Tracing Approach to Decarbonization of Buildings in Georgia

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Decarbonization of Buildings: Opportunities and Challenges

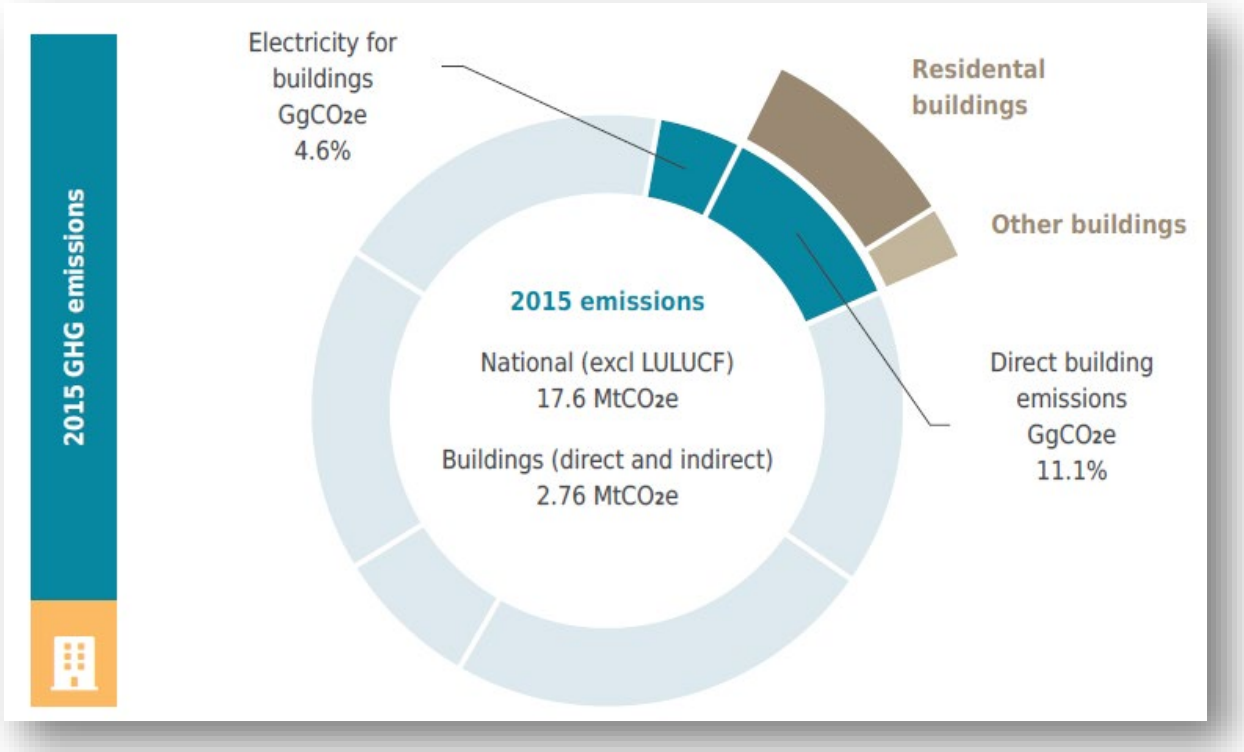
- The phenomenon of the buildings' decarbonization refers to the overall goal of enabling the energy transition over a clean energy sources as well as shift from the embodied carbon in materials to the clean alternatives, in order to achieve significant reductions in carbon emissions in the buildings' sector.
- For reaching this paramount goal it is essential to shape and introduce the adjusted portfolio of building decarbonization policies targeting reduction of the carbon emissions and insuring meeting of climate goals and collective challenges.
- Policies addressing building decarbonization have to reflect a full scale of a buildings sector related activities: starting from planning and designing (with high energy performance) followed up with construction process, use of materials and building operation phases, since each stage possesses potential to contribute to the fulfillment of an overall goal.

Decarbonization: Focus on Buildings Sector

- Buildings in Georgia were responsible for 15,7% of all energy –related emissions and 11% of the country's total national/direct GHG emissions for 2015. (Source: MEPA. Georgia's 2030 Climate Change Strategy)
- Breakdown of emissions released by buildings sector is specified as:

- *Direct emissions* that are released from onsite fossil fuel consumption related to operation of HVAC technical systems;
- *Indirect carbon emissions*- released from consumption of electricity in buildings,
- *Embodied carbon emissions* that are associated with CO_2 emitted from extraction and manufacturing processes to create construction materials such as steel, concrete and cement and transportation of materials and equipment to a project site as well as all emissions associated with the actual construction -related activities.

Georgia: Building Sector Emissions Breakdown



- Source: MEPA Report. Georgia’ s 2030 Climate Change Strategy

Emission Reduction Targets and Trajectories in the Buildings Sector of Georgia

2030 strategic target for emission reduction	2015	2030		
		Reference scenario	with CAP measures	NDC target
Buildings sector				
Support the low carbon development of the buildings sector	1.95 $MtCO_2e$	4.63 $MtCO_2e$	4.60 $MtCO_2e$	No quantitative target

Source: MEPA Report. Georgia's 2030 Climate Change Strategy

Key Buildings Decarbonization Policy Mechanisms: Strategic Instruments

- To develop a low emission strategy addressing energy transition towards clean energy sources and alternative materials for decarbonization of buildings within the framework of the integrated buildings' decarbonization policy approach;
- Develop integrated resilience strategies and plans for the built environment
- To introduce a road map targeting building low emission renovation strategies;

Key Buildings Decarbonization Policy Mechanisms: Regulatory Instruments

- To strengthen the decarbonization component of EE design standards;
- To develop guidelines addressing reduction of buildings' GHG/CO_2 emissions focusing on clean energy alternatives;
- To develop action plans for decarbonization of buildings with suggested measures and technologies;

Key Buildings Decarbonization Policy Mechanisms: Economic Instruments

- Prioritize research, analysis and investments targeting production of new low carbon construction materials such as: new cementitious binders (dry production methods) for replacement of Portland cement systems with low emissions alternatives
- Note: “Embedded carbon cases”

  Cement clinker is produced by calcining limestone and clay in a furnace at a temperature 1500 °C and constitutes a significant source of CO_2 emissions from building industry

- Develop roadmap with introduction of economic incentives for combating carbon embodied construction materials and technologies on the basis of each unit of pollution abatement being effected.

