ROMANIA

Ministry of Regional Development, Public Administration and European Funds

Strategy for mobilising investments in the renovation of residential and commercial buildings existing at national level, both public and private

– Version 2/2017 –

October 2017

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1. INTRODUCTION

Current situation

Buildings are one of the most significant consumers of energy due to the structure of the average energy consumption, as presented in Figure 1, which shows that, within a building, the thermal energy consumption for heating and the necessary hot water for sanitary use accounts for approximately 70% of total consumption of energy resources.

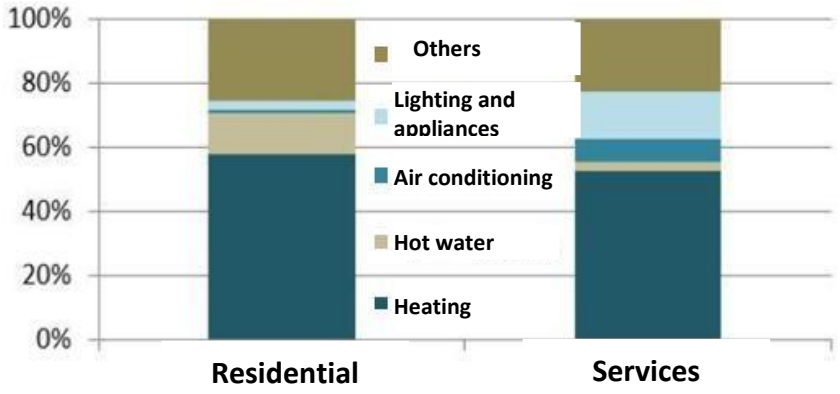


Figure 1 - Structure of average energy consumption within a residential and a non-residential building

Source: Study on the assessment of the implementation potential of efficient district heating and cooling at the level of territorial administrative units

Therefore, buildings are a central element of the policies of EU Member States on energy efficiency, as they account for approximately 40% of the final energy consumption and 36% of greenhouse gas emissions, while approximately 75% of buildings are not energy efficient.

At national level, energy consumption in the household sector and the tertiary sector (offices, business premises and other non-residential buildings) represents 45% of the total energy consumption. The total energy consumption per building categories is presented in Figure 2.

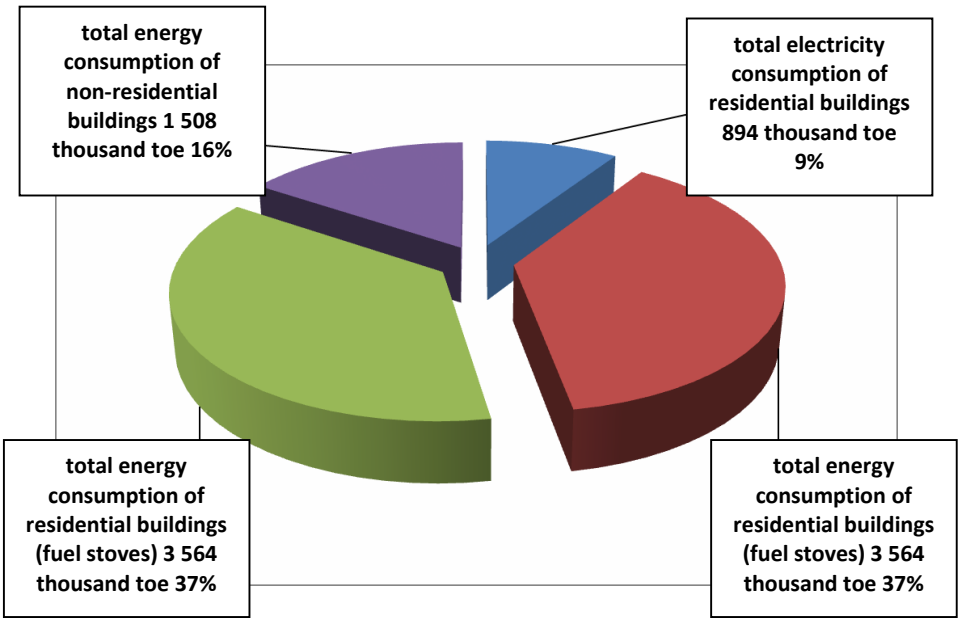


Figure 2 – Energy consumption of buildings: 2005-2010 average (residential buildings), estimate (non-residential buildings)

(Source: (National Research and Development Institute for Construction, Urban Planning and Sustainable Territorial Development "URBAN-INCERC" – INCD URBAN-INCERC)

The improvement of energy efficiency of the existing building stock is essential not only in order to achieve the national objectives concerning medium-term energy efficiency, but also in order to attain the medium-term and long-term objectives of the climate change strategy and moving to a competitive low-carbon economy by 2050.

At a time when environmental, economic and social concerns become increasingly important due to climate change or changes jeopardising energy security, exhaustion of resources or the ability to pay energy bills, the reduction of energy consumption in the building sector has a strategic importance, at both national and international level. Besides efforts to build new buildings with low energy demands for traditional energy sources, it is essential to tackle the high levels of energy consumption of the existing buildings.

In the light of all these strategic concerns, EU policies concerning energy consumption of buildings have been consolidated through the Energy Performance of Buildings Directive – EPBD (*DIRECTIVE 2010/31/UE*[1]) and the Energy Efficiency Directive - EED (*DIRECTIVE 2012/27/UE*[2]), which provide a framework enabling the implementation of policy measures aimed at reducing energy consumption, especially in the buildings sector.

Romania has an important heritage of buildings constructed mostly in the period between 1960 and 1990, with a low degree of thermal insulation, as a result of the fact that, prior to the 1973 energy crisis, there were no regulations in place concerning the thermal protection of buildings and perimeter sealing elements, and which no longer serve the purpose for which they were built.

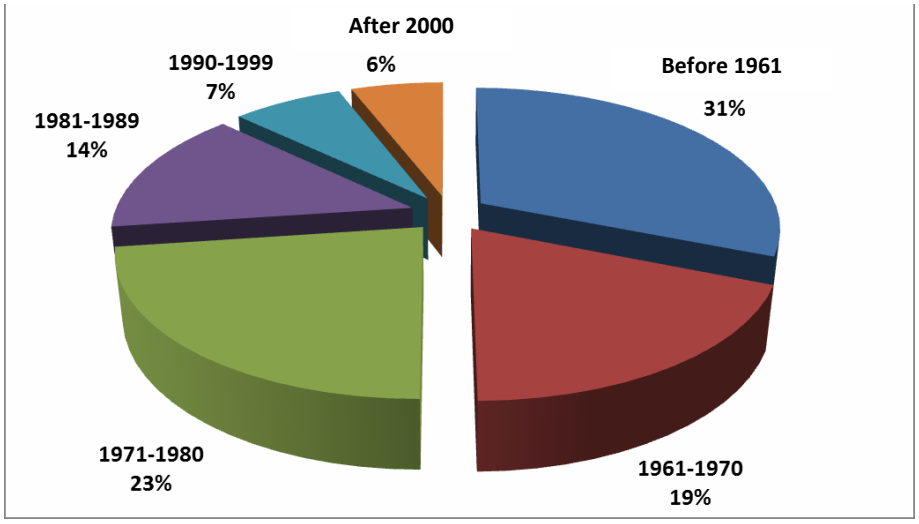


Figure 3 - Age profile of residential buildings, year of construction
(Source: Romanian National Institute of Statistics[3], INCD URBAN-INCERC[4])

The statistical data relating to energy consumption, available from the Energy balance and energy equipment structure for the period 2008 – 2010[5] and for 2010, respectively, allow the breakdown of data on final consumption according to the main areas of economy, as presented in Figure 4 and Figure 5:

[1] http://europa.eu/legislation_summaries/energy/energy_efficiency/en0021_ro.htm
[2] http://ec.europa.eu/energy/efficiency/eed/eed_en.htm
[3] Romanian National Institute of Statistics (2002 - 2011). Web Page: TEMPO-Online time series, Economic Statistics, www.insse.ro;
[4] Project '*Build Up Skills Romania - Status Quo Analysis Report*', http://www.buildupskills.eu/national- project/romania; http://www.iee-robust.ro/
[5] Romanian National Institute of Statistics (2002−2011), Energy balance and energy equipment structure in 2008, 2009 and 2010.

