

American University of Armenia
Acopean center for the Environment

SUSTAINABLE ENERGY ACADEMY
supported by Heinrich Boell Foundation

**Energy Efficiency: advantages
for people, cities and the State**

Energy Efficiency - why care?

Security

- Many countries import substantial share of energy resources

Deficit

- Growing demand & aging capacities may be leading to an emerging supply gap

Affordability

- Growing energy prices (in the long-run) & affordability concerns

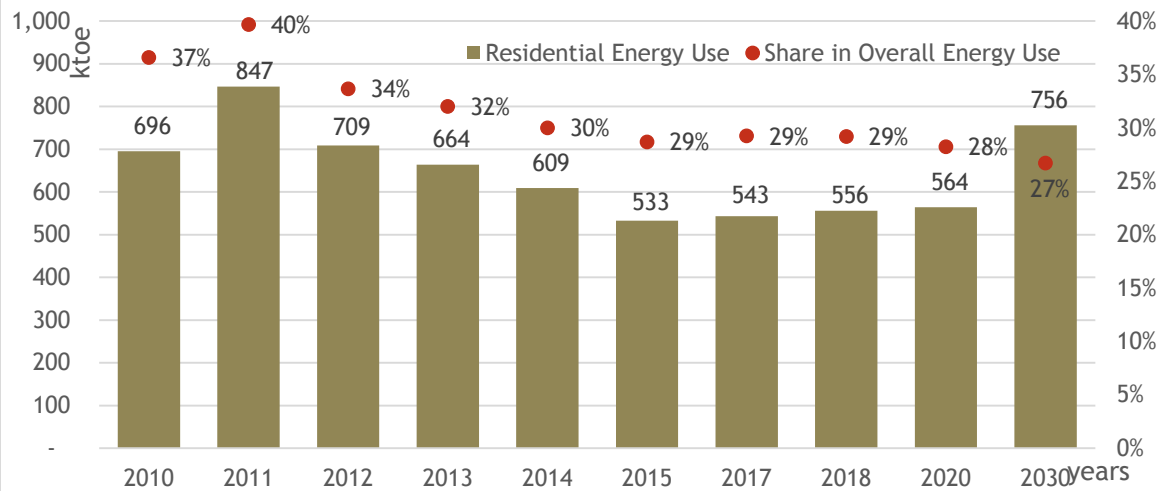
Economic growth

- Export competitiveness

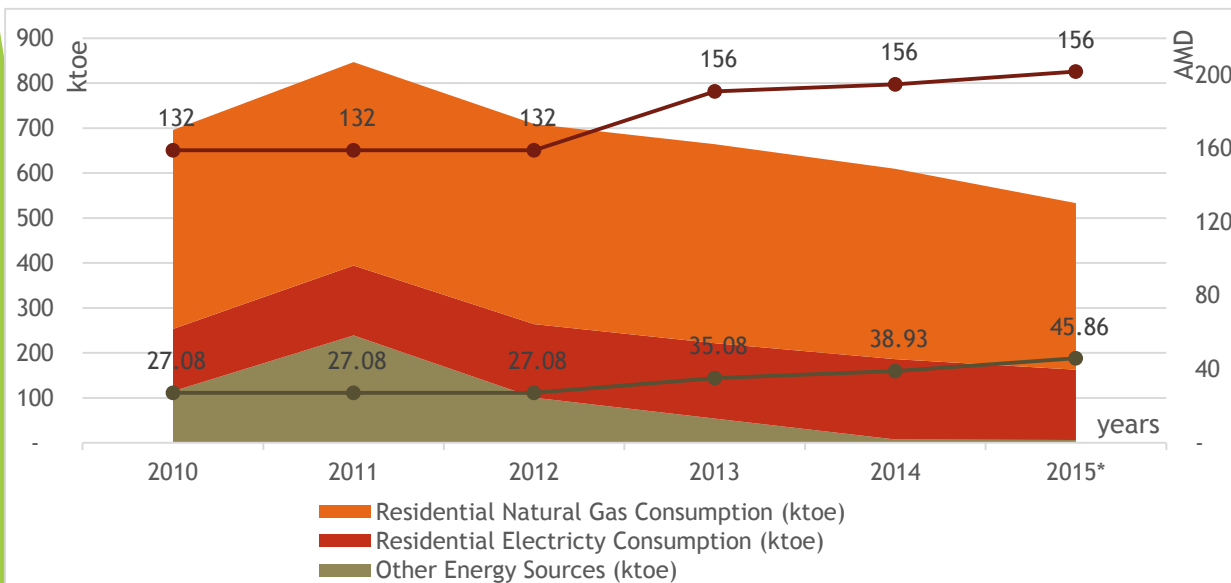
Environmental Footprint

- Local and global environmental concerns

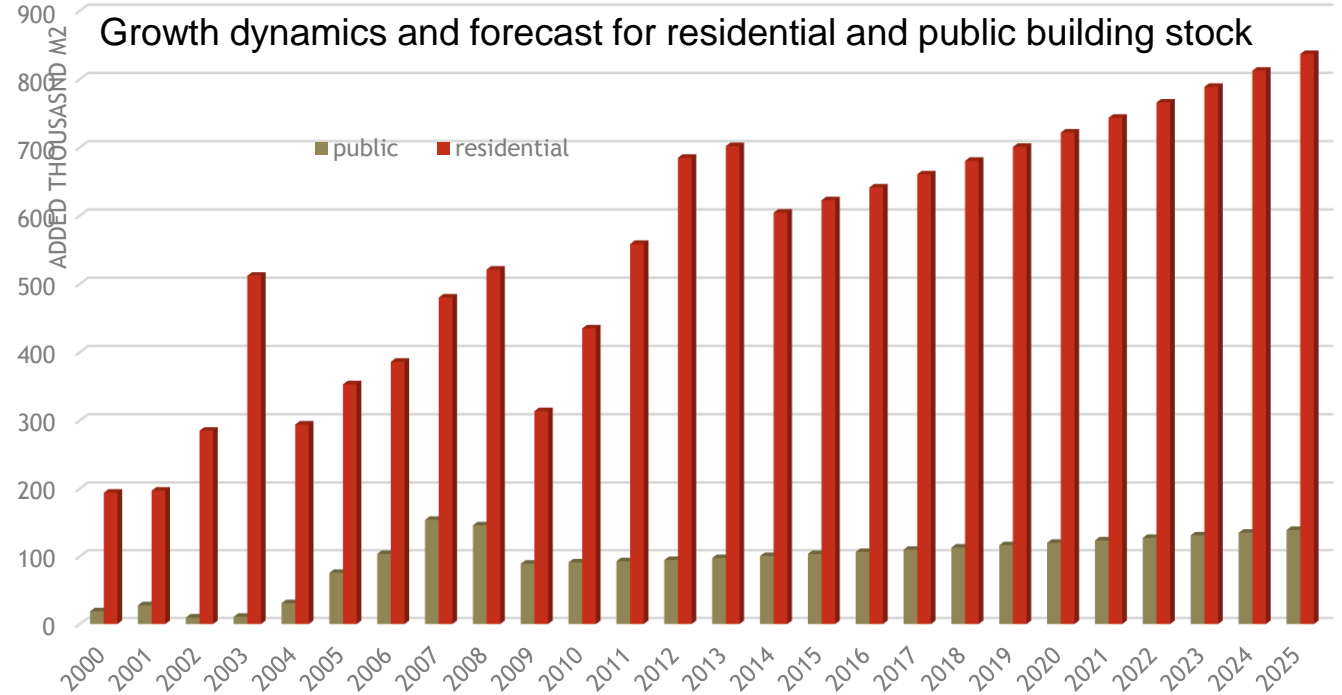
Buildings Sector/ Existing Residential Buildings



Energy Use in Residential Sector, 2010-2030.

