

**National study and detailed gap analysis between the performance objectives of the Framework Guidelines for Energy Efficiency Standards in Buildings and implementation of current building energy efficiency standards in Armenia**

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Andre Ohanian

# Building codes requirements and EE legislation

- In 2004, Armenia voted for the interstate building code, “Thermal performance of buildings”, which takes into account the requirements of EU codes and standards/methodologies.
- A corresponding document was developed in 2008 under the UNDP-GEF project.
- In 2009, proposals for energy audits and the certification of residential buildings were developed under the same project. In 2013, legal and institutional measures were drafted looking to improve energy efficiency in urban development (legislation improvements are currently under discussion).

# Building codes requirements and EE legislation

The following building codes are currently into force:

- RACN 24-01-2016 “Thermal Protection of Buildings”
- RACN II-7.02-95 “Building thermophysics of building envelope”
- RACN II-7.01-2011 “Construction Climatology”
- RACN 22-03-2017 “Artificial and Natural Lighting”

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”.

# Building codes requirements and EE legislation

Armenia has also adopted the following laws and government decisions:

- Government of the Republic of Armenia decision of April 12, 2018 N 426-N: The resolution on “Establishing technical regulations on energy saving and energy efficiency in new residential apartment buildings, as well as in facilities under construction (reconstructed) at the expense of state funds”, came into force in October 2019. Mandatory consideration of energy efficiency in construction/reconstruction under the state funded activities is stipulated by the Government Decision #1504-N (December 25, 2014)
- **Law on Energy Saving and Renewable Energy AL-122 (2004) (Amendments 2016, 2017)**

The Law was amended in 2016 to introduce (i) development of annual energy balance; (ii) sectoral categorization by energy intensity; and (iii) mandatory technical provisions for energy efficiency in new residential building construction, as well as in new construction, capital renovation or reconstruction with the use of state budget funds.

- **Energy Law AI-148 (07.03.2001) (Amendments 2014, 2017, 2018)**

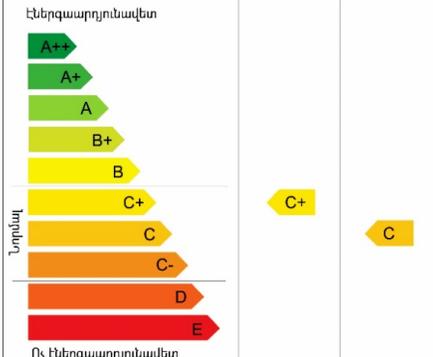
It defines energy efficiency and renewable energy sources as one pillar of the energy strategy.

- On April 18, 2018, the Armenian Parliament ratified the **Comprehensive and Extended Partnership Agreement (CEPA)** between Armenia and the European Union. It is targeted at protection, improvement and restoration of environment quality, human health protection, sustainable use of natural resources, as well as promotion of measures to address regional and global environmental issues at the international level.
- **National Program on Energy Saving and Renewable Energy (Adopted by Protocol Decision No.2 dated 18.01.2007)**

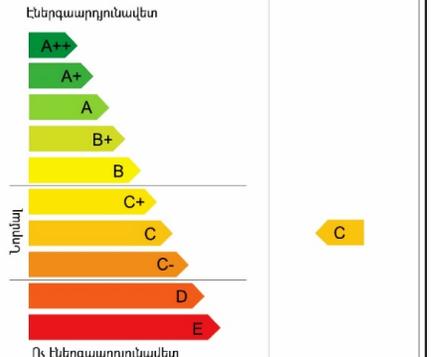
The Program foresees specific targets for the improvement of EE in buildings with a particular focus on thermal insulation only.

# Building codes requirements and EE legislation

- 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).

Շենքի էներգետիկ ընդթափը		
<b>ՏՈՒՆՔԻ ԿԱՐԳԻՆ ԱՆՏԻՏԻՎ ԵՆԵՐԳԻ ԵՎ ՊԵՏՎԱԿԱՆ ԵՆԵՐԳԱՅԻՆԱՐԿՈՒՄԻ ԵՎ ԵՆԵՐԳԱՅԻՆ ԿՈՄԵՏԻՏԻ</b>	<small>Համաձայն ՀԱՏ 362-2013 «Էներգահետաքրքրություն. Շենքի էներգետիկ անձնագիր. Հիմնական դրույթներ. Տիպային ձև»</small>	<b>Պահանջվող</b>
	<b>Նախագծային</b>	
<small>Էներգաարդյունավետ</small>	<small>Նորմալ</small>	
<small>Ոչ էներգաարդյունավետ</small>	<small>75 կՎտ ժ/մ² տարի</small>	
<small>Լրացուցիչ տեղեկատվություն ցուցանիշի և շենքի էներգատապանան վերաբերյալ</small>		
<small>Վարչական տեղեկատվություն Շենքի հասցեն՝ Շենքի ընդհանուր մակերեսը՝ Պիտակի տրման ամսաթիվը՝ Տրամադրողը՝</small>		

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	<small>Նորմալ</small>
<small>Ոչ էներգաարդյունավետ</small>	<small>82 կՎտ ժ/մ² տարի</small>
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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.