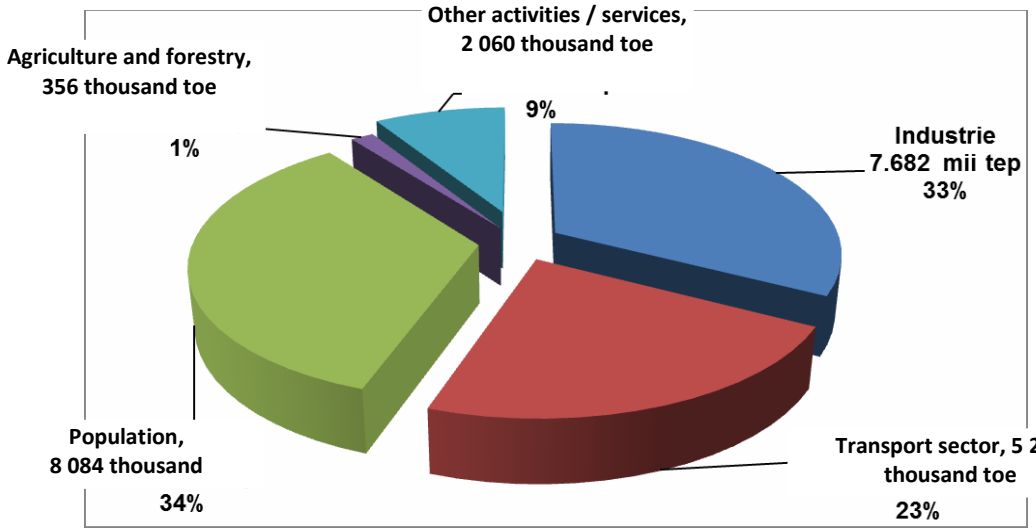


Figure 4 – Distribution of final energy consumption (2008–2010 average values)
(Source: Romanian National Institute of Statistics, INCD URBAN-INCERC)

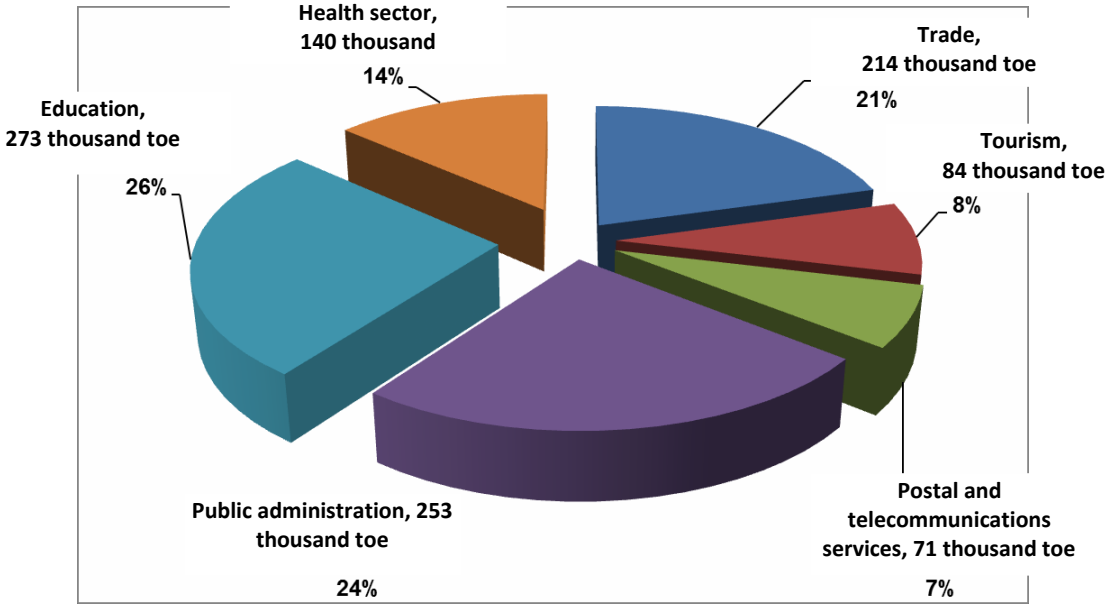


Figure 5 – Distribution of final energy consumption (2010) according to non-residential building categories
(Source: Romanian National Institute of Statistics, INCD URBAN-INCERC)

2. AIM OF THE STRATEGY

The Strategy for mobilising investments in the renovation of residential and commercial buildings, both public and private, hereinafter referred to as STRATEGY, has been developed in line with the provisions of Article 4 of Directive 2012/27/EU on energy efficiency.

The phases for the renovation of existing buildings, as identified and presented in the 'BPIE guide to developing strategies for building energy renovation' are presented in Figure 6:

Phase 1 – Identifying Key Stakeholders & Information Sources
- Identify key stakeholders
- Identify information sources

Phase 2 – Technical & Economic Appraisal
- Building stock characterisation
- Economic appraisal of renovation potential
- Quantification of investment requirements

Phase 3 – Policy Appraisal
- Comprehensive appraisal of barriers
- Development of holistic policy package

Phase 4 – Drafting & Consulting
- Draft renovation strategy
- Consultation on draft strategy

Phase 5 – Publication & Delivery
- Publish final strategy
- Commence policy implementation process
- Establish monitoring and evaluation procedures
- Review and update strategy every 3 years

Figure 6 – Phases identified for the development of the strategy
(source: BPIE guide to developing strategies for building energy renovation[6])

The STRATEGY has the following main roles:

- to stimulate debate between the stakeholders involved in the development and implementation of the strategy in order to reach a consensus concerning the steering of policies and initiatives aimed at enhancing the energy performance of buildings;
- to encourage all stakeholders to adopt ambitious and adequate attitudes aimed at the improvement of the quality of residential and business premises in order to ensure immediate and long-term benefits for building owners and to support the economy.

In order to illustrate the ambitious objectives concerning the energy efficiency of buildings, **the strategy proposes an approach in phases aimed at mobilising investments in the long-term renovation of existing residential and commercial buildings, both public and private.** It should be noted that this is a major challenge and an equally important commitment as it can:

- create much needed employment now and for decades to come;
- improve living conditions in residential buildings and workplaces;
- reduce dependence on external energy suppliers;
- make best use of natural resources and human resourcefulness, and in this context, a new stock of modern and energy-efficient buildings can be offered, which is fit for the 21st century and for the years to come.

[6] http://bpie.eu/renovation_strategy.html

Thus, a substantial reduction of energy consumption in buildings may be considered achievable, in phases, only through a combination of energy efficiency measures and widespread deployment of renewable resources in and on buildings.
The key successive phases, as identified and proposed for the renovation of the national building stock, are as follows:

- PHASE 1 – Establishing conditions based on which **deep renovations may become a goal within five years**;
- PHASE 2 – Technological development in the renovation of buildings, which is able to provide the means for achieving a substantial reduction in energy consumption and attaining a level where buildings have a nearly-zero dependence on traditional energy within approximately 15 years;
- PHASE 3 –Deep renovation of buildings within 15 years.

3. EUROPEAN POLICY CONTEXT

As a significant contributor to EU energy consumption, traditional energy resource utilisation and carbon emissions, the building sector is subject to numerous policies and medium-term and long-term goals which seek to reduce the negative impact on climate change. The goals of the '20-20-20' target by 2020 is the set of three key objectives for:

- a 20% reduction in EU greenhouse gas emissions from 1999 levels;
- raising the share of EU energy produced from renewable sources by 20%;
- a 20% improvement in EU energy efficiency.