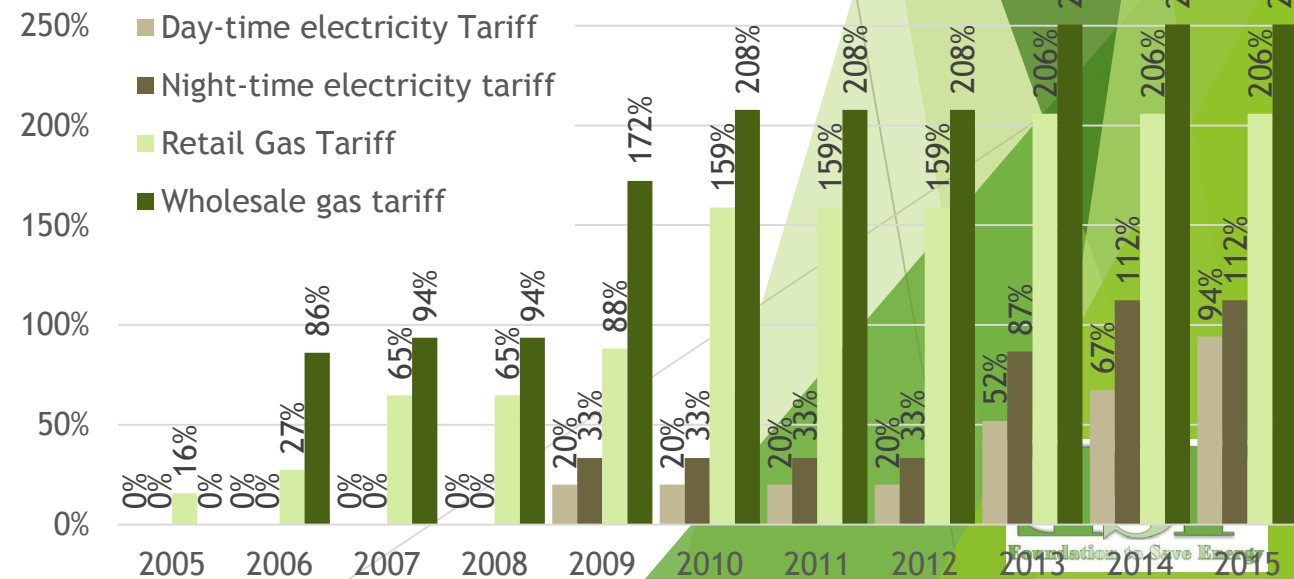


Energy tariffs and Energy Consumption in Residential Sector, 2010-2015

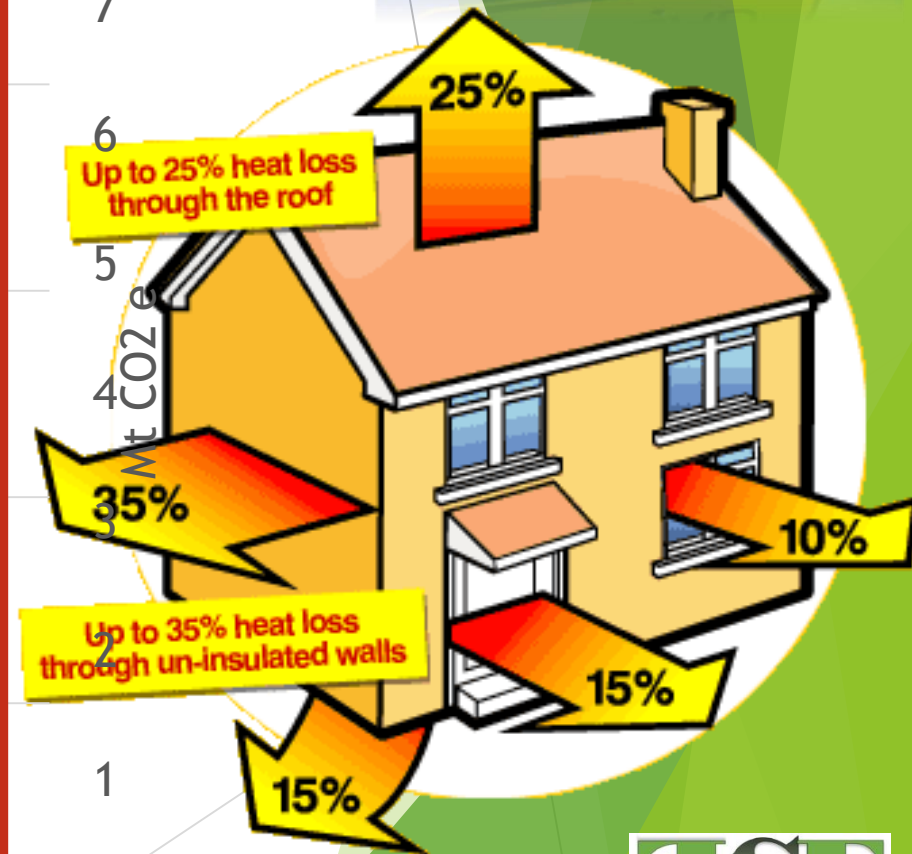
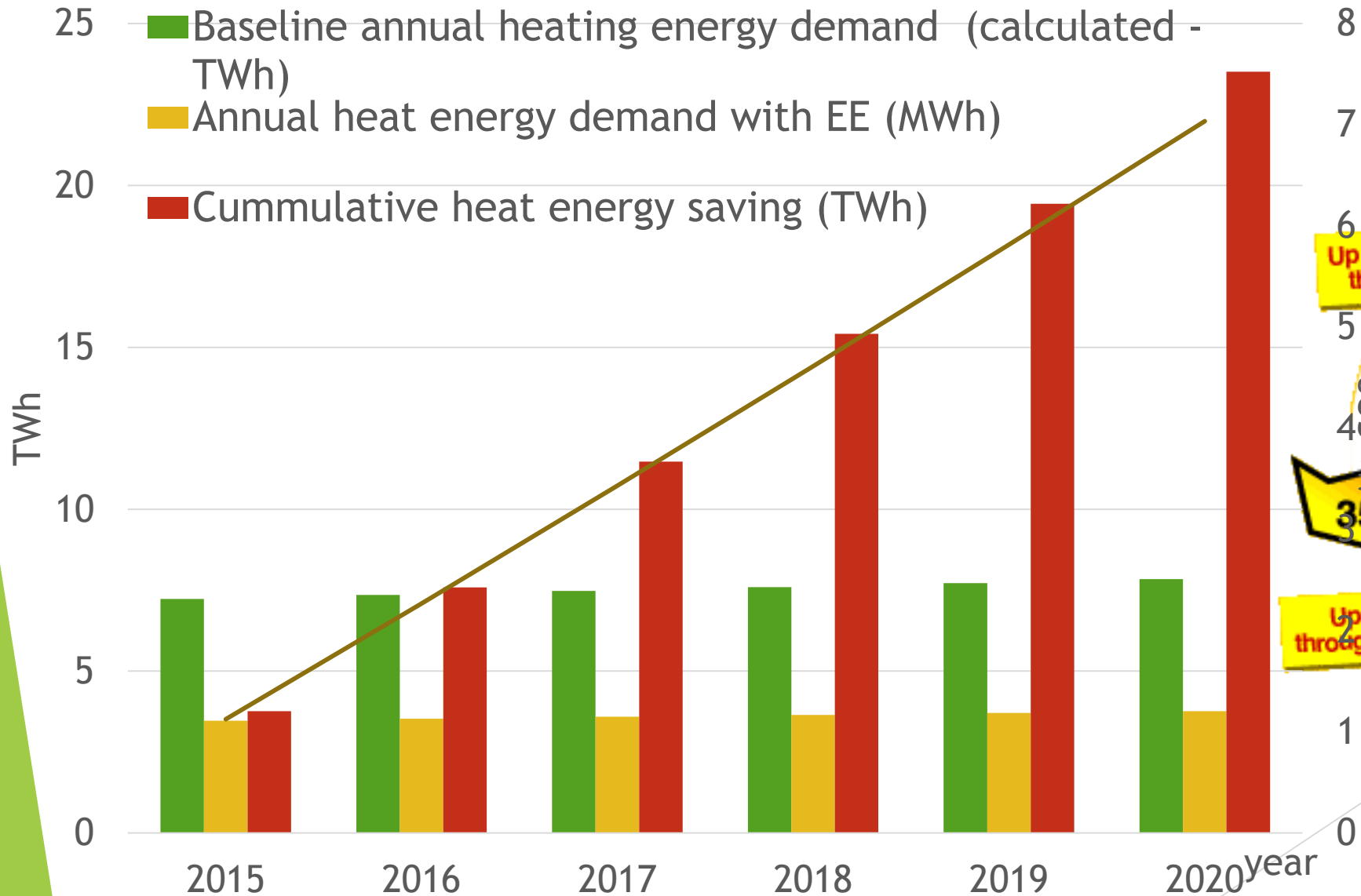


300%

Energy price increases: Gas & Electricity



Potential for Energy Saving and GHG Mitigation in Residential Buildings



Condominium Lending - AN OPPORTUNITY

**Law on
Energy
Saving & RES**

**Housing
and
Condomini
um Laws**

**Govt 5-yr
Program on
Residential
Buildings**

**EU Associate
Membership
(pending 2013),
EU Laws
transposition**

**Gas tariff
increased by
30%**

- ▶ Ararat, Byblos, Anelik, Ameria, ACBA, Ineco banks, and NMC offer various energy efficiency loans
- ▶ EBRD, KfW and AFD short- and medium-term plans include building loan schemes through commercial banks
- ▶ Green for Growth Fund expanding its operations, current regional borrowing for households 40%
- ▶ IFIs look for banks with experience in residential lending

