obtained. The average solar energy yield of the system, considering the global solar irradiation levels, tilt angles, shading and other factors, has been set as 1350 kWh/kW_P in energy-related calculations.

Eligibility criteria for "Acquisition" loans and assumptions in baseline definitions

Existing certification system for buildings' energy performance

During the last years Armenian Government demonstrates its engagement towards energy efficiency in the building sector through series of changes in the regulatory framework. Detailed information about the energy efficiency policy of Armenia can be found in the review developed by Energy Charter Secretariat[14].

The amendments in Law on Energy Saving and Renewable Energy in 2016, as well as Decision 1504-N of the Government of RA, dated 25 December 2014 on implementation of energy saving and energy efficiency improvement measures in facilities being constructed (reconstructed, renovated) under the state funding, Governmental Resolution No 426-N, dated 12 April 2018 on establishing the technical regulation for energy savings and energy efficiency in newly constructed multi-apartment buildings, as well as objects constructed (reconstructed/renovated) by state funds and Decree from the Minister of Economic Development and investments, No 342A, dated 30 May 2019 on establishing the rules of completing the compliance certificate form (energy performance certificate) and the template for newly constructed multi-apartment residential buildings, as well as objects constructed (reconstructed/renovated) by state funds are clear indication that the process of improvement for building energy performance is on the way.

The mandatory requirements for buildings' energy performance in new multi-apartment residential buildings and buildings funded by state funds is the first practical step, acknowledging that the public authorities recognize the improvement of the Armenian building stock as a priority.

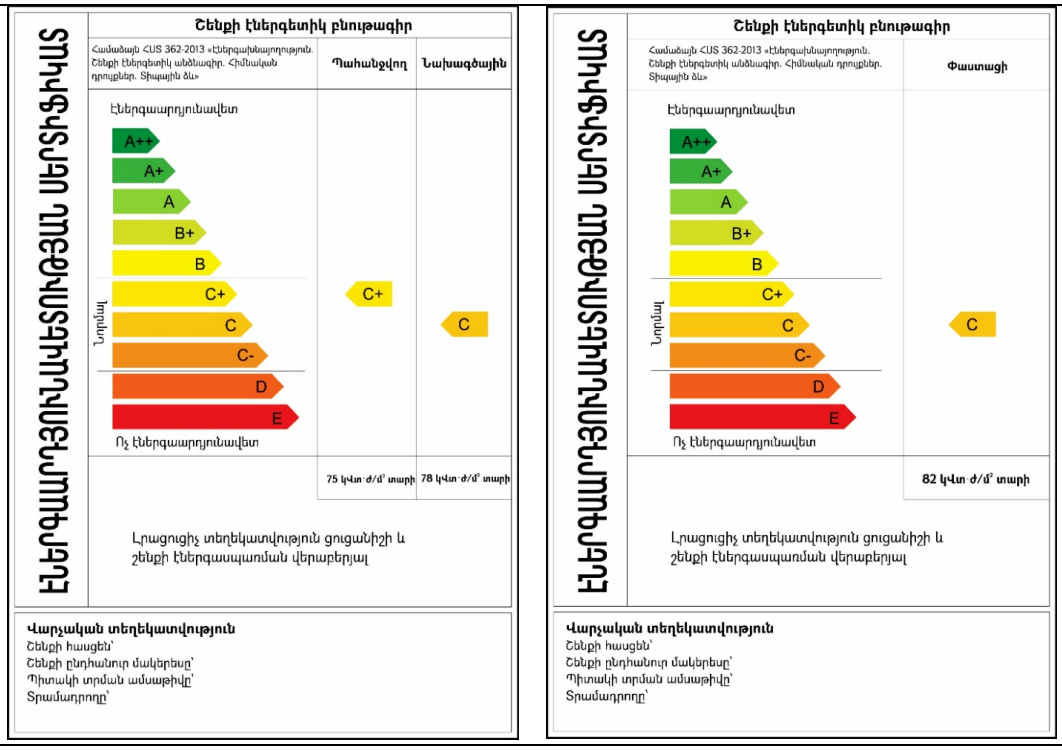
[14] In-Depth Review of Energy Efficiency Policy of Armenia:
https://www.energycharter.org/fileadmin/DocumentsMedia/EERR/ARMENIA_IDR_2017_Final_EN.pdf

In the period 2013 – 2016, two National Standards were developed in order to support the improvement of buildings' energy performance, enabling the implementation of important instruments as the building energy passports and energy audits:

- AST 362-2013 "Energy conservation. Building energy passport. Basic rules. Standard form";
- AST 371-2016 "Methodology for performing energy audit in residential and public buildings".

The construction norm "RACN 24-01-2016 Thermal Protection of the Buildings" (mandatory building code), approved in 2016, also tightens the requirements for energy efficiency through requirements for the heat transfer resistance of building structures, the characteristics of energy efficiency of buildings, the class of energy efficiency of buildings and the energy passport of a building.

AST 362-2013 "Energy conservation. Building energy passport Basic rules. Standard form" refers to the classification and building energy performance certificates (figure below shows the forms approved for use in Armenia).



A building certificate form specified in Armenia standard AST 362-2013 "Energy conservation. Building energy passport Basic rules. Standard form."[15]

[15] The template is the original version from AST 362-2013.

The standard is introducing the Building Energy Passport form, methodology to fill it in as well as the Building Energy Efficiency Certificate with classification of the buildings' energy performance.

In Armenia, the energy performance requirements in building norms are only based on thermal resistance of the elements of the building envelope and the heating degree-days for the building, taking into account heat gains, infiltration and factors related to heating self-regulation.