In a longer perspective, the EU has a set of longer-term objectives, contained within roadmaps to 2050. As far as the buildings sector is concerned, the three main roadmaps are the following:

- *EU Roadmap for moving to a competitive low carbon economy in 2050* (COM, 2011a), which identifies the need of reducing carbon emissions in the residential and services sector by 88%-91% (collectively referred to as the buildings sector) by 2050, compared to 1990 levels;
- *Energy Roadmap 2050* (COM, 2011b), according to which 'higher energy efficiency potential in new and existing buildings is key' in reaching a sustainable energy future and contributing significantly to reduced energy demand, increased security of energy supply and increased competitiveness;
- *Roadmap for a Resource Efficient Europe* (COM, 2011c), in which the building sector was identified as one of the top three sectors responsible for 70%–80% of the total negative impact on the environment. Constructing better buildings and optimising their use within the EU would result in the reduction by over 50% of the quantity of raw materials extracted from underground, and in the reduction by 30% of water consumption.

These roadmaps represent a long-term endeavour, which is desirable not only from a social and economic perspective, but is also essential from an environmental perspective, in order to tackle the three challenges of climate change, energy security and exhaustion of resources.
Since the European energy system is facing an increasing need to provide sustainable, accessible and competitive energy to all citizens, on 30 November 2016, the European Commission adopted the legislative package *'Clean Energy for all Europeans'*, which aims at applying the strategies and measures with a view to fulfilling the Union energy objectives for the first period of ten years (2021-2030), particularly in respect of EU objectives related to energy and climate for 2030, and refers to:

- energy security,
- energy market,
- energy efficiency,
- decarbonisation,
- research, innovation and competitiveness.

European directives affecting the building sector
The main directives relevant to energy performance of the building stock are as follows:

- Directive 2010/31/EU on the energy performance of buildings (EPBD);
- Directive 2012/27/EU on energy efficiency (EED);

- Directive 2009/28/EC on the promotion of the use of energy from renewable sources (RED), which imposes minimum levels for the use of energy from renewable sources in new buildings and existing buildings undergoing major renovation.

Community regulations provide a common framework in which each Member State must establish standards and performance levels concerning energy consumption in buildings, which apply equally to all building categories, both residential and non-residential.

<table>
<tr><th>Directive 2012/27/EU on energy efficiency (EED)</th><th>Ecodesign Directive 2009/125/EC (recast)</th><th>Energy Labelling Directive 2010/30/EU</th><th>Directive 2009/28/EC on the promotion of the use of energy from renewable sources</th><th>Directive 2010/31/EU on the energy performance of buildings (recast)</th></tr>
<tr><td>National strategies</td><td rowspan="2">EC declaration of conformity of energy-related products</td><td rowspan="2">Labelling of energy-related products</td><td rowspan="6">Setting of minimum levels of energy from renewable sources in new buildings and existing buildings undergoing renovation</td><td>Nearly zero-energy buildings</td></tr>
<tr><td rowspan="2">Energy saving targets</td><td rowspan="2">Energy performance certificates</td></tr>
<tr><td rowspan="2">Supplier obligations</td><td rowspan="2">Minimum requirements</td></tr>
<tr><td rowspan="3">Complementing the Ecodesign Directive</td><td>Cost optimality</td></tr>
<tr><td>Reporting requirements</td><td rowspan="3">Product regulations</td><td rowspan="3">HVAC inspections</td></tr>
<tr><td>Energy audits</td></tr>
<tr><td>Energy savings</td></tr>
</table>

In view of the revision of the European Directives concerning the increase of energy efficiency and, particularly, the improvement of the energy performance of buildings in the period 2017-2018, there will also be an increase in the energy efficiency target for 2030 towards values between 27% and 30%, in addition to the objectives related to the reduction of CO2 emissions and increase in the share of renewable energy sources.

4. BENEFITS

The renovation of the existing building stock in order to increase their energy performance is one of the most important and strategic investments that may be carried out. The key driver of EED is the achievement of the EU's 20% energy saving target by 2020, and reaching the long-term environmental protection objectives, referred to in the roadmaps on energy and reduction of carbon emissions, while the benefits of such achievements have a major impact on various aspects of the economy and society.

Following several studies conducted in the field at international level, the impact of a sustainable energy renovation of buildings can be summarised as follows:

- **Economic benefits** – The US Environmental Protection Agency estimates that the increased economic activity as a result of job creation and stimulation of investments generates 1.5 times the value of saving in energy costs in the form of additional production capacities.

The additional unquantified benefits are represented by the higher value of properties[7];

- **Societal benefits** – The improvement of energy efficiency in buildings has long been acknowledged by some of the Member States as an essential issue in order to ensure the financially affordable heating requirements of low-income families, and to tackle the issue of fuel poverty, which affects an estimated 10–25% of the total EU population. Residential buildings provided with a more efficient heating system offer health benefits as well, as they have less cold spots and air currents, less condensation and a reduced susceptibility to mould formation; in addition, the indoor air quality is also better. Copenhagen Economics[8] estimate that the health benefits of energy renovation could have approximately the same value as savings in energy costs. A draft assessment report of the UNDP/GEF[9] has found that, although in Romania there is no official definition of fuel poverty, it can be concluded that: *"A large proportion of Romania's population is not able – in general and in normal conditions – to provide itself with sufficient levels of thermal comfort in the home, because of the high cost of heating energy relative to their income."*
- **Environmental benefits** – buildings are the highest source of CO2 emissions, and hence the biggest contribution to climate change. The value of environmental benefits brought about by the renovation of buildings can be around 10% of the savings in energy costs;
- **Benefits for energy systems** – the savings made under the maximum load of the energy systems following the energy renovation of buildings, including energy self-generation, have about the same value as savings in energy costs, according to a study conducted by Ecofys[10]. These accrue to all users.

Quantification of the multiple benefits

By applying the following multipliers to savings in energy costs, the additional benefits for society may be almost five times the value of savings in energy costs as a result of the energy renovation of buildings, as seen below:

Benefit element	Multiplier
1. Savings in energy costs	1.0
2. Economic stimulus	1.5
3. Societal benefits (health benefits)	1.0
4. Benefits for energy systems	1.0
5. Environmental benefits	0.1
TOTAL additional BENEFITS for society	**4.6**

[7] Please also consult the model developed by BPIE, which indicates potential energy savings for businesses, households and public budgets, if the renovation strategy is implemented through the proposed renovation scenarios.

[8] http://www.copenhageneconomics.com/Website/Publications/Energy---Climate.aspx

[9] http://www.undp.ro/libraries/projects/EE/Assesment%20Report%20on%20Fuel%20Poverty%20-%20DRAFT(1).pdf

[10] 'Saving energy: bringing down Europe's energy prices for 2020 and beyond', Ecofys, 2013.

DEVELOPMENT OF THE STRATEGY

PHASE 1 – IDENTIFYING KEY STAKEHOLDERS AND INFORMATION SOURCES

Key stakeholders

The following national authorities have been identified with a possible key role in developing and implementing the strategy:

- Ministry of Regional Development, Public Administration and European Funds (MDRAPFE) – responsible for transposing and implementing EPBD, developer of the first version of the long-term strategy for mobilising investments in the renovation of residential and commercial buildings, both public and private, required by EED, managing the policies and measures for the increase of the energy performance of buildings and coordinating and managing structural instruments for energy efficiency;
- Ministry of Energy (ME) – responsible for coordinating the energy and energy resources fields at national level and for implementing renewable energy sources in and on buildings;
- Ministry of Public Finance (MFP) – responsible for co-financing budgetary sources in respect of energy efficiency;
- Ministry of Environment (MM) – responsible for financing mechanisms under the Kyoto Protocol;
- National Energy Regulatory Authority (ANRE) – in relation to the implications for energy service providers and the fulfilment of energy efficiency reporting obligations;

The following organisations were identified in the consultation process:

- *Association of Romanian Construction Materials Manufacturers (APMCR);*
- *Romanian Association of Construction Entrepreneurs (ARACO);*
- *Construction Companies Employer's Organisation (PSC);*
- *Association of Romanian Installation Engineers (AIIR);*
- *Association of Energy Auditors in Constructions (AAECR);*
- *League of Habitat Owners Associations*;
- *Federation of Property Owners' Associations in Romania*[11];
- *Association of Renewable Sources Producers (SunE);*
- *Romanian Association of Cities*;
- *Romanian Towns Association*;
- *Romanian Geoexchange Society* - representing users of geothermal energy in buildings.
- ***Romania Green Building Council Association***

It should be mentioned that these organisations may be involved both in the strategy implementation phase and in its revision and update, as required by EED.

