



Promoting Low Carbon Development in Municipalities of Armenia

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Technical background elaborated in course UNDP-GEF projects

- Third National Communication to UNFCCC
- National GHG Inventory Report for 2012 and mitigation policies and measures analyzed in the course of preparation of the First Biennial Update Report,
- Standardized Baseline of National Electrical Grid Emission Factor developed and approved by CDM EB and posted on UNFCCC web-site (2015) , valid for period 2015-2017
- NAMA on Energy Efficiency in Building Sector developed and posted in UNFCCC NAMA Registry –(2014)

Supportive National Context

- The energy security and reduction of dependence from imported fossil sources is stated as national priority
- Existing supportive legal framework promoting the energy efficiency and renewable energy
- IFIs and bilateral assistance programmes has on-going programmes supporting RES and EE
- 10 cities of Armenia joined the Covenant of Mayors
- Armenia submitted its INDC on 28 of September 2015, stating commitment for limiting GHG emissions

GHG Emissions by Sectors as of 2012

Sectors	Emissions, Gg CO ₂ eq.	Share in total emissions, %
Total emissions	9,423	100
Energy	6,913	73.4
Industrial processes and product use (IIPU)	662	7
Agriculture*	1,216	12.9
Waste	632	6.7

* Without Forestry and Other Land Use

Projection of main indicators

Parameters	2012	2015	2020	2025	2030
GDP, billion \$US*	9958	11758	15509	20456	23708
Population, million person	3.027*	3.01	2.99	2.97	2.95
<i>Business as usual</i>					
GHG emissions, thous. tCO_{2eq}	9,424	9,940.8	13,802	15,798	18,301.4
Emissions per GDP unit tCO _{2eq} /1000 \$US	0.946	0.845	0.89	0.77	0.772
Emissions per capita tCO _{2eq} /person	3.11	3.3	4.61	5.32	6.2
<i>Mitigation scenario with additional measures</i>					
GHG emissions, thous.tCO_{2eq}	9,424	9,048	12,439	13,546	12,045
Emissions per GDP unit tCO _{2eq} /1000 \$US	0.946	0.769	0.8	0.66	0.508
Emissions per capita tCO _{2eq} /person	3.11	3.0	4.16	4.56	4.02

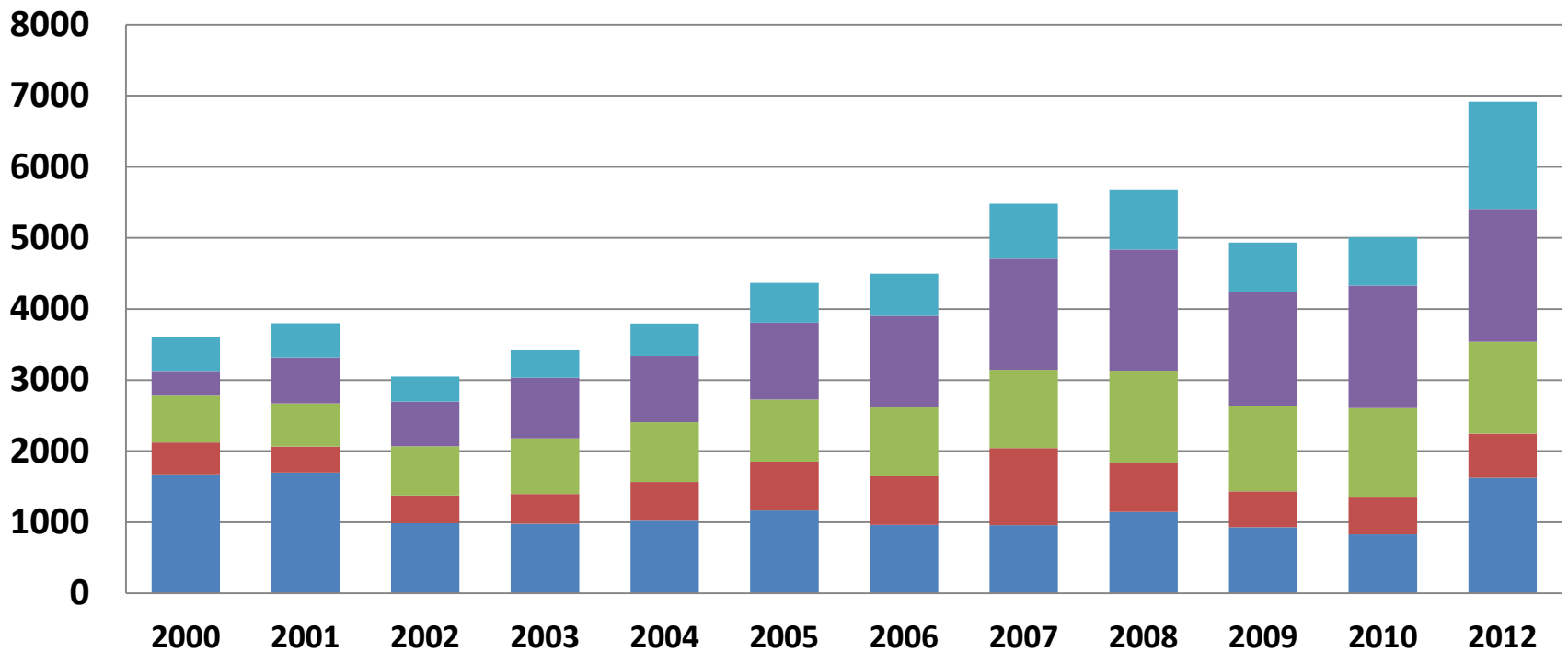
In 1990 GHG Emissions per unit of GDP, t CO2 eqv /\$ 1000 2,9