**Most
Buildings
30-60
years old**

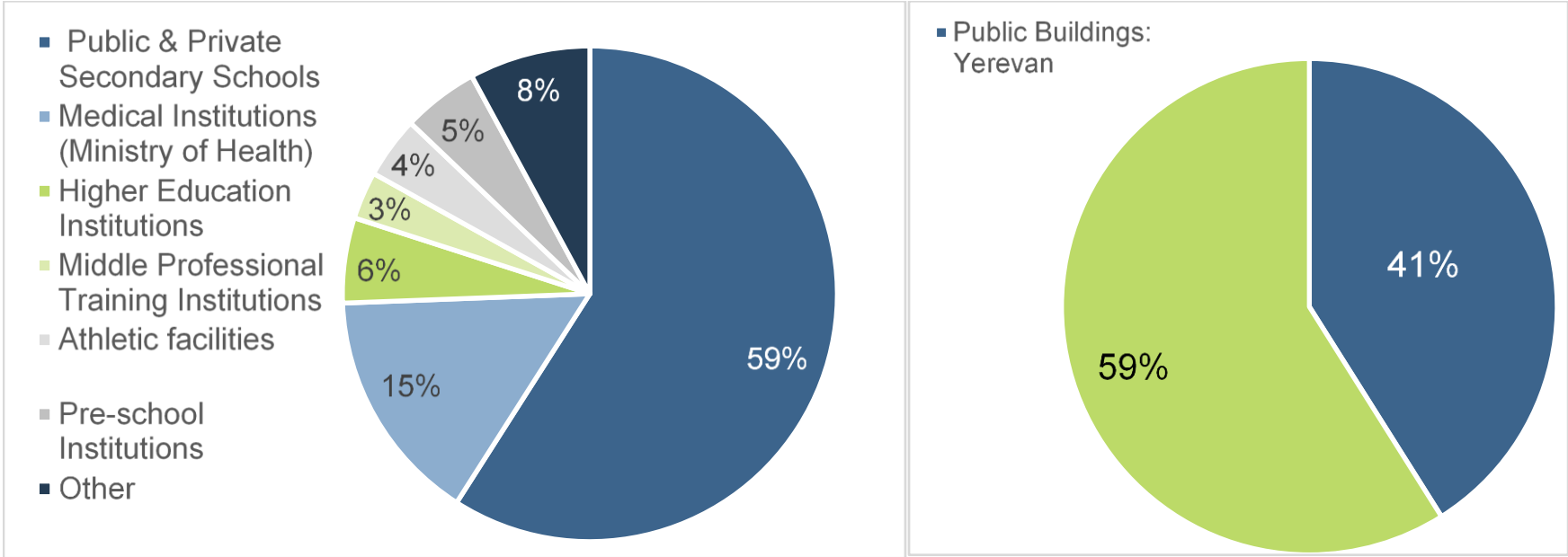
**94% in
bad/satisfa
ctory
condition**

**60% need
investments
in entrances
and
staircases**

**75% need
roof
repairs**

**Capital
invest-
ments
required**

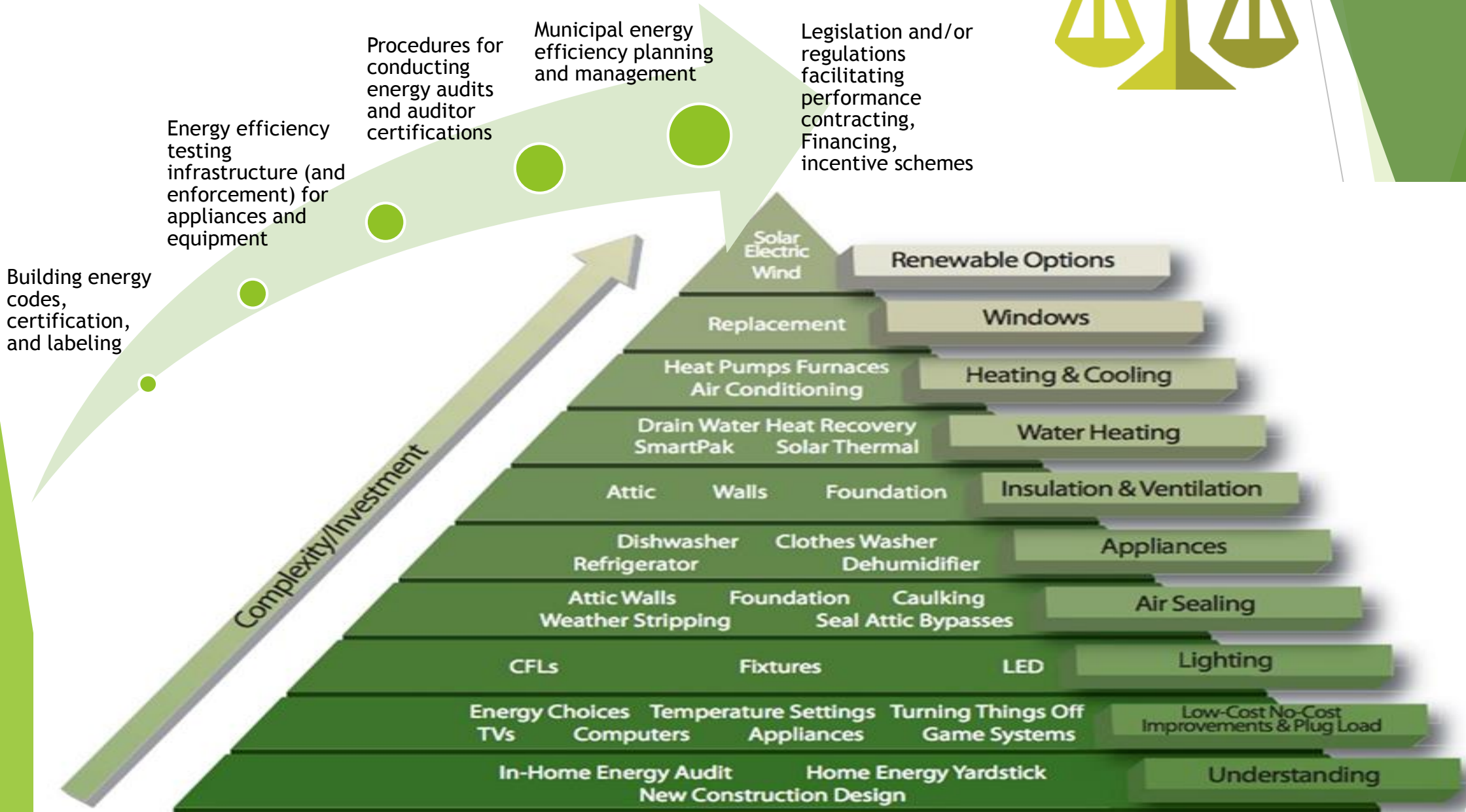
Public Buildings and Services



Energy Saving Potential in Public Buildings

Total Area of public buildings in Armenia (m2)	13,787,397
Total energy consumption in Public Buildings (MWh/year)*	1,764,787
Annual Energy Saving Potential (MWh/year)*	896,181
* - based on R2E2 experience with 56 projects.	
Average energy consumption prior to EE in public buildings	128 kWh.m/yr
Average energy consumption after EE	63 kWh.m/yr
Average energy saving rate	51%
Investment need (AMD) at average of AMD 8400/m2 for typical ESMs	115,814,134,238
Investment need (USD) - exchange rate 473	\$244,850,178
Total Financing currently available (GEF and KfW)	\$ 27,270,296

Legal Foundation for EE Improvement: Strong Primary Legislation



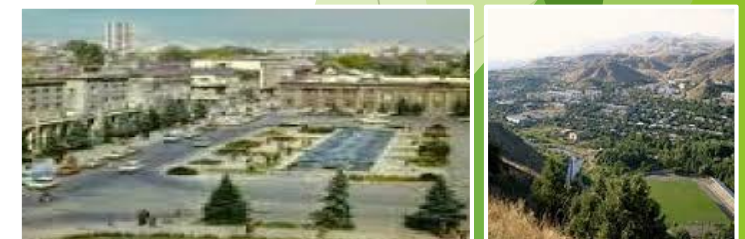
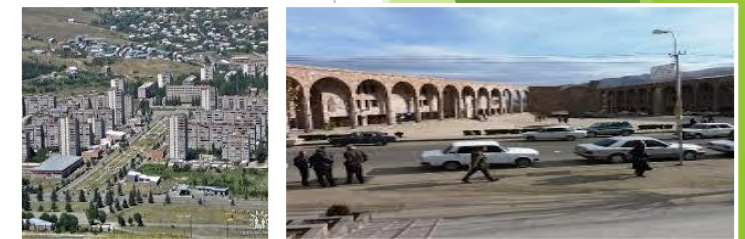
The Covenant of Mayors