Stakeholders were also consulted within the European project Horizon 2020 BUILD UPON (http://buildupon.eu/dialogue/countries/romania/), which ran from March 2015 to February 2017 and involved representatives of key stakeholders: professional associations, companies, universities, research institutes, NGOs, financial institutions, the media, final beneficiaries of building renovation, alongside representatives of local and central authorities. A roadmap of the stakeholders within BUILD UPON may be accessed on the project portal http://buildupon.eu/stakeholders/#stakeholder-maps . The consultation process involved 10 public consultation sessions, supported by the line ministries and local authorities, in seven cities of Romania (Bucharest, Cluj-Napoca, Iași, Galați, Brașov, Craiova and Timișoara). More information on the community and dialogue process can be found on BUILD UPON project portal http://buildupon.eu/dialogue/countries/romania/ .

[11] Owners living in multifamily buildings are organised in Owners' Associations, which are legally established pursuant to Law No 230/2007 regarding the establishment, organisation and functioning of Owners' Associations. The owners' association is defined as a legal person with legal authority to act, through elected and/or appointed representatives, on behalf of all of the co-owners within a multi-family building.

Sources of information

The main sources of information used in the development of this strategy are:

- Data Hub for Romania of the Buildings Performance Institute Europe (BPIE) www.buildingsdata.eu,, which includes data collected by BPIE during a survey conducted in 2011;
- The project called 'RENOVAREA ROMÂNIEI' – Renovating Romania – A strategy for the sustainable energy renovation of Romania's building stock, developed by Buildings Performance Institute Europe (BPIE), which is its copyright holder;
- The project called ENTRANZE, financed by the Intelligent Energy Europe programme (www.entranze.eu), in which BPIE is a project partner. The objective of the ENTRANZE project is to actively support policy making to achieve a fast and strong implementation of nZEB and renewable energy use within existing national building stocks;
- The project on Implementing nearly Zero-Energy Buildings (nZEB) in Romania - definition and roadmap, developed by BPIE (http://bpie.eu/low_energy_buildings_east_eu.html);
- The project '*Build Up Skills Romania - Status Quo Analysis Report*', coordinated by the National Research and Development Institute for Construction, Urban Planning and Sustainable Territorial Development 'Urban-Incerc' (INCD URBAN-INCERC) (http://www.buildupskills.eu/națio nal-project/romania; http://www.iee- robust.ro/);
- Romania's Third National Action Plan for Energy Efficiency;
- Romanian Statistical Yearbook;
- Census data.

PHASE 2 – TECHNICAL AND ECONOMIC APPRAISAL

2.1. Overview of the existing building stock

In Romania, the total building floor area is of 493 000 000 square meters, 86% of which are accounted for by residential buildings. Of the 8.1 million dwellings, single-family houses are in higher number, accounting for 61% of the total. The age analysis of the existing residential buildings is illustrated in Figure 4a)

With reference to the residential sector, it can be stated that:

- 88.5% of dwellings are permanently inhabited;
- Almost half of the total number of homes (47.5%) are located in rural areas, which means that the proportion of rural population in Romania is above the European average;
- In rural areas, 95% of dwellings are individual family houses (single-family houses);
- In urban areas, 72% of dwellings are located in multi-family buildings (which comprise an average of 40 apartments per block of flats);
- Over 60% of multi-family buildings are four storeys high, while 16% are ten storeys high;
- The dominant form of tenure is private ownership, which represents 84% of the total residential building stock, 1% being public property, and the remaining 15% of the buildings are owned in some form of mixed ownership;
- Dwellings (apartments) in multi-family buildings have an average heated area of 48 square meters compared to 73 square meters for single-family dwellings.

As far as the age profile is concerned, the majority of residential buildings were built in the second half of the 20th century, especially during the period 1961–1980. During this period, the vast majority of residential buildings in Romania were built without any specific thermal requirements for the building elements that form the building envelope, as illustrated in Table 1. Thus, from the perspective of energy consumption, the existing residential building stock has yet another important potential in terms of raising the standards of energy performance, which highlights the importance of developing an ambitious strategy for the renovation of residential buildings in Romania.

The analysis of residential buildings reveals that heating energy represents approximately 55% of the total energy consumption of flats and up to 80% in the case of individual houses, and, depending on the climatic zone, a single-family dwelling consumes on average 24% more energy per square meter compared to a dwelling (apartment) within a multi-family building[12].

Table 1 – Energy performance characteristics – residential buildings

Year of construction	Thermal characteristics U [W/(square meter K)]		Final energy consumption (kWh/square meter year)
	Vertical	Horizontal	
< 1910	1.40 – 2.00	0.90 – 1.80	150 – 400
1910 - 1929	1.40 – 2.00	0.90 – 1.80	150 – 400
1930 - 1944	1.40 – 2.00	0.90 – 1.80	150 – 400
1945 - 1960	1.40 – 2.00	0.90 – 1.80	150 – 400
1961 - 1970	1.35 – 1.90	0.90 – 1.80	150 – 400
1971 - 1980	1.35 – 1.90	0.90 – 1.80	150 – 400
1981 - 1989	1.25 – 1.60	0.90 – 1.80	150 – 400
1990 - 1994	1.10 – 1.50	0.90 – 1.80	150 – 350
1995 - 1999	0.80 – 1.10	0.90 – 1.80	140 – 280
> 2000	0.70 – 1.10	0.90 – 1.80	120 – 230

(Source: INCD URBAN-INCERC)

The total area of non-residential buildings is 67 200 000 square meters, and the structure of the non-residential building stock is presented in Figure 7 and Table 2:

[12] BPIE estimates based on the survey conducted for the BPIE report called 'European Buildings under the Microscope', 2011.

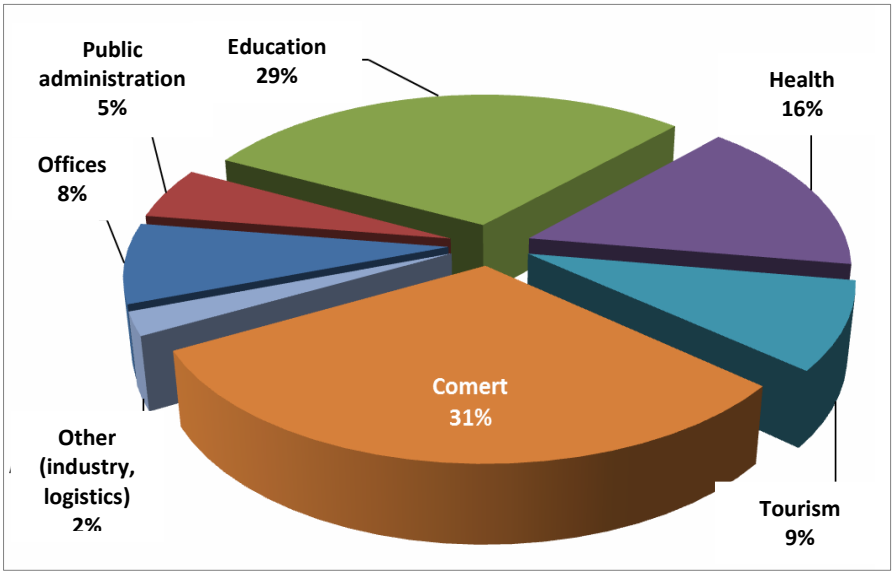


Figure 7 – Breakdown of the building stock according to building categories (square meters)
(Source: Romanian National Institute of Statistics[13], Colliers[14], INCD URBAN-INCERC[15], BPIE's Data Hub[16])

