UNECE

ENERGY

Mapping of Existing Technologies to Enhance Energy Efficiency in Buildings in the UNECE Region

Kankana Dubey and Andrey Dodonov

Introduction

Objectives of the Study

- To strengthen understanding of the UNECE member states on the potential impact of energy efficiency (EE) technologies in the buildings sector.
- Analyze and evaluate the correlation between the strictness and enforcement of existing standards, and the level of applied technologies.
- Analyze gaps between existing energy efficient technologies in buildings vis-à-vis application and adaptation.
- Review and assess the application and adaption of the relevant technologies at the nation level.

Introduction

Objectives of the Study

ENERGY

Building upon previous research

Mapping of Existing Energy Efficiency Standards and Technologies in Buildings	Mapping of Existing Technologies to Enhance Energy Efficiency in Buildings
Objective to identify which building energy efficiency standards are used by UNECE member States.	Objective of the study is to examine and analyze the current status of energy efficiency in buildings.
Aims to improve the knowledge of UNECE member States of existing energy efficiency standards and collect best practices related to existing standards. The goal is to develop and implement more effective energy efficiency policies in buildings in the UNECE region.	Aims to highlight the difference in the use of technologies among countries of the UNECE region and examine the correlation (if it exists) between the strictness and enforcement of existing standards and the level of applied technologies.
Methodology - survey, desktop research, and stakeholder engagement.	Methodology - desktop research and consultation with stakeholders.

Methodology

ENERGY

Sub-region A		Sub-region B	Sub-region D
• Andorra • Austria • Belgium • Denmark • Finland • France • Germany • Greece • Iceland • Ireland • Italy • Liechtenstein	• Luxembourg • Monaco • Netherlands • Norway • Portugal • San Marino • Spain • Sweden • Switzerland • United Kingdom and Northern Islands	• Bulgaria • Croatia • Cyprus • Czech Republic • Estonia • Hungary • Latvia • Lithuania • Malta • Poland • Romania • Slovakia • Slovenia	• Canada • United States

Methodology

ENERGY

Sub-region C	Sub-region E
• Albania • Armenia • Azerbaijan • Belarus • Bosnia and Herzegovina • Georgia • Israel • Kazakhstan • Kyrgyzstan • Montenegro	• Republic of Moldova • Russian Federation • Serbia • Tajikistan • The Former Yugoslav Republic of Macedonia • Turkey • Turkmenistan • Ukraine • Uzbekistan

Methodology

The first stage of the country analysis was based on a detailed overview of the following legislative documents adopted on the governmental level:

- National law decrees,
- National building standards, norms, and energy codes
- Other prescriptive documents determining non-obligatory requirements

Within the second stage, the following sources have also been considered:

- Country-specific reports on building energy efficiency, international directives
- Academic literature and news articles
- Market information
- Corporate suppliers and vendors
- Country-specific details reflecting implementation of EE technologies (e.g. availability of energy sources & fossil fuel resources depending on regional climatic zones)

Data Collection

ENERGY

The data collected to measure and analyse the trends and patterns of application of energy efficient technologies is based on the following assessment criteria. The implementation of each technology in each country was evaluated by an impact score as defined below.

Impact Score	Assessment Criteria
3 (High)	The technology is strongly prevalent. There is governmental support and initiative to support promotion of the technology and there are active measures being undertaken which include financial support and incentives. Application of this technology is mandatory or in a transition phase to becoming mandatory. There could be fines for non-compliance. This technology might be made affordable and economically feasible through means of incentives and being widely implemented.
2 (Medium)	National legislation (laws building energy codes etc.) does not require implementation of this technology. There are only some cases when implementation of this technology is supported on the regional level (e.g. in some climate zones etc. but not in the whole country). Some prescriptive recommendations may exist in the legislative documents. This technology is frequently implemented during new construction or retrofits; despite the lack of proper regulatory framework it may be affordable and widely used. There is a moderate trend of implementation for the technology but there are still some gap areas which exist. This could be improved with public-private partnerships government support push-pull marketing strategies compliance standards and financial incentives.

Data Collection

ENERGY

Impact Score	Assessment Criteria
1 (Low)	Existing legislation does not require implementation of this technology. There are also no specific building energy codes that describe at least prescriptive requirements. This technology is only seldom implemented in some regions (including demo-projects implemented by the international public organizations and co-financed by the various funds). The technology is likely economically inefficient. It is being implemented but at a stage of infancy; market barriers exist which curtail adaptation. Much is mentioned about it in policies but there is not substantial applicability and efforts are required to promote the technology.
0 (Non-applicable)	Implementation of this technology is not economically feasible and not mandatory. This technology is not applicable (only in some specific cases).
NI – No Information	No information as of now on the data point.