- EU initiative launched in 2008 by the Commission – DG ENERGY to endorse and support local and regional authorities in the fight against climate change
- Voluntary commitment of signatories to meet and exceed the EU **20% CO₂ reduction** target through the implementation of a **Sustainable Energy Action Plan**



Covenant of Mayors in Armenia

Signatories	Population	Commitments	Status
Akhtala, AM	2,753	2030 ADAPT	<div><div></div></div>
Alaverdi, AM	16,400	2030 ADAPT	<div><div></div></div>
Aparan, AM	6,500	2020	<div><div></div></div>
Artik, AM	19,500	2020	<div><div></div></div>
Gavar, AM	19,900	2030 ADAPT	<div><div></div></div>
Goris, AM	21,555	2030 ADAPT	<div><div></div></div>
Hrazdan, AM	42,000	2020	<div><div></div></div>
Ijevan, AM	20,800	2030 ADAPT	<div><div></div></div>
Kapan, AM	42,900	2030 ADAPT	<div><div></div></div>
Masis, AM	21,376	2030 ADAPT	<div><div></div></div>
Paraqar, AM	9,140	2030 ADAPT	<div><div></div></div>
Spitak, AM	18,237	2020	<div><div></div></div>
Tashir, AM	8,700	2020 2030 ADAPT	<div><div></div></div>
Tsakhkadzor, AM	1,700	2020	<div><div></div></div>
Vanadzor, AM	86,199	2020	<div><div></div></div>
Vayk, AM	5,900	2020	<div><div></div></div>
Yerevan, AM	1,077,400	2020	<div><div></div></div>



Sustainable Energy Investments Planned in SEAPs of Armenian Signatories (8 cities)

Introducing municipal energy management system in public institutions

Capital repair and thermal modernization of municipal buildings

- Insulation, window & door replacement, efficient lighting in kindergartens, culture centers, art schools, administrative buildings, etc.

Energy efficiency retrofits of multi-apartment residential buildings

- Insulation, Efficient doors and windows
- Improved lighting

Energy efficiency upgrades in public lighting system

- Public spaces / courtyards
- Municipal street-lighting

Efficiency Municipal transport

- Road network optimization, upgrading of car fleet, rerouting
- Development of bike lanes and pedestrian commute

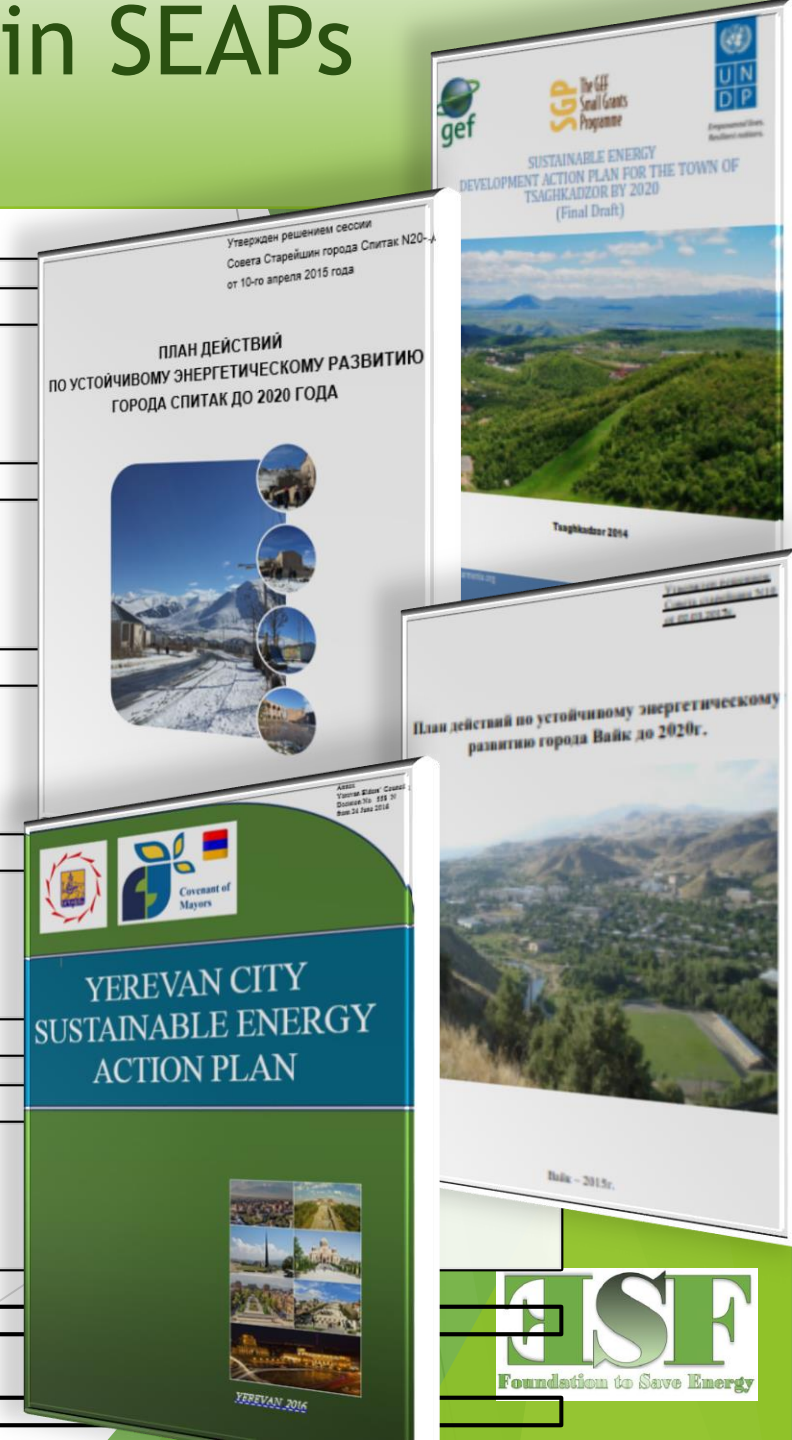
Renewable Energy Development

Increased public awareness on sustainable energy and energy efficiency

- Trainings and capacity building, Energy days, Earth Hour
- Energy Certification of buildings

Rehabilitation of green spaces

Municipal solid waste management & Methane utilization



From Energy Sustainable City to Climate Resilient to GREEN & SMART

1. Green City Baseline

Q: What is the current state of the environment?

- ▶ Map and understand the context
- ▶ Collect, process and analyse relevant data
- ▶ Identify and prioritise challenges as a basis for subsequent policy making

2. Green City Action Plan

Q: Where do we want to go and how do we get there?

- ▶ Develop a vision
- ▶ Identify and prioritise policy measures
- ▶ Determine medium-term targets and action

3. Green City Implementation

Q: How do we operationalise the plan and what are the resources available?

- ▶ Adopt the Plan
- ▶ Implement key measures first
- ▶ Monitor progress and adapt according to lessons learnt