Table 2 – Breakdown of the non-residential building stock according to the type of building

Offices	16.3%
Educational buildings	16.9%
Hospitals	13.8%
Hotels and restaurants	7.7%
Sports facilities	7.0%
Premises for wholesale and retail trade	27.2%
Other non-residential buildings	11.1%

(source: BPIE's Data Hub)

As far as the energy performance of the existing non-residential building stock is concerned, the main characteristics are presented in Table 3:

Table 3 – Energy performance characteristics – non-residential buildings

Building category	**Thermal characteristics U [W/(square meter K)]**		**Final energy consumption (kWh/square meter year)**
	Vertical	**Horizontal**	
Offices	0.70 – 1.50	0.35 – 1.30	120 – 250
Education, culture	0.70 – 1.50	0.35 – 1.30	200 – 350
Health	0.70 – 1.50	0.35 – 1.30	200 – 400
Tourism	0.70 – 1.50	0.35 – 1.30	150 – 300
Trade	0.70 – 1.50	0.35 – 1.30	150 – 300

(Source: INCD URBAN-INCERC)

[13] Romanian National Institute of Statistics (2002 - 2011). Web Page: TEMPO-Online time series, Economic Statistics, www.insse.ro;
[14] Romania Real Estate Review (2011), Colliers International, Bucharest, Romania, www.colliers.com/country/romania/
[15] Project '*Build Up Skills Romania - Status Quo Analysis Report*', http://www.buildupskills.eu/national- project/romania; http://www.iee-robust.ro/
[16] http://bpie.eu/renovation_strategy.html

Energy systems of buildings

There are three main heating sources: biomass, gas and district heating system (Figure 8) Three out of four single-family houses have a biomass heating system, while over half of multi-family buildings are connected to a district heating network. Almost all (92%) of the energy supplied by the district heating network is delivered through co-generation systems (CHP)[17]. Just over half of the energy supplied into district heating systems is natural gas, while the rest is divided between petroleum products (26%) and coal (20%).

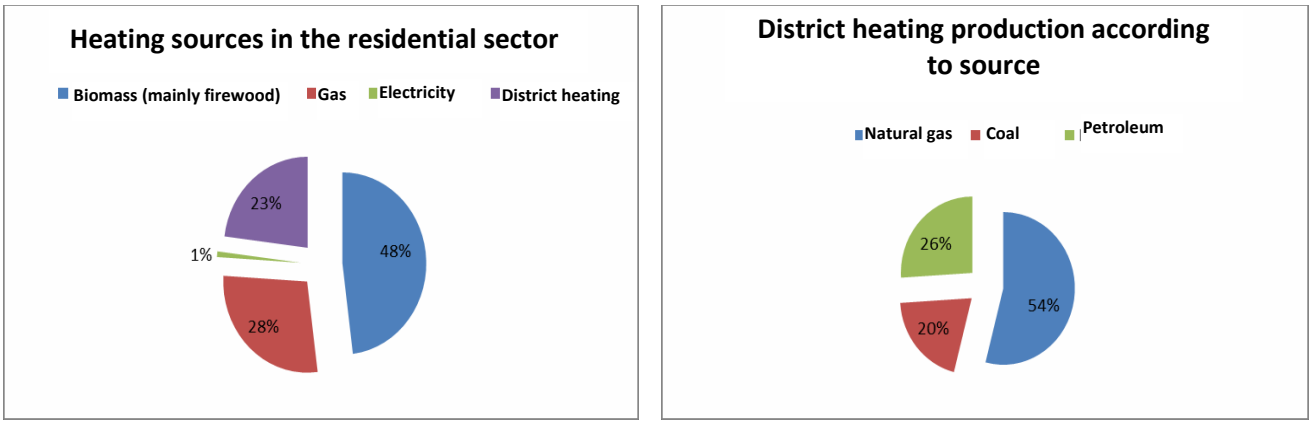


Figure 8 – Heating sources in the residential sector (Source: BPIE's Data Hub)

In the residential sector, thermal energy is used for heating and for producing hot water for sanitary use. In general, the efficiency of such use of thermal energy is only 43% (63% in Bucharest)[18]. In rural areas, heating of individual rooms is still widespread, mainly by burning wood in stoves. In urban areas, approximately 1.5 million dwellings are connected to district heating systems; however, in the last decade, there has been a constant tendency of disconnection from district heating networks and switching to the use of independent gas boilers in each apartment. This phenomenon may be due to the numerous issues of the old district heating systems: reduced efficiency (an improvement potential of 30%), high carbon footprint and increasing prices (also determined by the ongoing policies for the reduction of heating subsidies)[19]. There is a general absence of metering systems in both multi-family buildings and at individual level. However, there is an ongoing programme aimed at improving district heating networks and metering and controlling systems for heating, which has reduced the number of disconnections from the network (PNAEE Romania).

Table 4, which is an adaptation after Euroheat & Power (http://www.euroheat.org/Romania-90.aspx), (http://www.euroheat.org/Romania-90.aspx) presents the key statistics of the use of district heating networks.

[17] Euroheat & Power Statistics http://www.euroheat.org.

[18] Please visit the website of project TABULA: http://www.building-typology.eu/

[19] 11 PWC Romania: Challenges and Opportunities for the Romanian District Heating System, June 2011, available at: http://www.pwc.com/ro/en/publications/assets/assets_2011/Provocari_Oportunitati_Energie_Termica.pdf

Table 4 – Use of district heating networks in Romania in 2011, except if otherwise indicated

Breakdown of energy supply for district heating generated	
- Recycled heat including indirect use of renewable energy	91 %
- Direct renewable energy	0.31 %
- Others	8.3 %
Total district heat sales	49 095 TJ
(Total district heat sales in 2007)	*56 110 TJ*
Annual district heat sales turnover	EUR 713.84 million
Share of citizens served by district heating networks	19 %
Trench length of district heating pipeline system	6 055 km
(Trench length of district heating pipeline system in 2007)	*7 611 km*
Average district heating price	EUR 14.54/GJ
Number of district heating units	89
Total installed district heating capacity	13 619 MWth
Total investment in district heating	EUR 168 million
Estimated employment figures in district heating sector	19 360
District heated floor space	55 590 000 square meters
New connections to district heating	166 000
CO_2 emissions per TJ of district heat generated	81.7 tons of CO_2/TJ
Total heat demand	243 367 TJ
Total share of CHP in the national electricity production	10.9%
CHP heat autoproduction	89 TJ
Average energy consumption of buildings per square meter	0.883 GJ/square meter

(source: Euroheat & Power)

Air-conditioning (SPLIT) systems are becoming more widespread in the residential sector; the share of dwellings equipped with an air-conditioning system has risen from 0.4 % in 2000 to 10% in 2015. On the other hand, an increase in the household use of renewable energy systems has been noted. According to the EurObserv'ER barometer concerning renewable energy[20], the total installed solar thermal collector area in 2016 in Romania was at around 194 275 square meters, with a 35.2% increase compared to 2010. The majority of this solar thermal capacity is installed in commercial buildings (including hotels) and to a lesser extent in residential buildings.

Due to the condition of the buildings, mainly as a result of the neglect of repairs, in particular in the case of multi-family buildings in urban areas, and, partially, in the case of single-family houses in rural areas[21], approximately **58% of the existing multi-family buildings (approximately 2.4 million apartments) built before 1985 require rehabilitation and thermal modernisation.**

[20] 12 EurObserv'ER (2016): The state of renewable energy in Europe. 11th EurObserv'ER Report, available at: http://www.energiesrenouvelables.org/observer/stat_baro/barobilan/barobilan11.pdf

[21] UN ECE 2001; TrainRebuild 2012.

Non-residential sector

Non-residential buildings represent 18% of total floor area and approximately 5% of the total building stock, including most of Romania's public buildings[22]. Premises occupied by public administration and educational and commercial buildings account for approximately 75% of the non-residential energy consumption (Figure 9), each representing 20–25% of the overall value.