As illustrated, the “normal” class of the building should at least be “C-“, as the “normal” zoning ranges from “C-“ to “C+“, and starting from “B” class, the building is considered energy efficient (exceeding the code minimal requirements).

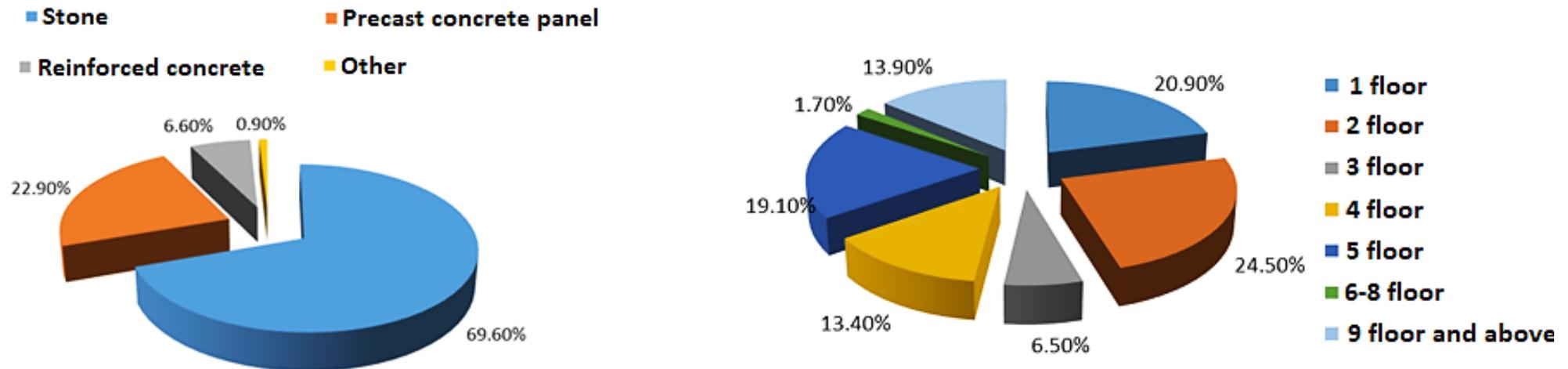
# Energy intensity in residential & public buildings

- 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.
- Natural gas is the main fuel consumed by households, making up to 86% of the total fuel consumption.

<i>Multi-apartment buildings</i>			<i>Single family houses</i>		<i>Dormitory and temporary dwellings, thousand m<sup>2</sup></i>	<i>Total area per resident, m<sup>2</sup></i>
<i>Number</i>	<i>Number of apartments</i>	<i>Total area, thousand m<sup>2</sup></i>	<i>Number</i>	<i>Total area, thousand m<sup>2</sup></i>		
19,195	443,023	28,280,813	396,948	66,305,298	273,507	31.9

# Energy intensity in residential & public buildings

- Most of Armenia's 19,000 buildings 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.



average specific residential energy consumption is 185 kWh/m<sup>2</sup> per year and varies between 171 kWh/m<sup>2</sup> per year and 218 kWh/m<sup>2</sup> per year for stand-alone buildings.

# Energy intensity in residential & public buildings

- With negligible exceptions, centralized **DHW supply systems are not in operation in Armenia** since early 2000's.
- Until the early 90s, **centralized district heating** provided heat for 64% of the country's residential space (and more than 90% of residential space in multi-apartment buildings); however, **it collapsed** after the dissolution of Armenia from the Soviet Union.
- With minor exceptions in conventional office buildings, **centralized space heating and cooling does not exist in residential or municipal buildings in Armenia**. Centralized heating and cooling systems do exist in hospitals and newly built office/commercial buildings, but these cannot be grouped in a unified scheme, as the systems and typologies differ case by case, hence a standardized scheme cannot be considered.
- There are currently **no restrictions on the wattage of household lamps** in Armenia. Regulations on lighting design and installation in the Republic of Armenia are integrated into building codes and health codes.
- **Energy labels for refrigerators/freezers, washing machines and dishwashers** are widely used in Armenia. Air conditioners (for which there is a – little used – Armenian energy label as well as EU and Russian energy labels) and electric ovens (for which there is only an EU energy labels) are not commonly labelled.

## Gap analysis between performance objectives of the Framework Guidelines for Energy Efficiency Standards in Buildings and the existing energy efficiency standards in buildings

The main gap between the local approach for EPB assessment and the best EU practices is the numeric indicator that express the building energy class – kWh/(m<sup>3</sup>.y) of useful energy for heating and ventilation (Armenia) vs kWh/(m<sup>2</sup>.y) of primary energy for heating, cooling, DHW, ventilation, lighting and other technical building systems (EPB).