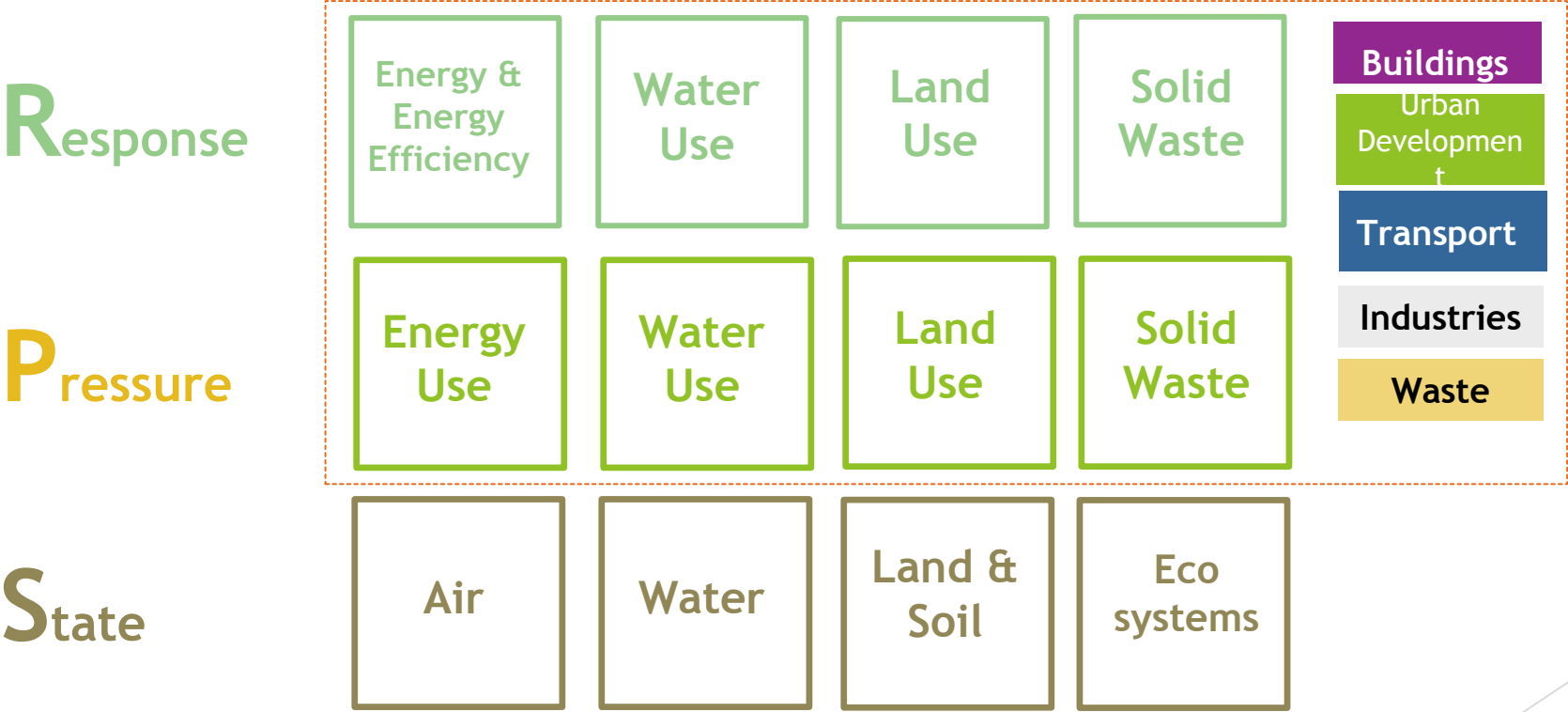
4. Green City Reporting

Q: What have we been able to achieve - and how?

- ▶ Analyse successes and failures
- ▶ Verify processes
- ▶ Inform stakeholders & provide basis for further decisions

From Energy Sustainable City to Climate Resilient to GREEN & SMART

State-Pressure-Response Indicators Approach



Source: EY (based on EBRD's GCAP methodology)