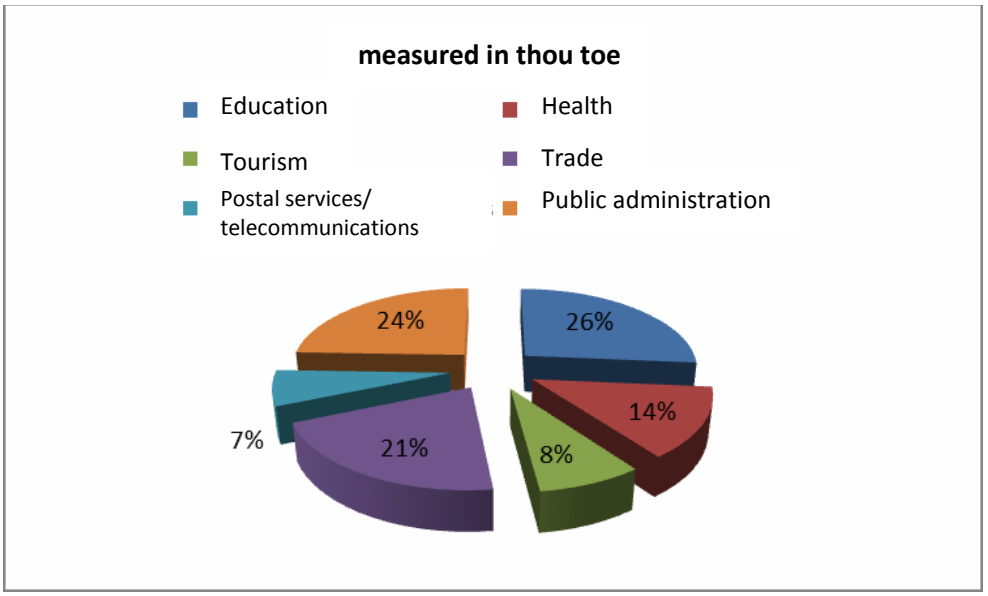
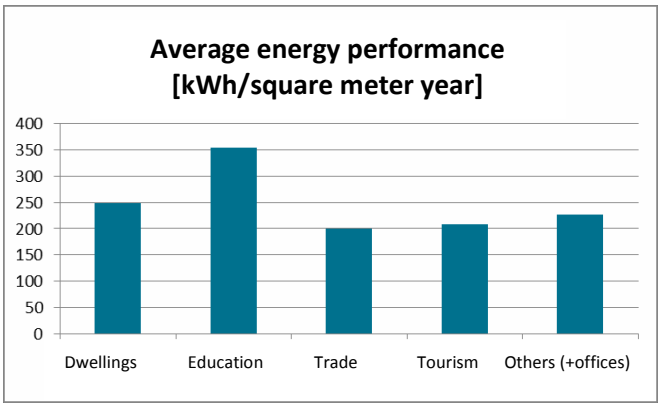


Figure 8 – Distribution of final energy consumption by type of non-residential building
(source: INCD URBAN-INCERC)

In terms of energy performance, educational buildings (354 kWh/square meter per year) stand out as the highest consumers of energy, with other sectors in the range 200–250 kWh/square meter per year.
NOTE: the above figures represent the total energy consumption, including appliances and other plug loads. Regulated loads are those covered by the Energy Performance of Buildings Directive, and include heating, cooling, ventilation, hot water and lighting systems. The energy consumption of appliances and other plug loads is covered by other policy areas, notably eco-design and sustainable procurement.



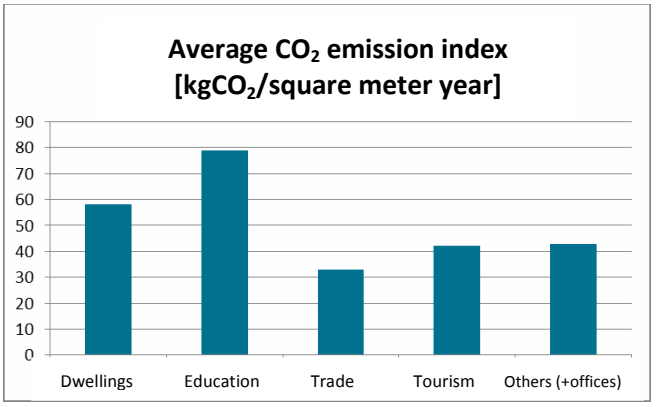


Figure 10 – Energy performance and CO2 emissions by building sector
(source: INCD URBAN-INCERC)

[22] Publicly owned housing accounts for a very low percentage in non-residential buildings.

Energy prices

The energy price is among the lowest energy prices across the EU due to subsidies on both electricity and natural gas. The comparison is illustrated in Figures 11 and 12 below for electricity and natural gas, respectively[23].

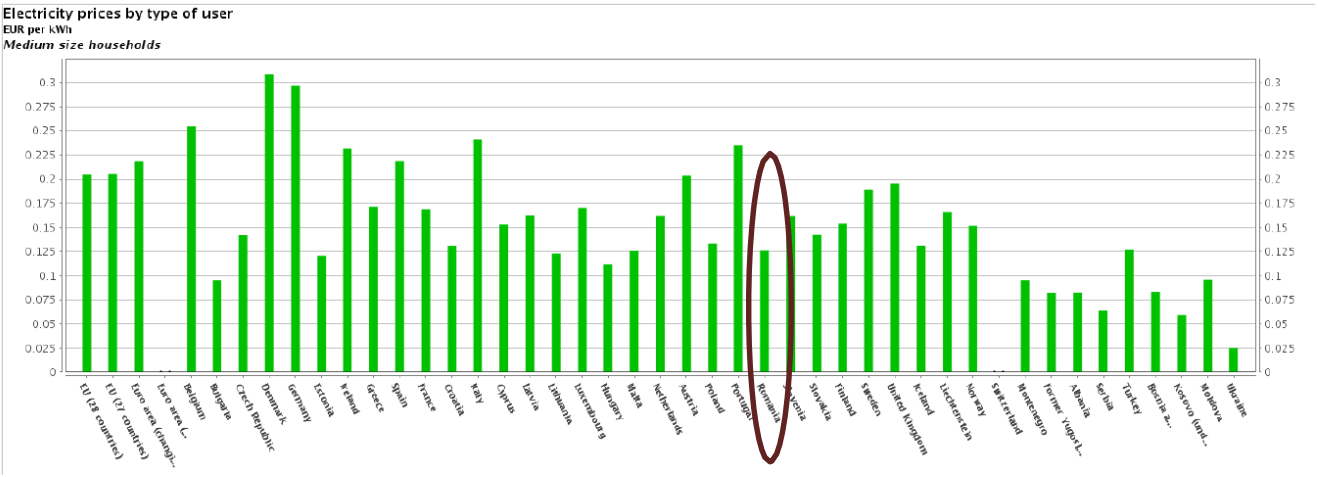


Figure 11 – Electricity price comparison for households across the EU in 2017
(source: Eurostat)

