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Energy Efficiency In Housing Sector

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Strengthening National Capacities for Housing and Urban Planning in Armenia
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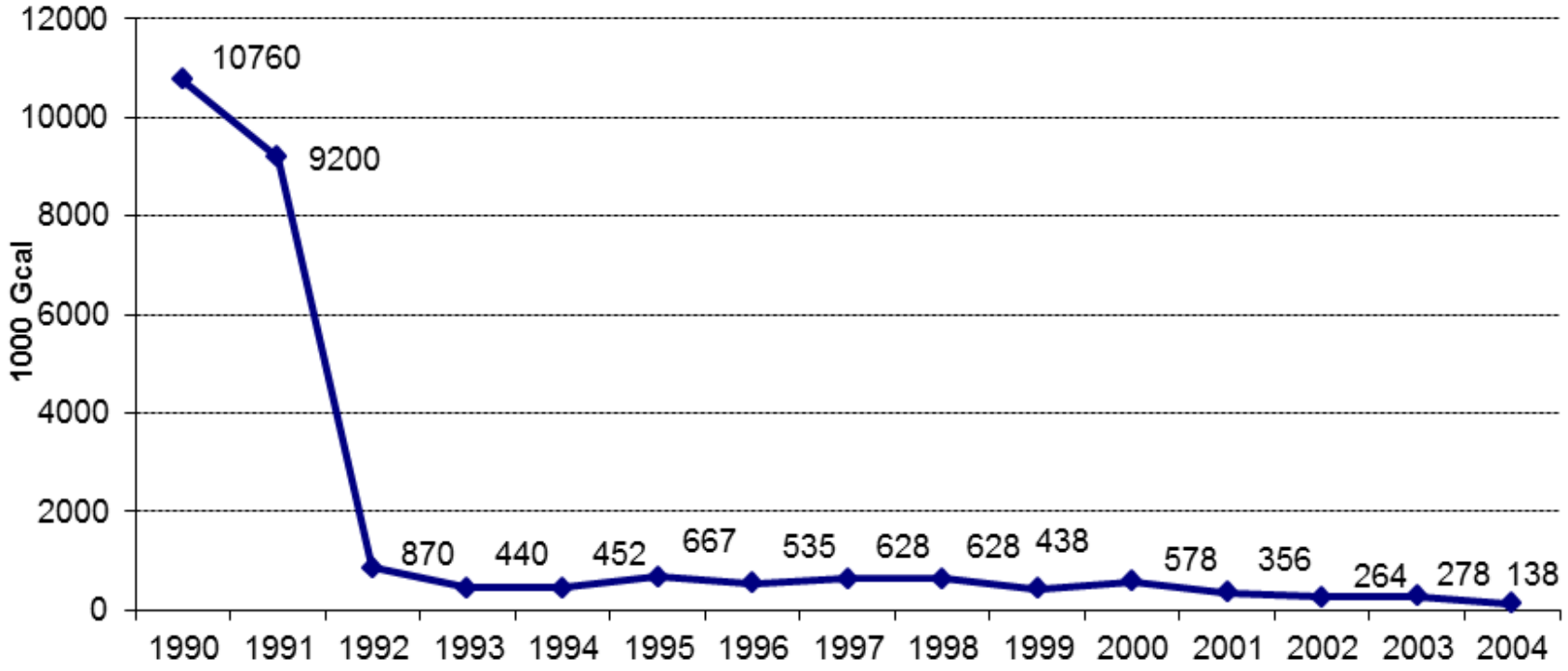
UNDP is Assisting Armenia in Assessment and Realization of the of Climate Change Mitigation Potential

- **Assisting in evaluation of the mitigation potential in different sectors, and in planning transformational changes** towards low carbon development through active involvement in the global efforts for climate change mitigation

- Capacity building and demonstrating benefits of energy efficiency technologies and practices

- Supporting **behavioral change** among population towards energy efficiency

Heat Energy Production by District Heating Systems in Armenia, 1990-2004



The district heating system had actually collapsed: heat generation by district heating systems in 2005 fell to about 2.5% of that in 1990;

Master plan of the City of Yerevan for 2005-2020 provides for district heating restoration in five large residential areas of the city

Energy Efficiency in Existing Housing Sector

Due to collapse of municipal heat supply services currently only 2,5% of former capacity is in operation. The energy efficiency in heating sector can be realized only on the level of consumption side:

- improvement of building energy performance - building envelop (major potential),
- energy efficient apartment level gas boilers - labelling/ tuning (minor potential)
- introduction of solar water heating systems (medium potential)
- behavioral changes (medium potential)

Potential in retrofitting housing stock

- No of panel buildings is around 4,300.
- The energy efficiency potential from thermal modernization of panel buildings - 1,260 mln kWh/year.
- Energy prices in Armenia are already high enough to generate appropriate return on investment.
- The thermal modernization is high priority for development agenda due continuous rising of energy tariffs in recent years (e.g. natural gas tariffs has rised 1.85 times from 2008 to 2014).