Positive Steps & Successes to Date and Remaining Issues



70%

60%

50%

40%

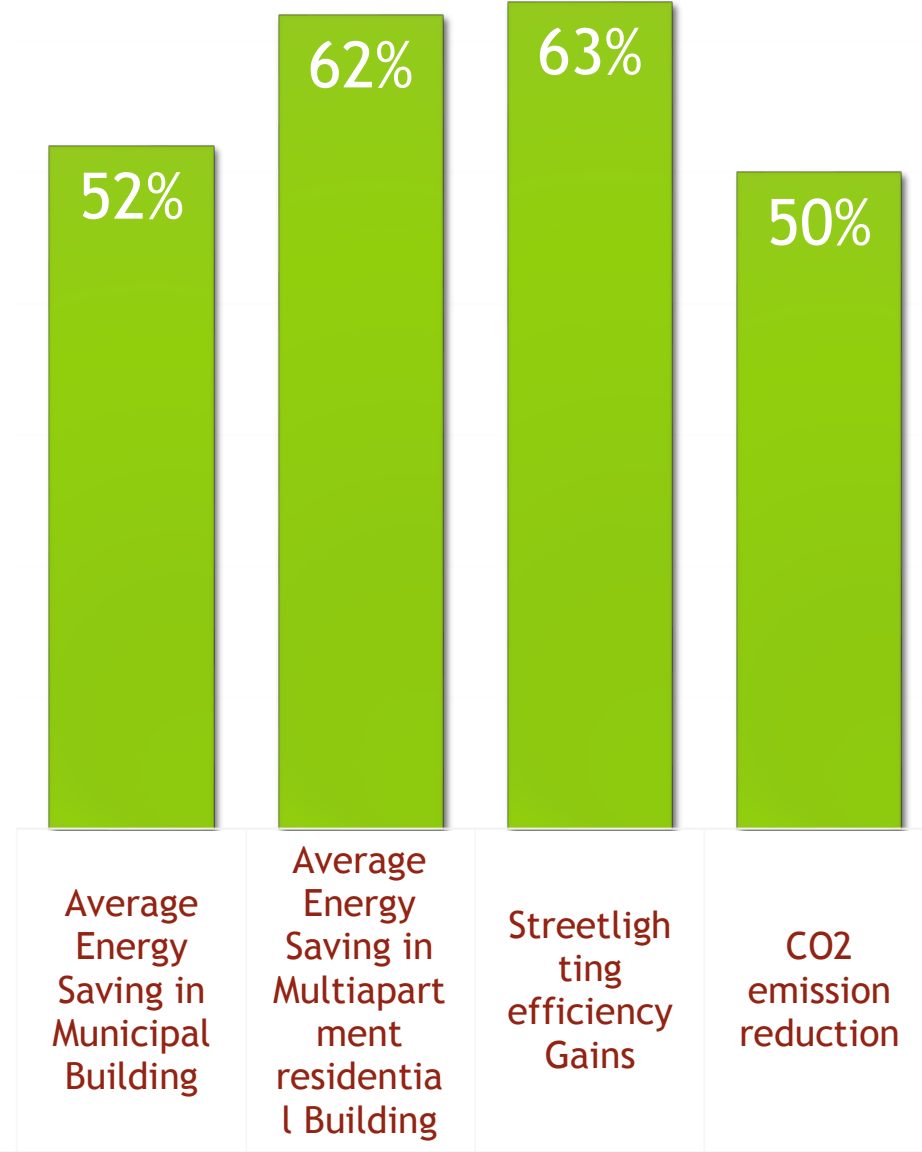
30%

20%

10%

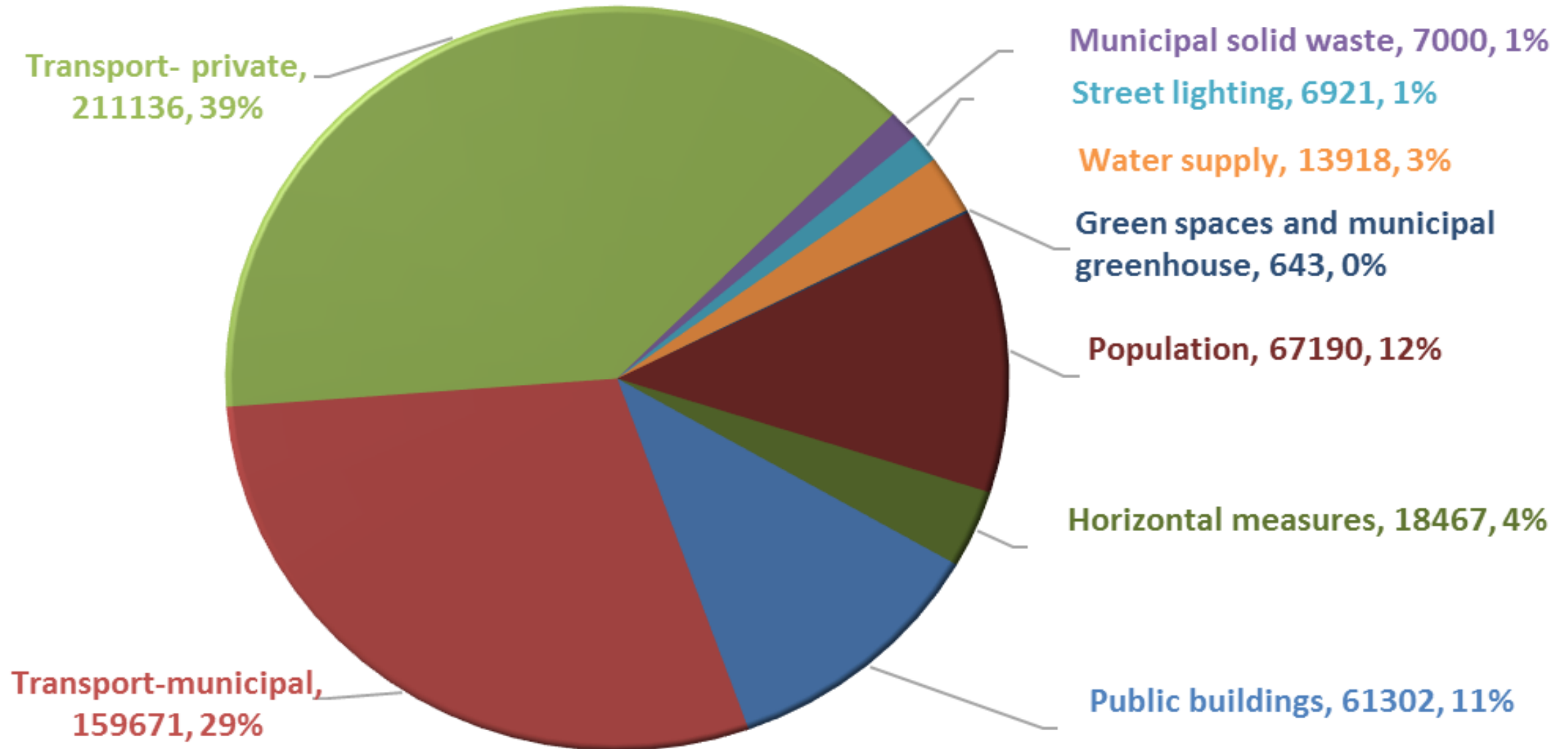
0%

Typical Energy Saving Results of Pilot Projects



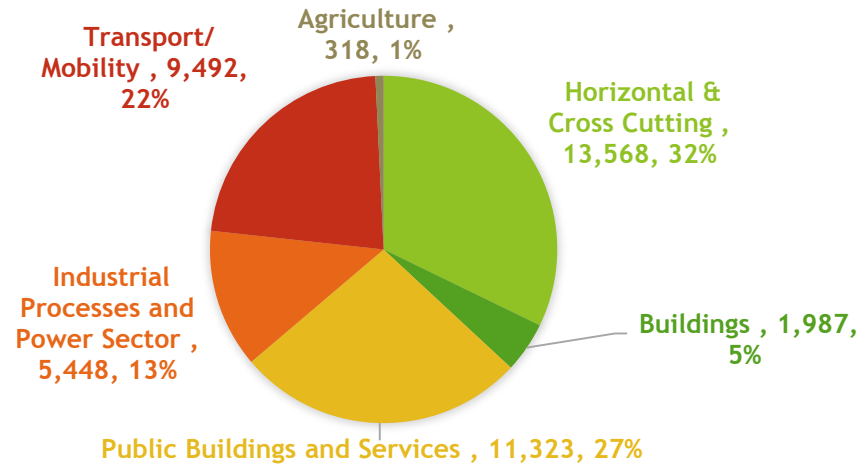
How Much Energy can a City Save: Yerevan Case

Potential for Energy Saving by sectors (MWh & %)

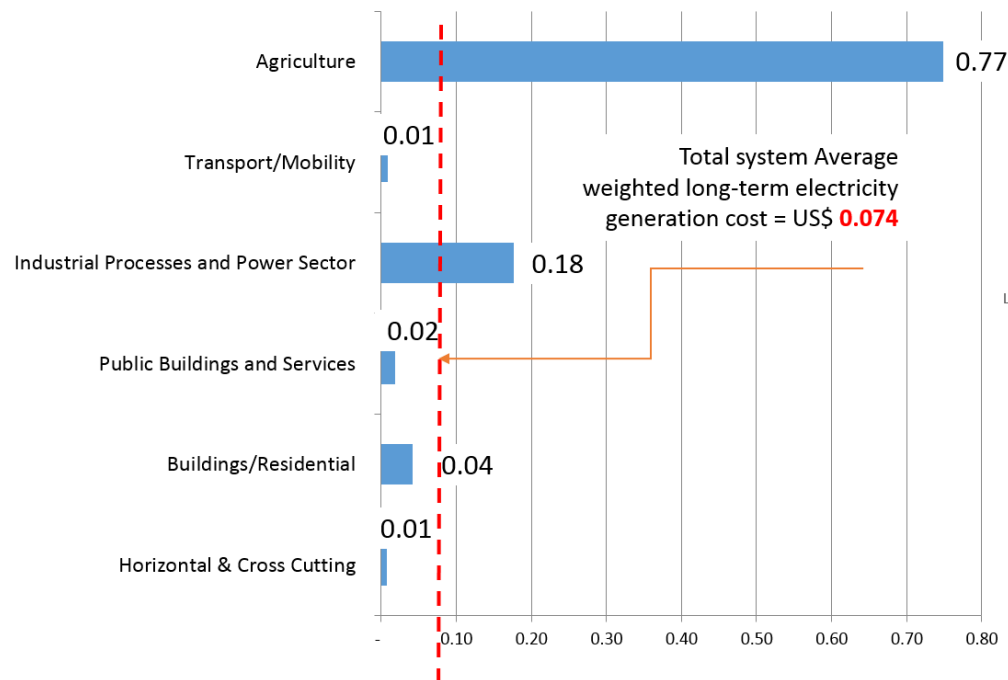


Energy Efficiency

POTENTIAL BY SECTOR (GWH, %)

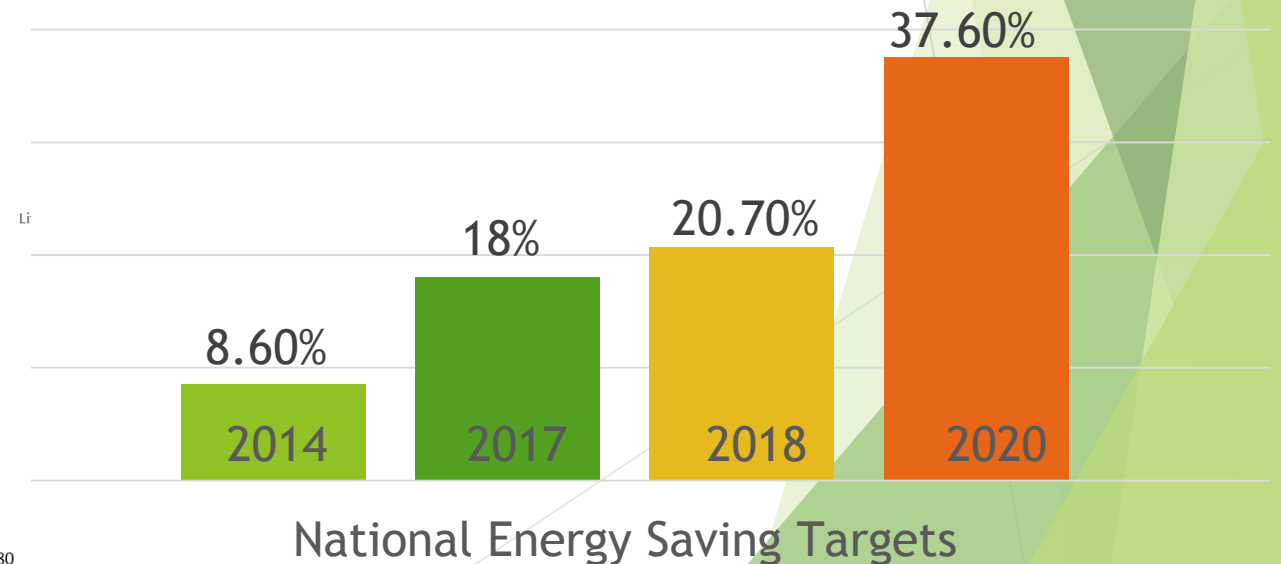
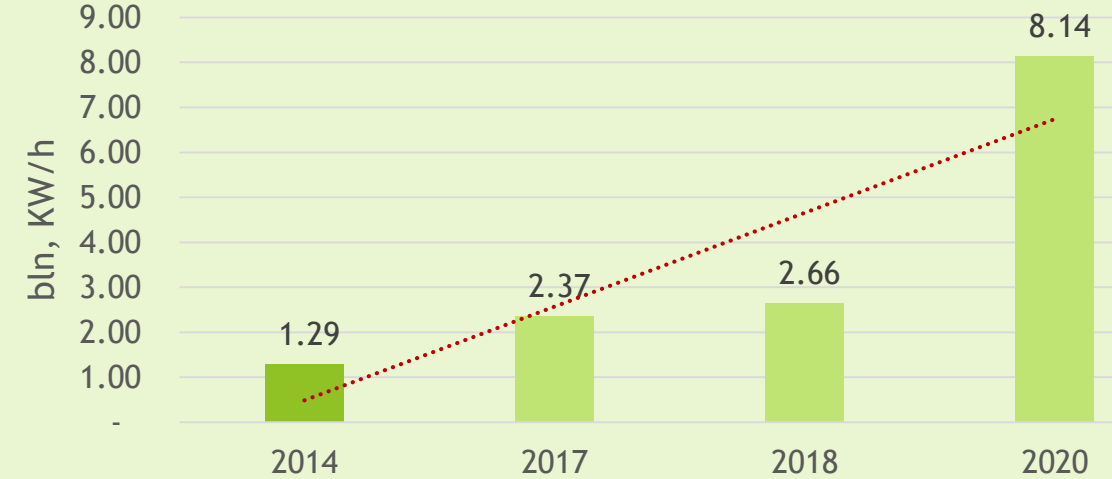