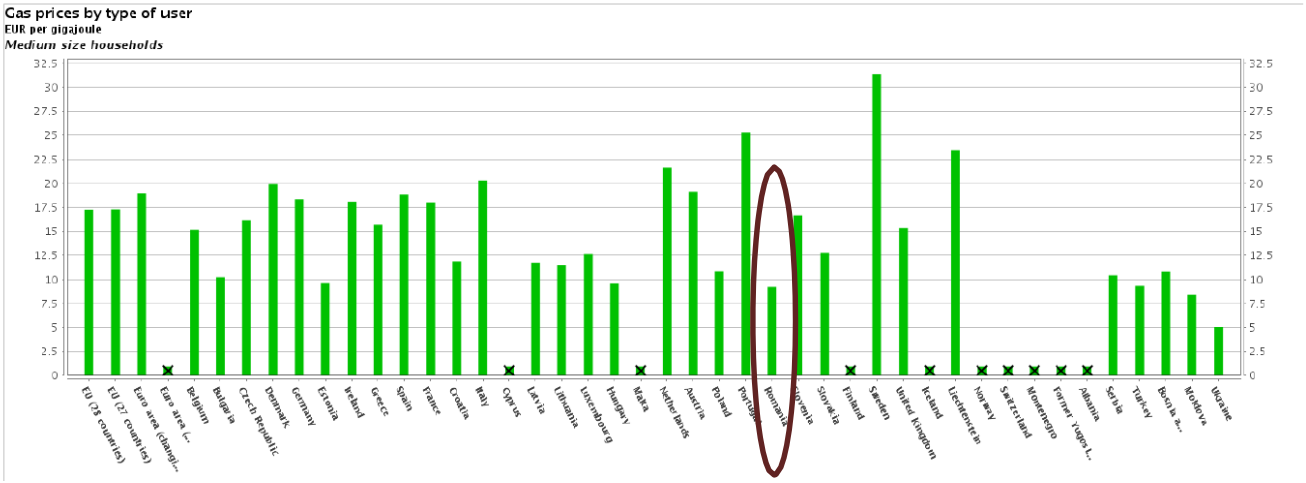


Figure 12 – Gas price comparison for households across the EU in 2017
(source: Eurostat)

Against a background of radical reform in the structural and institutional areas, which was characteristic to the Romanian economy after 1989 and aimed at decentralising services with a view to enhanced quality and efficiency, the Romanian energy market has gradually opened to competition as an integral part of the liberalisation of the national economy and free movement of goods and services. (ANRE[24]).

A price comparison tool will be developed and it will set up a protection scheme for vulnerable customers.

In order to gain an overview of the technical and economic potential for renovating Romania's building stock, the BPIE study model was used, which was based on the analysis of the EU renovation potential, as published in "*Europe's Buildings under the Microscope*".

[23] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Energy_price_statistics
[24] http://www.anre.ro/
[25] http://bpie.eu/eu_buildings_under_microscope.html

2.2. Identification of solutions for renovation

For the examination of scenarios that illustrate the impact on energy consumption and CO_2 emissions of different rates (*i.e. percentage of buildings renovated each year*) and depth of renovation (*i.e. level of energy achieved*) in the residential and non-residential building sectors until 2050, a number of scenarios may be considered to illustrate the financial, economic, environmental, employment and energy consumption impacts of different rates of uptake and depth of building renovation. In particular, the scenarios assess the following outcomes, both annually and in total:

- Energy savings;
- Reduction of CO_2 emissions;
- Total investment required to implement the renovation measures;
- Savings in energy costs;
- Employment impact – the number of full-time equivalent jobs created until 2050;
- Cost-effectiveness indicators:
  - **Internal rate of return** (IRR) – based on the net saving each year (i.e. cost saving less investment required in a given year);
  - **Net saving to consumers** – the difference between lifetime savings in energy costs and lifetime investments. Both figures are discounted to give net present values;
  - **Net saving to society**, including the value of externalities – the sum of the lifetime savings in energy costs and value of externalities, less the lifetime investments. Both figures are discounted by the societal discount rate;
  - **Carbon abatement cost** – net lifetime societal savings divided by the lifetime carbon savings. A negative figure indicates a net benefit per ton of CO_2 saved.

Initial data and assumptions

The scenario for the renovation of buildings takes into consideration different input data for four building types:

- Single-family houses (SFH)
- Multi-family houses (MFH)
- Public buildings (administrative buildings make up for 5% of all non-residential buildings[26])
- Commercial and industrial buildings.

There are approximately 1 million abandoned houses in Romania[27], which is a consequence of strong migration and emigration trends in recent years. It is considered that the abandoned housing stock does not consume energy and is thus excluded from the model.

Our assumption is that, going forward, an additional 0.1 % of the existing stock will be abandoned each year, for various reasons; many abandoned dwellings are located in rural areas, where there is a high proportion of renewable energy use (mostly firewood) and new build is happening in urban areas, which mostly depend on district heating or the gas network. There is thus reason to believe this will influence the evolution of the energy mix, causing a slower decarbonisation than in the rest of the EU.

Variations of the building stocks

The scenario allows for the following stock variations:

- **Demolitions and abandoned buildings**: the total building stock is reduced by 0.2% a year, half of which corresponds to the average demolition rate in the period 2005-2012 and the other half to abandoned buildings.
- **Heritage buildings:** many buildings have historical, aesthetic and/or cultural value. As a consequence, planning authorities and other bodies may restrict the extent and type of renovation that can be undertaken. In practice, these buildings are not excluded because there will always be some energy saving measures that can be applied, even if it is not a total renovation. Minor and moderate renovations may often be feasible in case of heritage buildings.
- **Recent renovations:** some buildings may have undergone renovation in the recent past and this may make future renovation economically less attractive. The number of buildings renovated to a level that

[26] Romania cost optimality study.

[27] Second NAPEE - Energy Efficiency Action Plan in Romania EN.

would prevent the application of further energy saving measures is likely to be very small, of the order of 1% of the existing stock.

- **New buildings**: new buildings constructed between now and 2020 will probably be subject to renovation in the period up to 2050, even if only to replace heating, ventilation or air-conditioning (HVAC) equipment. Furthermore, as energy standards for renovation are tightened and new technologies become more widely available and affordable, these will increasingly be deployed on buildings constructed this decade. The rate of new build is set at 0.85% based on the average useful floor area of dwellings finished in the period 1990-2012. Beyond 2020, it is assumed that nZEB requirements under the recast of the EPBD will result in buildings achieving a level of energy performance that will not require further renovation (other than equipment replacement) until 2050.

Renovation variables

The main variables that influence the renovation processes of buildings are:

- the rate of renovation, expressed as a percentage (%) of the building stock in a given year;
- the depth of renovation, according to the four previously described levels:
  - minor,
  - moderate,
  - deep,
  - nZEB.
- the cost of renovation, which itself varies with depth.

Renovation rate

The main variables concerning renovation rates and considered by this scenario are the speed at which renovation activity ramps up, the percentage of stock to be renovated and the duration of the strategy.
Taking into account the above-mentioned assumptions, this scenario proposes two main growth pathways: SLOW and MEDIUM. They are benchmarked against a BASELINE which assumes that the renovation rates remain unchanged from today's rate (assumed to be 1% p.a.).

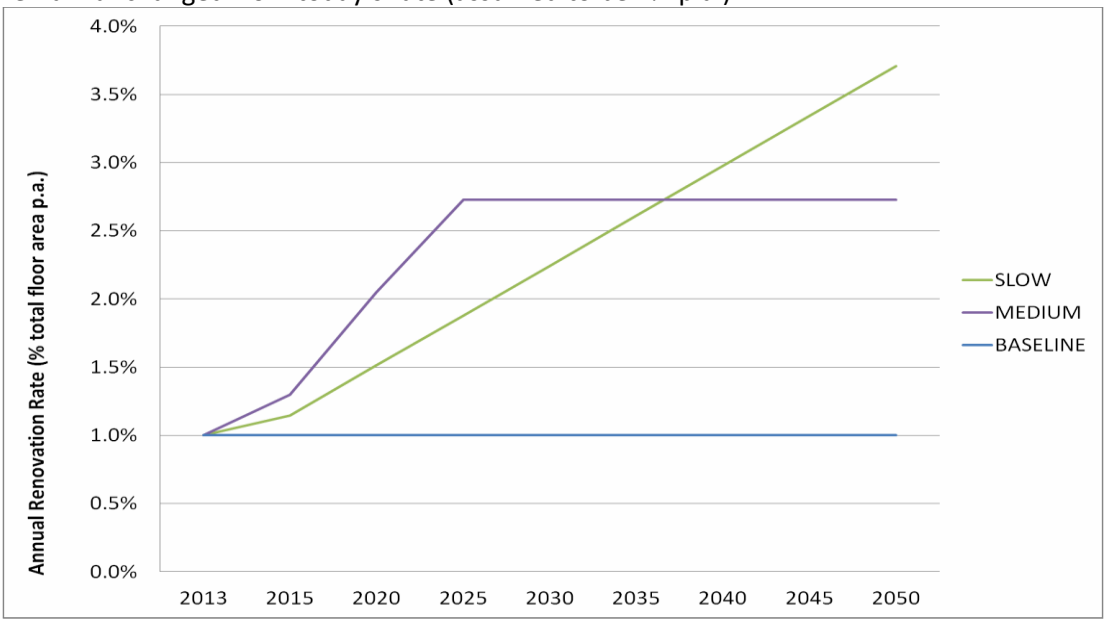


Figure 13 – Modelled pathways for renovation rates

In the case of residential buildings, the renovation rate was chosen in order to prioritise buildings constructed before 1960 and those constructed between 1961 and 2000, of which a great part is or will be renovated between now and 2030.