Limited opportunities for promotion of centralized heat supply

- Exploring further public-private partnership in attracting private investments in cogeneration based heat supply systems

- Using the heat energy of thermal power plants

Energy Efficiency In District Heating

Combined heat and power based district heating restoration project in Avan district, Yerevan

39 Multi-storey buildings
445 apartments are joined
2 public buildings

Leveraged foreign direct investment- USD 12 mln

CHP capacity installed - 4MWe and 4.36 MWt

The system was commissioned on 15 December 2009

- UNDP supported the design and implementation of the restoration of the centralized heat supply system in Avan district of Yerevan
- Decision of the Government of Armenia No.509-N dated 13 April, 2006 on establishing promotional tariff for electricity purchased from CHP plant,
- Full reconstruction of main and distribution networks,
- Redesign of the internal distribution system in the buildings (from vertical distribution into horizontal one),
- Installation of apartment level heat and hot water meters for introducing consumption based payment system,
- The Methodology developed for calculation of heat and electricity tariffs based on useful heat demand (approved by PSRC N206N 7 May, 2007),
- A multi-part tariff system for heat and hot water.

Integration of RES and EE in Heating Systems

- **Promotion of solar collectors use in centralized hot water supply based hot water supply system installations - 600 sq m** of solar water heaters installed (26 systems)
  - *Boarding schools*
  - *Kindergartens*
  - *Hospitals*
  - *Residential district heating systems*

- **Heat pump based heating and cooling in "AYB" high school**

- **Infrared heating system in Hayordats House in Yerevan and Ayrum Coopertive**

Energy Efficiency in New Constructions

Legislative and Regulatory Framework

•Energy efficiency related laws and decrees revision and amendment in accordance with EU and Eurasian Economic Community directives and technical regulations

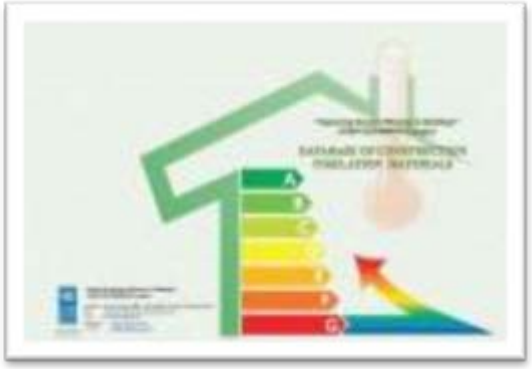
•National and international standards development and adaption for Armenia, methodologies and handbooks on energy efficiency