Weighted average cost of reduction of 1 kWh energy by sectors (USD) [over NEEAP lifetime 2010-20]



among top 4 energy sector priorities of the country, legal framework in place, a dozen credit lines, \$340 million underserved

Expected/actual energy saving, annually

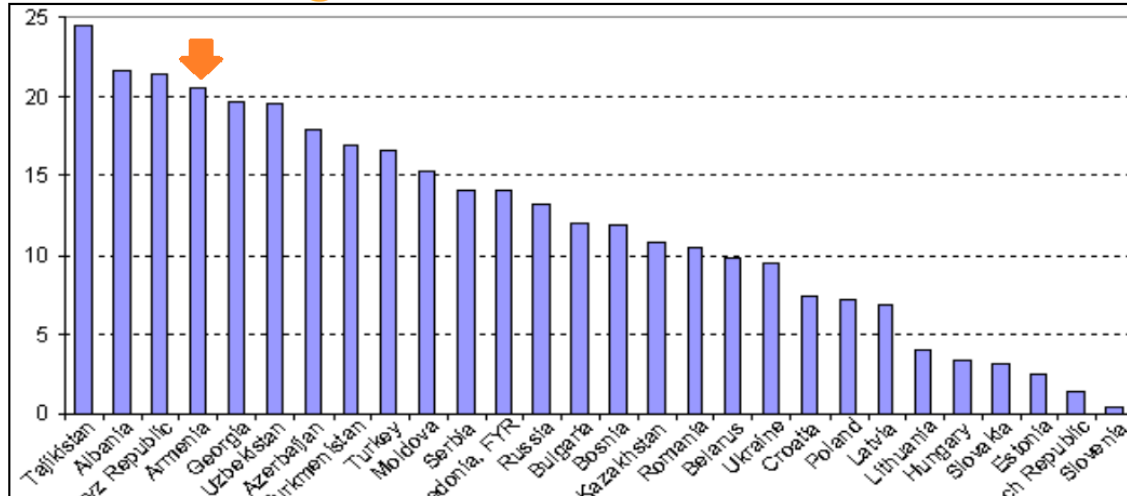


Climate change and carbon footprint

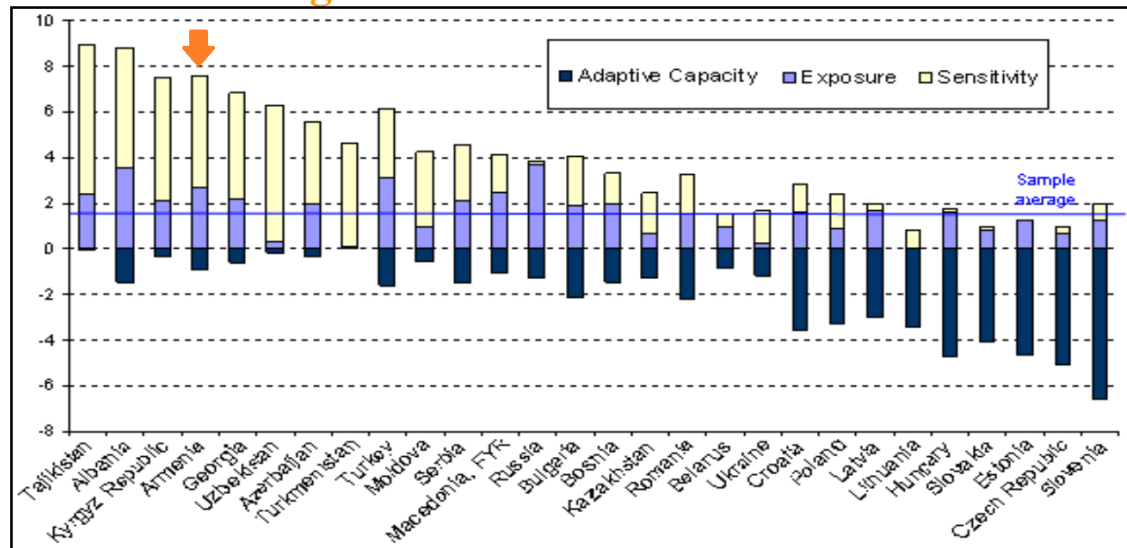
Party to UNFCCC and Kyoto Protocol

Non-Annex I, negotiating blocks: CECAM, LINK, Mountain Partnership

An Index of Vulnerability to Climate Change for Different ECA Countries



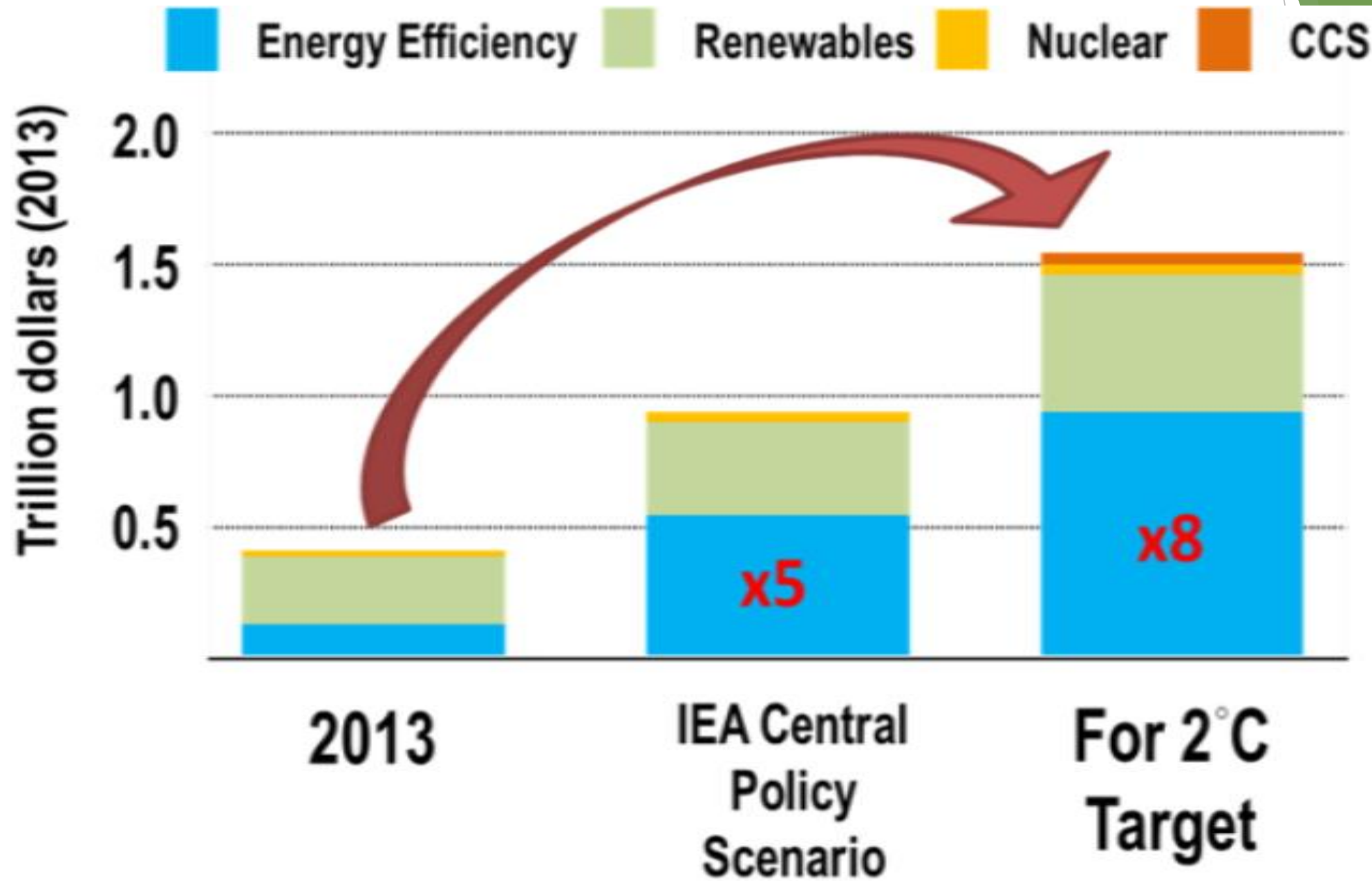
The Drivers of Vulnerability to Climate Change for Different ECA Countries