GHG emissions per capita, t CO2 eqv./person 7.0

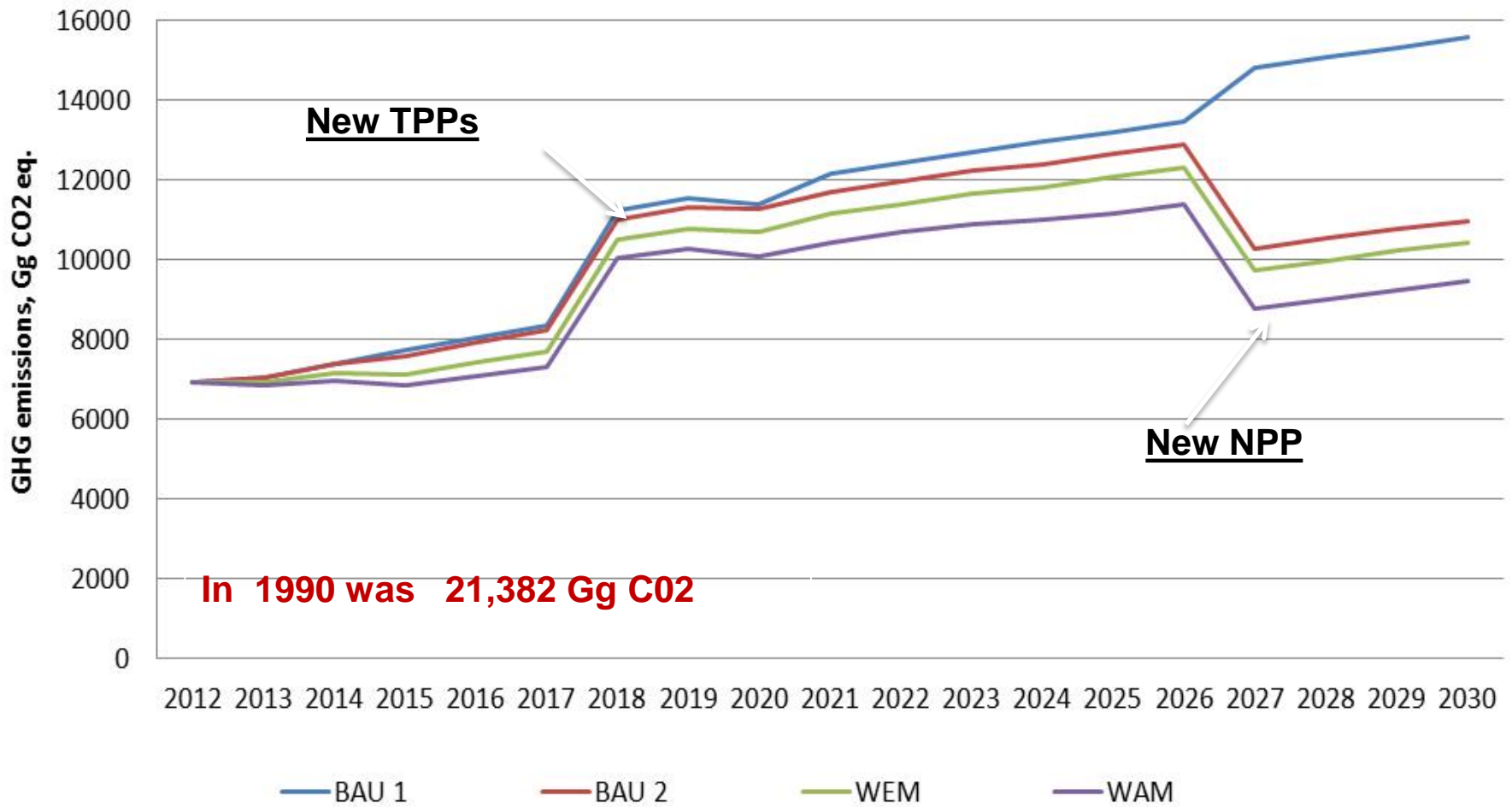
*Source: NSS, WB

GHG Emissions in “Energy” Sector

- Energy generation
- Industry and construction
- Transport
- Other sectors
- Fugitive emissions



GHG Emission Projections from Energy Sector



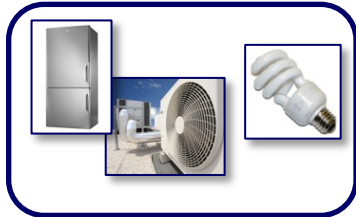
GHG Emission Projections in Energy sector, 2012-2030

Four scenarios were considered:

- 1. Business as Usual, BAU-1:** Growing demand will be met by the construction by TPPs. With no mitigation measures on the demand side
- 2. Business as Usual, BAU-2:** Development of the Armenian energy system in compliance with Energy Security Strategy (2014), with RES and new NPP. With no mitigation measures on the demand side
- 3. With Measures, WM:** includes measures on generation side and demand side with high probability of implementation and secured finance
- 4. With Additional Measures, WAM:** additional mitigation measures on generation side and demand side

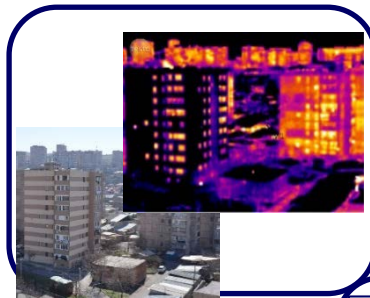
Energy efficiency on household, municipal, national level

Household level

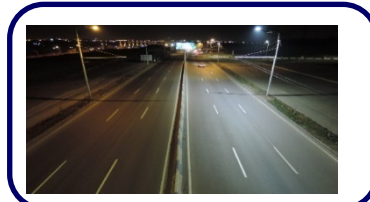


Standards and labelling
Awareness raising

Municipal level



EE retrofitting of buildings



Street Lighting

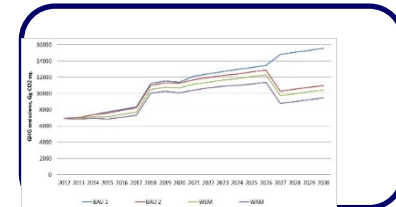


Cogeneration based centralized heating
Boilers testing

National Level



Building code, EE standards,
Minimum performance standards



Greenhouse gas mitigation targets, INDC
NAMAs

*"Green Urban Lighting" UNDP-GEF/00074869
project*

Green Urban Lighting Project

- Lighting is the second largest source of municipal greenhouse gas (GHG) emissions in Armenia (after heating), accounting for about one-third of municipalities' GHG emissions and up to 50 percent of their electricity bill.
- Municipal lighting in the capital city of Yerevan accounts for the largest consumption in the country: 78 per cent of all urban lighting energy use nation wide;
- Considerable share of streets in urban communities and large rural communities in the regions are poorly illuminated;
- Technical potential for cost-effective efficiency improvements in public lighting is significant: average specific power consumption for street lighting in Yerevan is 1.3-1.5 times higher than that of European.