Key Buildings Decarbonization Policy Mechanisms: Information Instruments

- Support information and awareness rising campaigns for promoting goals of the building decarbonization measures;
- Enable easy access to information on the carbon footprint of materials;
- Develop public procurement policies that incentivize materials with low carbon footprints;
- Conduct trainings for target groups on decarbonization of buildings sector issues;
- Support workshops for outreaching energy information and behavior change to drive decarbonization of buildings;
- Lead by example by decarbonizing public buildings'.

Current Demonstration Project: Inclusion of Decarbonization Elements into the EE Rehabilitation of Public Buildings in Georgia

- Target building stock subsector –Kindergartens' of the Batumi City Municipality;
- EE Rehabilitation of Kindergarten buildings foresees:
- Deep renovation with high energy performance standards addressing building envelope measures (low U values were selected for building envelope components and windows and external doors as well)
- Installation of new technical building systems such as:
  - Heating system with the heat pump;
  - DHW supply with heat pumps in combination with solar collectors;
  - Ventilation system with recuperation;
  - Energy efficient lighting

Current Demonstration Project: Actual Energy Consumption Data and Costs for Kg No. 6

	2018	2019	2020[14]
Natural gas			
Consumption (reported)	12,163 m^3	14,465 m^3	12,301 m^3
Consumption (converted)	119,197 kWh	141,757 kWh	120,550 kWh
Costs	10,338 GEL	13,163 GEL	11,686 GEL
Specific consumption	64.75 kWh/m^2a	77.00 kWh/m^2a	65.48 kWh/m^2a
Average tariff	0.85 GEL/m^3	0.91 GEL/m^3	0.95 GEL/m^3
	0.086 GEL/kWh	0.092 GEL/kWh	0.097 GEL/kWh
Electricity			
Consumption	45,753 kWh	43,716 kWh	25,102 kWh
Costs 9608	9,608 GEL	9,180 GEL	5,271 GEL
Specific consumption	24.85 kWh/m^2a	23.75 kWh/m^2a	13.63 kWh/m^2a
Average tariff	0.21 GEL/kWh	0.21 GEL/kWh	0.21 GEL/kWh
Energy consumption			
Total consumption	164,950 kWh	185,473 kWh	145,652 kWh
Specific consumption	89.60 kWh/m^2a	100.75 kWh/m^2a	79.12 kWh/m^2a

Selection of energy efficiency measures and packages

PACKAGE 1

No	Description	Quantity (units)
1.	Measure 1 - Thermal insulation exterior walls	1,235 m^2
2.	Measure 2 - Replacement windows and doors	331 m^2
3.	Measure 3 - Thermal insulation roof	707 m^2
4.	Measure 4 - Thermal insulation basement	707 m^2
5.	Measure 5 - Ventilation with heat recovery	33 units

PACKAGE 2 = Package 1 + Measures 6 and 7

No	Description	Quantity (units)
1.	Package 1	-
2.	Measure 6 - Solar collectors for DHW	17
3.	Measure 7 - New heating system (condensing gasboiler)	2

PACKAGE 3=Package 1+ Measures 6 and 8

No	Description	Quantity (units)
1.	Package 1	-
2.	Measure 6 - Solar collectors for DHW	17
3.	Measure 8 - New heating system (outside air heat pump with low temperature radiators)	1

Current Demonstration Project: Energy Savings Compared to the Baseline

Description	Unit	Package 1	Package 2	Package 3
Fuel to be used:				
Natural gas	-	✓	✓	
Electricity	-	✓	✓	✓
Baseline energy consumption	MWh/a	585.83		
Energy consumption - packages	MWh/a	386.15	264.81	73.19
Net energy savings	MWh/a	199.68	321.02	512.64
Specific baseline energy consumption	kWh/m²a	318.19		
Specific energy consumption - packages	kWh/m²a	209.74	143.83	39.75
Specific energy savings	kWh/m²a	108.45	174.36	278.44
Net energy savings (compared to baseline)	%	34.1%	54.8%	87.5%

Current Demonstration Project: CO_2 Emissions Reductions Compared to the Baseline

Description	Unit	Package 1	Package 2	Package 3
Baseline CO_2 emissions	t/a	109.38		
CO_2 emissions - packages	tCO_2/a	67.35	53.73	8.78
CO_2 emissions reduction	tCO_2/a	42.03	55.65	100.6
Specific baseline CO_2 emissions	kg/m^2a	59.41		
Specific CO_2 emissions - packages	kg/m^2a	36.58	29.18	4.77
Specific CO_2 emissions reduction	kg/m^2a	22.83	30.23	54.64
CO_2 emissions reduction (compared to baseline)	%	38.4%	50.9%	92.0%

Conclusions

- Buildings' sector is recognized as one of the largest energy consuming sector in the word;
- The decarbonization of buildings maps new challenges and opportunities for sector specific acceleration of energy transition to clean energy sources;
- Combating emissions from building stock calls for shaping adjusted buildings' decarbonization policies that have to be tailored to country specific priorities;
- Decarbonization policy packages have to be "well weighted" and present combinations of regulatory and incentive policy-base instruments, as well as awareness-raising and capacity building programs.

Thank you