- ❑ 0.02% of global GHG emissions
- ❑ Country climate change risks:
 - ❑ High vulnerability due to:
 - ❑ Significant exposure
 - ❑ Low adaptive capacity
 - ❑ High sensitivity

- ❑ **GHG emissions in Armenia:**
- ❑ **Total 7,463.6 Gg CO₂eq in 2010**
 - ❑ (5.4 Mt CO₂ eq in 2012!)
- ❑ **2.14 tons per capita in 2010**
 - ❑ **(1.83 tCO₂ in 2013!).**
- ❑ **By 2030 GHG emissions to reach: -**
- ❑ **BAU scenario: 20,000 tons of CO₂ eq.**
- ❑ **Mitigation scenario: 14,000 tons CO₂ eq.**
- ❑ **If no mitigation:** temperature in Armenia may increase by 4.7°C, more frequent and severe hydro-meteorological extremes
- ❑ INDC Armenia based on per-capita approach
- ❑ **633 million tons CO₂ equiv. for 2015-2050**
- ❑ **(189 tons per capita x 3.35 million people – 1990 population level, or 5.4 tons per capita).**

EE finance: The status. The need!

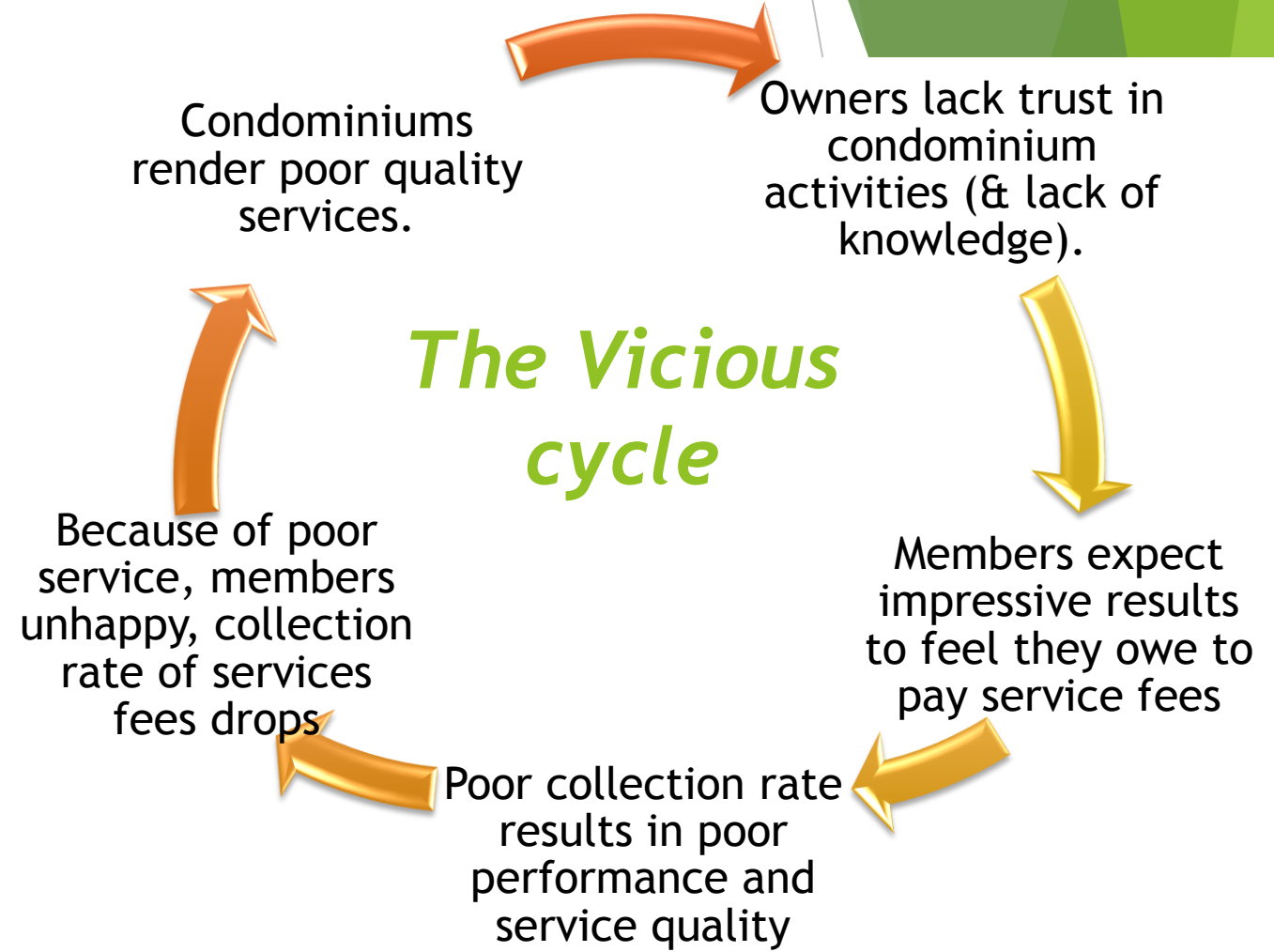
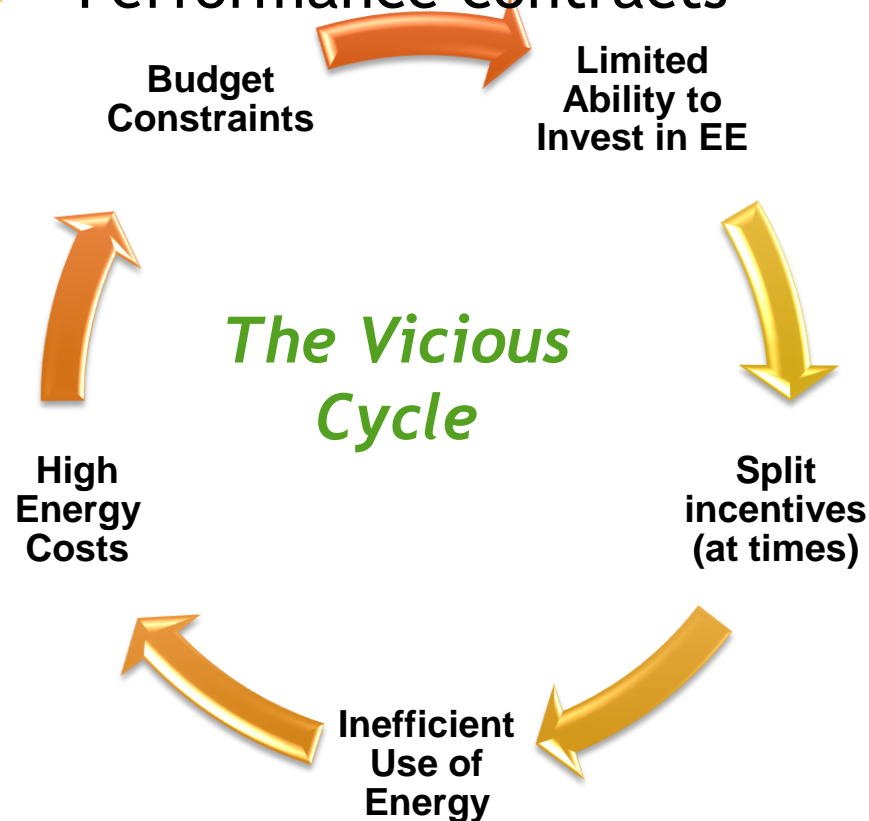


The vicious circle: Public Buildings

The vicious circle: Residential Buildings

Sources of financing for public building EE projects:

1. Direct appropriations
2. Off-budget mechanisms
 - ✦ Bonds, Loans,
 - ✦ Performance contracts



Food for thought

If Armenia fully realizes its potential for energy saving, the available energy supply will increase by 50-70% (hence import can be reduced)

The economic benefit of energy saving is equivalent to 5% of GDP, or about 80% of budget deficit

1m³ of imported natural gas costs about twice more than investing in conservation of 1m³ of natural gas

Building 1kW new capacity costs 5 times more than the cost of 1kW energy saved

Roughly 40% of Armenia's energy saving potential is in the buildings sector

Saving energy in building design phase is a low-cost/no cost opportunity with over 50% saving potential

Foundation to
FSE
Save Energy

Thank you



**We are
supporting the
Covenant of Mayors!**

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