According to RACN 24-01-2016 "Thermal Protection of Buildings" norm, specific thermal load values in $W/m^3 \cdot °C$ unit (depend on the typology of the building and the number of floors) are defined. The table below shows these values:

Type of building	Specific thermal load for buildings in $W/m^3 \cdot °C$							
	Number of floors							
	1	2	3	4, 5	6, 7	8, 9	10, 11	12+
Residential (MFH), hotels, hostels	0.455	0.414	0.372	0.359	0.336	0.319	0.301	0.290
Public, except for the next rows	0.487	0.440	0.417	0.371	0.359	0.342	0.324	0.311
Polyclinics, health care, nursing homes	0.394	0.382	0.371	0.359	0.348	0.336	0.324	0.311
Kindergartens	0.521	0.521	0.521	-	-	-	-	-
Techno-parks, warehouses for services, cultural and leisure activities	0.266	0.225	0.243	0.232	0.232	-	-	-
Administrative (offices)	0.417	0.394	0.382	0.313	0.278	0.255	0.232	0.232

The energy class of the building is based on the deviation between the calculated specific energy consumption for heating and ventilation in $kWh/(m^3.y)$ and the specific energy consumption determined by multiplying the thermal load from tables above by the heating degree-days for the specific building. The energy class of the building is determined as shown:

Energy classes for buildings in Armenia
(RACN 24-01-2016 "Thermal Protection of Buildings")

Energy class	Energy efficiency	Deviation of the actual energy for heating and ventilation and the calculated referent value, %	Suggested events/measures
For new and reconstructed buildings to be designed and operated			
A++	Very high	**Less than -60**	Economic promotion
A+		**Between -50 and -60**	
A		**Between -40 and -50**	
B+		**Between -30 and -40**	**Economic promotion**

B	High	**Between -15 and -30**	
C+	Normal	**Between -5 and -15**	No actions required
C		**Between -5 and 5**	
C-		**Between 5 and 15**	
For existing buildings			
D	Low	**Between 15 and 50**	Refurbishment recommended
E	Very Low	**Over 50**	Refurbishment recommended

In particular, the **level "C"** refers to the "required level" of thermal protection of the building. The minimum acceptable EE class, as per the norm, is "C-"(average allowance: +10% deviation), which has been considered as the baseline EE class for calculation of energy and CO_2 savings.

Levels "C+" and "C-" represent deviation from the required level of energy performance by +/- 5 to +/-15 per cent. **Level "B"** represents deviation from the required level of energy performance by - 15 to -30 per cent, which means "better than code requirements by 15-30 per cent. **Level "A"** represents deviation from the required level of energy performance by -40 to -50 per cent, which means "better than code requirements by 40-50 per cent.

Once the deviation from the specific thermal load has resulted in the range applicable for required level (C), then the R-values of different building shell components can be reduced, as long as the required level C is still met.

Currently the efficiency of the building HVAC systems, type of energy (energy carriers) used for heating, the energy for cooling, DHW, lighting and the generated emissions are not part of the energy performance requirements.

In order to ensure at least 20% savings, "B" energy class (with minimum allowance: -15% deviation) has been set as a minimum requirement for the building to be eligible for this mortgage product, hence, residential buildings **with class "B" and above** are considered energy efficient.

EE class	Specific thermal load for residential buildings in $W/m^3 \cdot °C$							
	Number of floors							
	1	2	3	4, 5	6, 7	8, 9	10, 11	12+
Residential, per code (absolute C class, 0% deviation)	0.455	0.414	0.372	0.359	0.336	0.319	0.301	0.290
C- Class, Average allowance (+10% deviation)	0.501	0.455	0.409	0.395	0.370	0.351	0.331	0.319
B Class, minimum allowance (-15% deviation)	0.387	0.352	0.316	0.305	0.286	0.271	0.256	0.247

It should be noted that for producing the energy saving and CO_2 emission reductions, HDDs are further calibrated by NMC in line with the climatic conditions set out for 30-year climate projections for each settlement. Specific and useful energy figures on apartment and building level are being extracted from the issued Energy Passport of the building, and the quantities of final energy consumption are shaped based on the structure of final energy consumption by households.

Obtaining Energy passport of the building

Energy audit of the technical design documentation is carried out for the buildings constructed, repaired and reconstructed at the expense of the state funds in accordance with the requirements approved by the decision of the Government of the Republic of Armenia No. 1399 of August 31, 2006, and design documents are drawn up based on the baseline data. Based on the Law on "Technical Regulation" the Building Certificate should be issued by accredited conformity assessment body.

The energy examination (audit) of the heating, ventilation, air quality systems of buildings, as well as the building shell components is carried out in accordance with the requirements approved by the decision of the Government of the Republic of Armenia N 1399 of August 31, 2006[16].

As a result of the energy examination of the building, an energy passport can be compiled and issued. The energy examination (audit) of the building is to be carried out by individuals certified by the certification bodies[17] of physical persons accredited in accordance with the RA "Law on Certification".

Based on the energy passport, the building must be given an EE label (EE certificate). The EE label is provided by the accredited certification bodies, according to the RA Government 426-N decision, with certified energy auditor present in its staff, which will verify and validate the issued EE passport.

Further details can be found on NMC's website[18]

[16] https://www.arlis.am/documentview.aspx?docid=100211
[17] https://website.armnab.am/DocUploads/1548.doc
[18] https://admin.nmc.am/storage/files/1/uploads/Energy%20Certificates/EE%20label%20-%20guide_eng.pdf