The approach used in Armenia is focused mainly on building envelope and the energy required to maintain thermal comfort, while EU through EPBD and Delegated Regulation 244/2012 require more general approach that evaluates the overall impact of the energy used in the building sector, taking into consideration the energy sources, the efficiency of the energy usage, the environmental impact and last but not least the comfort and the healthy environment.

## Gap analysis between performance objectives of the Framework Guidelines for Energy Efficiency Standards in Buildings and the existing energy efficiency standards in buildings – Recommendations

Below topics are not reflected in the existing calculation methodology of EPB and certification system and should be included further on:

- Efficiency of heating, ventilation and air conditioning control systems
- Efficiency of heating and cooling generation
- Cooling losses in building systems
- Lighting, appliances, pumps and ventilators with or without useful heat gains inside heated volume
- Renewable sources for both heat and electricity, taking into account the perimeter the energy is produced
- Final energy consumption in kWh/(m<sup>2</sup>.y) and kWh/y
- Primary energy consumption in kWh/(m<sup>2</sup>.y) and kWh/y
- CO<sub>2</sub> emissions calculation in kgCO<sub>2</sub>/y

## Gap analysis between the requirements of existing energy efficiency standards in buildings and their actual implementation

- The energy efficiency legislation in force does not introduce the ESCO mechanism, and there are no operating energy service companies in Armenia.
- Despite all bottlenecks, there have been successful experiences of comprehensive energy efficiency retrofits of residential buildings in some Central and Eastern European countries, which also faced similar barriers.
- Based on the in-depth analysis of the barriers in Armenia, as well as on known operational tools from other countries throughout Europe, the gap analysis concludes that exploitation of the significant untapped potential for EE improvement in Armenia demands the adjustment and tailoring of intervention mechanisms to current market needs.

# Gap analysis between the requirements of existing energy efficiency standards in buildings and their actual implementation - Recommendations

- **Technical assistance for legal-regulatory support**
- **Capacity building for quality project design** (energy audits, technical design, surveillance, monitoring and verification), and capacity building of project promoters,
- **Design risk assurance schemes** based on cash flow from generated savings
- **Low-interest loans**
- **Seek opportunities for private sector participation through energy service companies**
- **Internalization and quantification of non-monetary benefits**, such as avoided greenhouse gas emissions, increased service and utilization of public institutions (e.g. universities, policlinics, hospitals, art facilities, etc.),
- In **public buildings** – seek opportunities to join donor and IFI efforts to scale up the individual successes to country-wide public building energy efficiency retrofitting program packaged with public sector energy management and optimization of public budget expenses
- In **residential buildings** – design tailor-made, simplified, easy-to-use loan products, that are supported by grants and guarantee schemes

# Conclusion

The analysis of legal-regulatory environment, existing institutional capacities, available financing resources, coupled with the technical and economic potential for energy efficiency investments in buildings, has identified a number of gaps, which can be summarized as follows:

No.	Gap	Proposed actions (Elements)
1	Need to complete legal-regulatory reforms and enforcement	<ul style="list-style-type: none"> <li>• Harmonization with EU Acquis</li> <li>• Enhance capacity building</li> <li>• Market liberalization and integration in regional markets</li> </ul>
2	Insufficient Technical and Institutional Capacities of EE Promoters	<ul style="list-style-type: none"> <li>• TA to improve capacity of EE promoters</li> <li>• Internalization and quantification of non-monetary benefits</li> </ul>
3	Lack of Tailor-Made, Affordable Financing Schemes for Upscaling Investments in Building EE	<ul style="list-style-type: none"> <li>• Low interest debt financing</li> <li>• Grant co-financing</li> <li>• Leveraging of national social services</li> <li>• Guarantee vehicles</li> </ul>
4	Lack of Adequate Resources to Overcome Barriers for Country-Wide Public Building Energy Efficiency Roll-Out Program	<ul style="list-style-type: none"> <li>• Expansion of lending schemes to public and municipal infrastructure energy efficiency</li> <li>• Grant co-financing</li> <li>• Design an exemplary energy efficiency upgrade campaign</li> <li>• Public Energy Management Program</li> </ul>
5	Untapped Market for Multi-Apartment Residential Building EE Investments	<ul style="list-style-type: none"> <li>• Grant technical assistance for developing enabling investment environment</li> <li>• Grant co-financing for concessional lending</li> <li>• Credit guarantees to reduce the imposed margins</li> </ul>
6	Absence of EE Product and Service Delivery Mechanisms for Rural Households Leading to Fuel Poverty and Dramatic Deforestation	<ul style="list-style-type: none"> <li>• Grant technical assistance for developing enabling investment environment</li> <li>• Grant co-financing for concessional lending</li> <li>• credit guarantees to reduce the imposed margins</li> <li>• Monetize the benefits of mitigated deforestation</li> </ul>
7	Lack of Awareness on the Benefits of Energy Efficiency among Decisions Makers, Service Vendors and End-Users	<ul style="list-style-type: none"> <li>• Nation-wide public outreach campaign</li> </ul>

Thank you