Data Collection

ENERGY

	Croatia							
	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1 Building envelope and glazing								
Insulation of external walls	3	3	3	3	3	3	3	3
Insulation of attic/ground floor slab	3	3	3	3	3	3	3	3
Insulation of roof	3	3	3	3	3	3	3	3
Installation of new modern EE window	3	3	3	3	3	3	3	3
Arrangement of new entrance/entrance doors	3	3	3	3	3	3	3	3

The following buildings types were analysed:

- MFB – multi-family buildings
- SFB – single-family buildings
- CB – commercial buildings
- PB – public buildings

Two categories for analysis:

- Retrofit – any type of buildings (MFBSFBCBPB) under renovation
- New construction

Data Collection

ENERGY

	Retrofit				New construction			
	MFB	SFB	CB	PB	MFB	SFB	CB	PB
3.1Building envelope and glazing								
Insulation of external walls	2	1	2	2	3	1	3	3
Insualtion of attic/ground floor slab	2	1	2	2	3	1	3	3
Insulation of roof	2	1	2	2	3	1	3	3
Installation of new modern EE windows	2	2	2	2	3	2	3	3
Arrangement of new entrance/entrance doors	2	0	2	2	3	0	3	3
3.2 Heating/Domestic hot water/cold water supply								
3.2.a Improvement of decentralized heating source								
Installation of new gas-fired boilers	2	1	1	1	3	2	3	3
Installation of new diesel boilers	1	1	1	1	1	2	1	1
Installation of new electrical boilers	1	1	1	1	1	1	1	1
Installation of new coal boilers	1	0	1	1	1	0	1	1
Installation of new biomass boilers	0	0	0	0	0	0	0	0
Installation of sollar collector system	0	0	0	0	0	0	0	0
Installation of heat pumps	0	0	0	0	1	0	0	0
3.2.b Improvement of centralized heating source								
Installation/arrangement of new individual heat point with wheater compensation control	3	0	3	3	3	0	3	3
3.2.c Common measures								
Insulation of pipes, equipment	2	1	2	2	2	1	2	2
Installation of balancing and individual thermostatic valves	3	1	3	3	3	1	3	3
Installation of pumps, radiators, heat exchangers with high efficiency factor	3	1	3	3	3	1	3	3
Application of FCD for the heating, water pumps	2	1	2	2	3	1	3	3
Occupancy sensors for cold water supply system (water taps, flushing)	0	1	1	0	0	1	2	0
Waste water technologies for recuperation of heat for DHW	1	1	0	0	0	1	0	0
3.3 Air conditioning, Ventilation and Cooling								
Application of air recuperators	1	0	0	0	1	0	0	0
Application of FCD for the pumps, fans, AHU control	1	1	1	1	3	1	3	3
Installation of VAC equipment with high efficiency factor	1	1	1	1	1	0	1	1
Application of variable flow cooling system	1	0	1	1	1	0	1	1
Insulation of distribution pipes	2	0	2	2	2	0	2	2
Installation of balancing and individual thermostatic controls	3	2	3	3	3	2	2	2
3.4 Appliance								
EE appliance	3	3	3	3	3	3	3	3
3.5 Lighting								
Installation of new EE lamps (LED)	2	2	2	2	2	2	2	2
Occupancy/vacancy/daylight sensors	1	1	1	1	2	1	2	1
Exterior lighting control	1	1	1	1	1	1	1	1
Application of of "daylight" solution in architecture	1	1	1	1	1	1	1	1

Relevant existing energy efficiency technologies were divided into five broad categories

UNECE

Data Collection

ENERGY

- Building envelope and glazing
- Heating/Domestic hot water/Cold water supply
- Air conditioning Ventilation and Cooling
- Appliances
- Lighting

Conclusions

ENERGY

- Energy efficiency in the building sector is improving only incrementally and in disjoint fragments.
- This is particularly surprising, given that recent advances in technology design have yielded remarkable advancements in efficiency and this trend is expected to continue.
- The substantial gaps between what is available in the market and what is used makes it clear that implementation, rather than just technical advancement, is key to increasing energy efficiency.

Conclusions

ENERGY

- EU countries show increased adoption of high energy efficiency boilers, along with shifts to cleaner fuel sources, however strong concerns remain regarding the use of coal for residential space heating.
- With the implementation of labelling and eco-design regulations, the uptake for energy efficient appliance is on an upward trend.
- Most countries in the UNECE region have banned, or are phasing out, incandescent light bulbs in favour of CFL and LED. Lighting sensors and controls are being implemented less frequently.
- Energy performance certificates have accelerated retrofitting of existing buildings but much needs to be done.

Recommendations

ENERGY

- Role of public and private sector
- New market opportunities
- Connecting building energy efficiency with INDC targets
- Synergistic integration with other sectors
- Technological adaptation
- Policy and legislation

Recommendations

- Investment and finance
- Capacity development
- Curate and publish data regarding monetary benefits
- Multiple benefits of energy efficiency
- Informational awareness for simple retrofit opportunities

Recommendations

ENERGY

- Energy imports / exports
- Key focus on building retrofits
- Coordination between regional and national governmental levels
- Performance vs. prescriptive
- Reduce fossil fuel use in space heating

UNECE

ENERGY

Thank you!

Kankana Dubey and Andrey Dodonov
Consultants
UNECE
Date 13 I 11 I 2018 Kyiv