Use on new technologies and construction materials

Enforcement of regulations

Building certification and issuance of energy passports



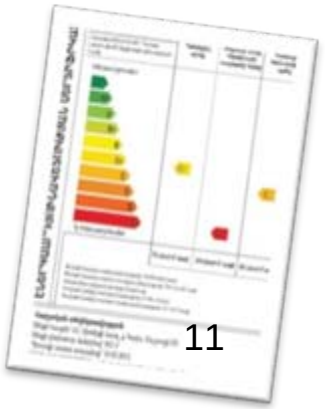



Assistance in promotion of EE legal and regulatory framework

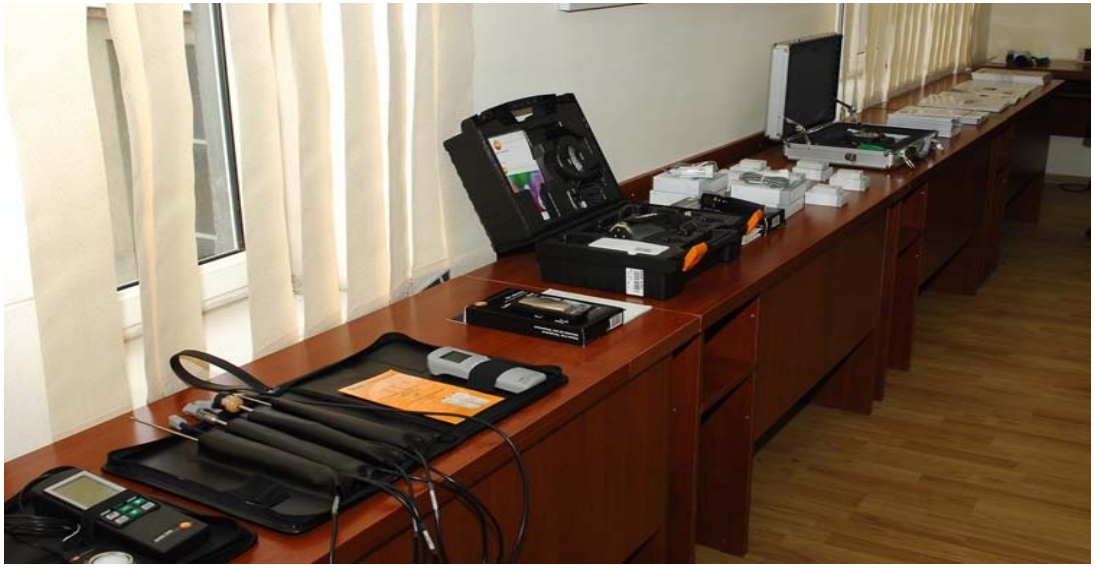
- **Amendments to the RA Laws "On Urban Development" and "On Energy Saving and Renewable Energy"** (pending approval by the RA Government)
- **Governmental decree on integration of requirements for EE in state-funded procurement procedures** (approved by the RA Government)
- "Buildings, structures, construction materials: Safety" technical regulations were drafted (submitted to the RA Government)
- Energy Performance in Buildings EU Directive harmonized (submitted to the RA Government)
- Charter of the MUD amended with Clause on EE
- Energy efficiency provisions included in the Law on Yerevan City Small Center (pending approval)
- 15 EN/ISO standards are approximated/adapted and registered
- "Buildings' Energy Passport" national standard adopted
- "Construction Climatology" II-7.01-2011 RA building code renewed.

Capacities strengthened

- EE laboratory established in in State University of Architecture and Construction
- Insulation materials testing and certification laboratory established at “Shincertificate” LLC
- Designs of five replicable/typical energy efficient individual residential houses along with respective catalog
- Database of locally produced and imported construction insulation materials developed
- Education curricula and bilingual modules “Green Architecture” - 420 pages
- 11 locally produced and imported insulation materials and pre-fabricates were tested and granted certificates.



Established Laboratories on EE and on Building Physics



Energy Efficient Social Building in Goris

cooperation with Swiss Development and Cooperation Agency and Government of Armenia

940 m^2 total area
22 apartments
3 storeys

- Total enveloping of the building
- Thermal insulation of reinforced concrete columns and balcony blocks and elimination of “cold bridges”
- Installation of windows and doors with higher thermal resistance
- Construction of tambours of the entrances
- Installation of regulation and metering equipment for heating system

Incremental cost of EE measures: 8%

Energy performance improvement: 2 times

Additional benefit: about 25 m^2 of living area

Energy Efficient Residential Building in Earthquake Zone

In cooperation with Government of Armenia, under state housing program *(in process)*

total area: 2242 m^2
apartments: 36
storeys: 4

Incremental costs: 6%

Energy performance improvement: 2 times

Additional benefit: about 90 m^2 of living area

Replication of Energy Efficient Building Design Involving Private Sector

- The energy efficient solutions piloted by the UNDP are replicated in the construction by private developer “Al Hamra Real Estate Armenia” LLC

- Additional **>900 sq.m** available as a result of redesign valued at **1800$/sq.m**

- Direct benefit to the developer - > **1,500,000 USD**

- Energy performance improvement - **36%**

EE Refurbishment of Existing Residential Building

- 9-storey, 36 apartment building in Yerevan
- In cooperation and with co-financing from Yerevan Municipality