Identified Barriers

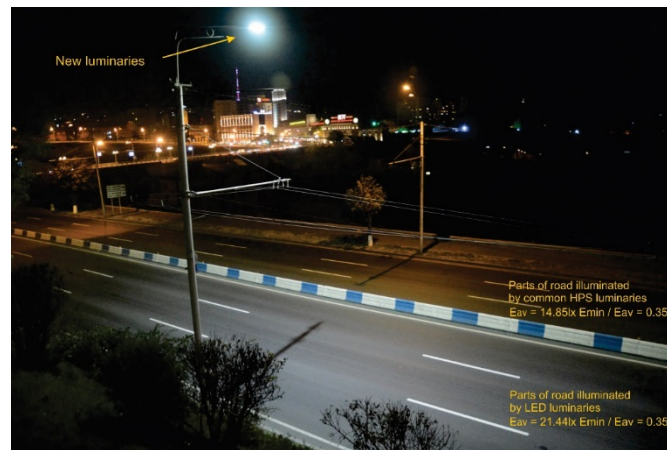
- **Insufficient public awareness** of modern energy efficient technologies and solutions in the lighting sector.
- **Lack of efficient market supervision**, consequently, prevalence of low quality lighting devices and those with discrepancy between the marked and actual technical indicators.
- **Limited** technical and financial **capacities** of local self-government bodies.
- **Limited funding** sources (lending options).
- **Negligence** towards energy efficiency and qualitative indicators of devices procured via the state procurement procedures.
- **Limited involvement** of the private sector.
- **Lack of favorable taxation**, including customs, for production and import of energy efficient devices
- **Insufficient regulative framework** (standards, norms etc.)

Urban Lighting in Armenia

Indicators	Yerevan	Other cities
Total installed capacity, MW	15	4
Number of illuminated objects	1 235	981
Number of street lights	54 880	16 234
Mercury lamps	2 700	6 474
Annual electricity cost for 2011, mln USD/year	2,0	0,6
Average daily length of operation of street lighting, hours	8	6,44
Number of not illuminated streets, side streets, alleys, yards.	507	400

Process and results of EE luminaries installation in Yerevan

Isakov avenue



Energy Efficiency Revolving Fund established in Yerevan Municipality from savings of the demonstration project

Parameter	Before	After	Benefits
Total installed capacity, kW	215.5	79.0	Decrease: 136.5 kW
Annual energy consumption, MWh	794.5	291.2	Energy saving: 63%
Annual greenhouse gas emission, t CO ₂	352.7	129.3	Reduction: 223.4 t

Process and results of EE luminaries installation in Yerevan

Yerevan zoo



Parameter	Before	After	Benefits
Total installed capacity, kW	19.04	4.37	Decrease: 14.67 kW
Annual energy consumption, MWh	27.80	6.38	Energy saving: 77 %
Annual greenhouse gas emission, t CO ₂	12.35	2.84	Reduction: 9.5 t CO ₂

Street Light Retrofitting Demonstration Projects


City	Object	Number existing fixtures	Number of LED fixtures	Reduction of system capacity (kW)
Yerevan	Isakov Avenue, Tairov Street 9 km	756	482	136.5
Yerevan	ZOO, 1.8km	112	112	14.67
Alaverdi	Z. Andranik, Sayat-Nova, Shahumyan, 1.8km	67	67	15.8
Spitak	Shahumyan and Manukyan 1.3 km	60	60	10
Abovian	Yerevanyan 1.3 km	124	84	28.5
Sevan	Shahumyan 1.0 km	62	62	13.4
TOTAL	16.2 km	1181	867 (73%)	219

Energy saving - 57 to 80%,

GHG emissions reduction 285 ton CO2 eq./ annual

Illuminance improvement to comply with the norms

THANKS



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Solar Water Heating System, Yerevan

Climate Change Information Center

WELCOME TO THE UPGRADED WEBSITE OF THE CLIMATE CHANGE INFORMATION CENTER OF ARMENIA! YOU WILL FIND THIS WEBSITE MORE USER FRIENDLY, PROJECT ORIENTED AND WITH NEW ADDITIONAL FEATURES. WE LOOK FORWARD TO YOUR FREQUENT VISITS TO OUR WEBSITE.

Climate Change Information Center was established in 1997 in the frames of ARM/95/G31/A/1G/99 UNDP/GEF Project "Armenia - Country Study on Climate Change" with a main goal to strengthen the Information Center of the Ministry of Nature Protection.

The aim of the project was to identify and create connections to both national and international sources of information which would lead to knowledge sharing and prevention of duplication in similar kind of efforts. The main goal of this activity is to find potential international partners to cooperate with either on this project or on the following possible projects dealing with Climate Change problems.

Second National Communication



The Second National Communication of the Republic of Armenia to the UNFCCC has been developed by the Ministry of Nature Protection of the Republic of Armenia in the frames of the "Enabling Activities for the Preparation of Armenia's Second National Communication to the UNFCCC" UNDP/GEF Project

[Download in English 3.3MB pdf](#)

CURRENT PROJECTS

- Municipal Heating
- Second National Communication
- Forest Adaptation to CC
- Energy Efficiency in Buildings

COMPLETED PROJECTS

Weather in YEREVAN

Radiation:	18
Humidity:	81%
Barometer:	571
Geomagnetic:	1
Day:	+20
Night:	+14