Before 178kWh/m2 year

CO_2 emissions: 91 tons/year

620$ per flat /year – heating

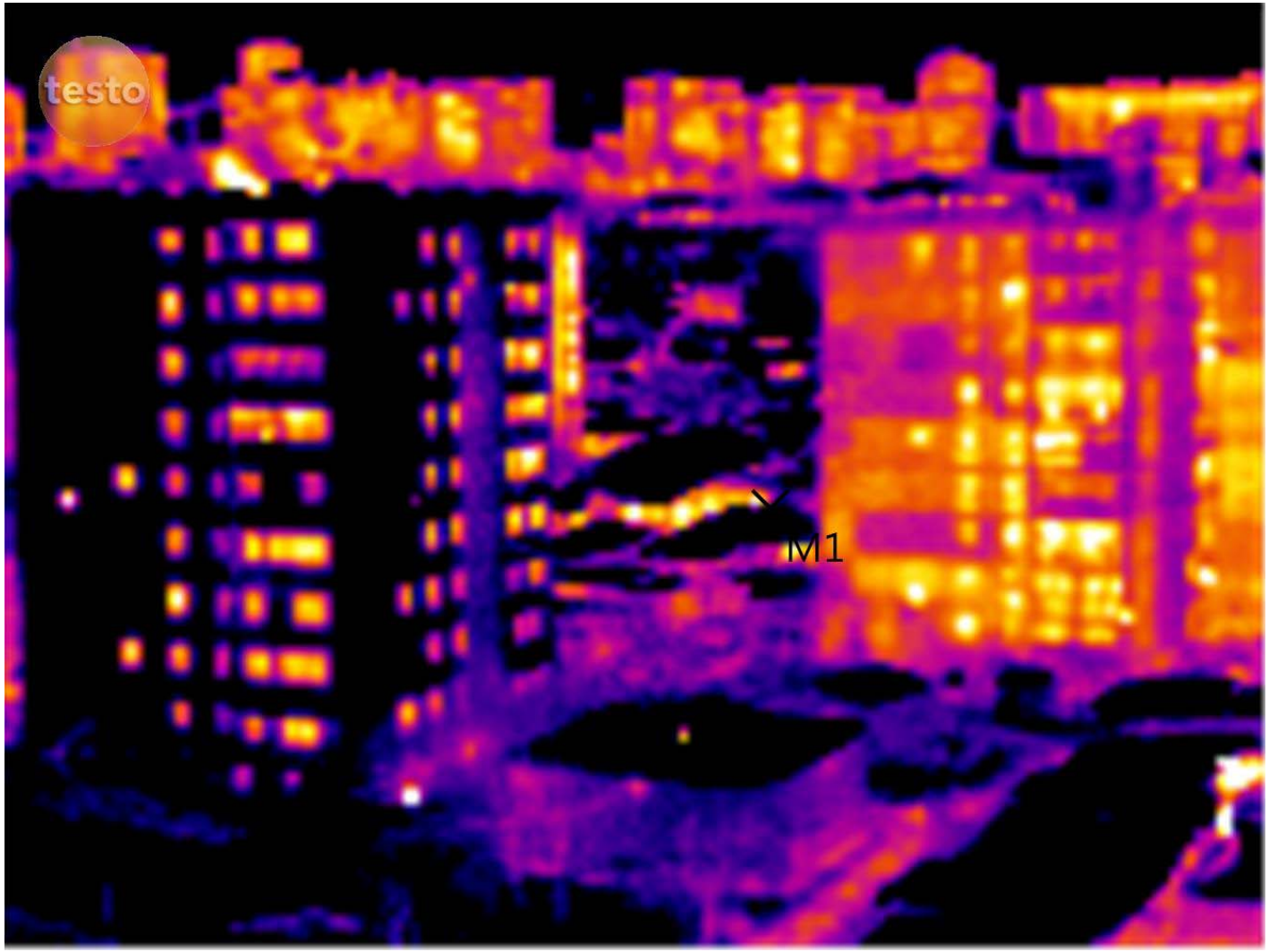
After 74kWh/m2 year

CO_2 emissions: 31 tons/year

255$ per flat/year – heating

Energy performance improved by 60% !

Infrared Imaging of the Energy Efficient Building



Supporting Behavioral Change Towards Energy Efficiency

- TV programs for pilot project results dissemination
- Journalists training and contests (2)
- Web-site (local and regional)
- EE certification of buildings (8)
- Media contests to promote topics on EE (2)
- Articles, thematic calendars (on annual basis)
- School classes, contests (on annual basis)

“Green Urban Lighting” UNDP-GEF Project

Overall Goal: To save energy and to reduce emissions of greenhouse gases by increasing energy efficiency of municipal lighting in the cities of Armenia via implementation of municipal investment programs and national policies.

Specific Components:

1)Municipal energy audits and technical capacity-building

2)Demonstration projects on EE municipal lighting (Yerevan, Alaverdi, Spitak…..)

3)Replication via municipal lighting programs and associated financial instruments (e.g. municipal revolving funds)

4)National policies, codes, and standards on lighting

Duration: January 2014 - January 2018

GEF Funding: 1.6 mln USD

Testing of the LED street luminary on the pilot street in Yerevan

Isakov Avenue, Tairov and Parakar Str, - 9km

BEFORE 16 lx

AFTER 26 lx

Expected results: **Energy saving and demonstration of technology benefits - 63% saving**

- Improved illumination level (to reach the norm requirement)
- Elimination of unconformity of illumination of the street

THANK YOU


ARMENIA


IMPROVING ENERGY
EFFICIENCY IN BUILDINGS


GREEN
URBAN
LIGHTING