Depth of renovation

There are three different renovation depth scenarios: **shallow, intermediate** and **deep**, reflecting progressive transition to renovations which achieve higher average savings, as illustrated schematically below.

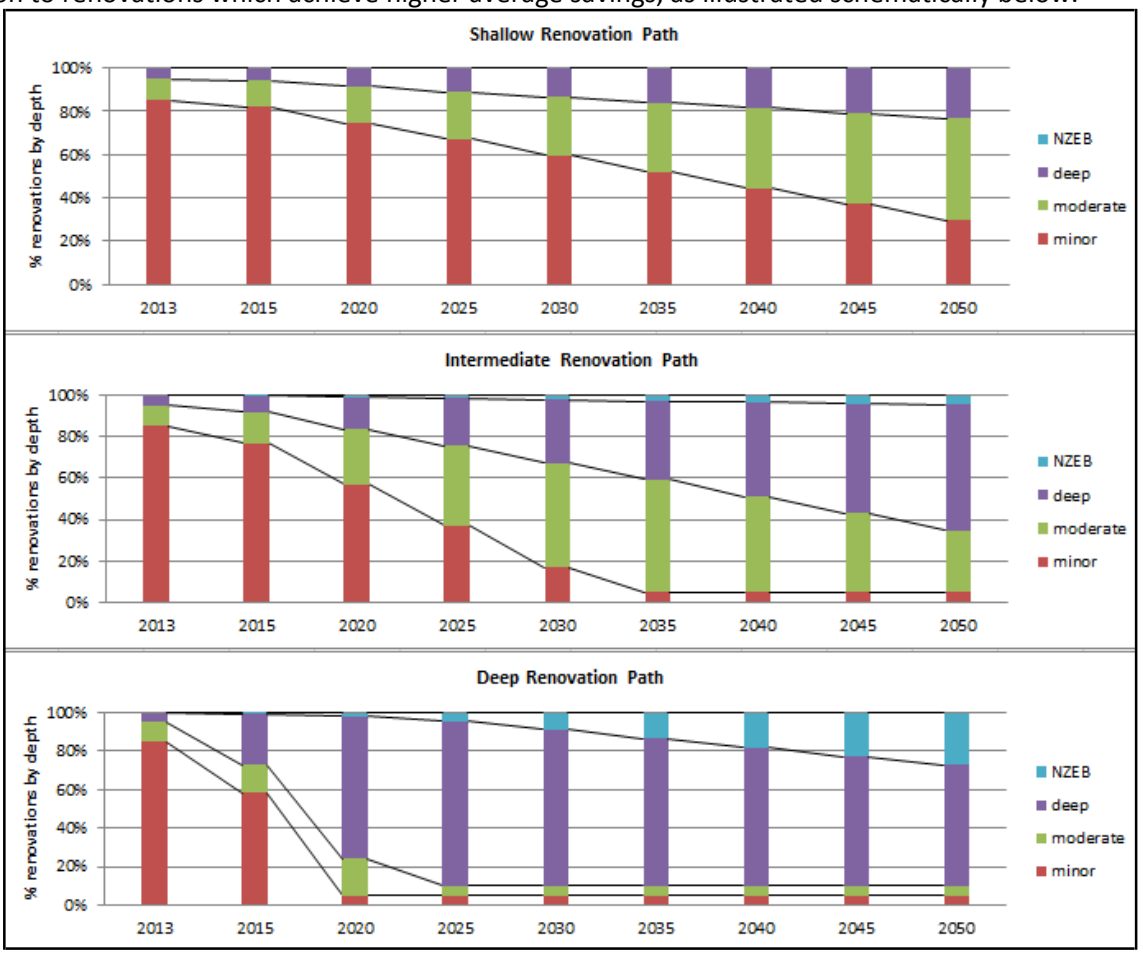


Figure 14 – Depth of renovation

RENOVATION MEASURES

In all scenarios, the renovation activity is "technology neutral". In other words, no assumptions have been made regarding specific measures to be applied in order to achieve a particular level of energy saving. An ideal approach would be to consider the best package of measures that would achieve the maximum improvement in energy performance for each particular building type, also taking into consideration the location in Romania's climatic zones. The package could include a range of measures, including some or all of the following:

- insulation of building envelope - walls, floors, roofs;
- upgrading of windows and doors;
- solar shading – notably to reduce the requirement for air conditioning;
- reducing air infiltration;
- upgrade of HVAC systems;
- installation of combined heat and power systems;
- connection to district heating systems;
- installation of heat recovery systems (from exhaust air);
- upgrade of indoor lighting systems;
- improved controls of the energy used;
- installation of energy equipment that use renewable energy (water heating installations with solar thermal panels, photovoltaic panels, heat pumps, biomass boilers, mini wind turbines, micro-cogeneration systems, etc.).

Depending on the renovation solutions/measures that lead to increased energy performance of buildings, various scenarios can be modelled based on the combinations between the renovation rate and renovation depths.

For the purposes of this report, four scenarios are considered:

- BASELINE – a continuation of current practice, i.e. predominantly minor renovations at 1% floor area per year and current rates of decarbonisation;
- MODEST – assumes a SLOW renovation rate, and a SHALLOW renovation pathway;
- INTERMEDIATE – assumes a MEDIUM renovation rate, and an INTERMEDIATE renovation pathway;
- AMBITIOUS – assumes a MEDIUM renovation rate, and a DEEP renovation pathway.

RESULTS

The results are based on different renovation scenarios of the existing Romanian building stock up to 2050, as illustrated in Table 5.

Table 5 – Results of scenario analysis

SCENARIO		baseline	modest	intermediate	ambitious
Energy saving					
Energy Savings in 2050	TWh/year	8.5	31.1	44.8	63.2
Energy saving in 2050 compared to 2010	%	8.3%	30.4%	43.8%	61.8%
Carbon Emissions*					
Annual CO_2 saving in 2050	$MtCO_2$/year	3	22	24	25
CO_2 saving in 2050 (% of 2010)	%	12%	79%	83%	89%
CO_2 abatement cost	EUR/tCO_2	-138	-40	-54	-70
Societal benefits					
Employment generated	Average jobs/year	4 403	15 854	24 888	39 736

** Decarbonisation rate for baseline is the average rate of decarbonisation in the EU since 1990. For other scenarios, it is the required rate to achieve the objectives of the EU Roadmap for moving to a competitive low carbon economy in 2050.*

Example: *Table 6 presents the energy savings of a building with a specific energy consumption of 211 kWh/square meter/year and the energy performance following the application of the various energy efficiency scenarios.*

Table 6 – Energy saving and resulting energy performance by renovation depth (for a building consuming 211 kWh/square meter/year)

Renovation type	Energy saving (%)	Annual specific energy saving (kWh/square meter/year)	Resulting energy performance (kWh/square meter/year)
Minor	15%	32	179
Moderate	45%	95	116
Deep	75%	158	53
nZEB	95%	200	11

FINANCING OF MEASURES

When considered over the economic life of the measures, all scenarios are cost effective in that the present value savings in energy costs considerably outweigh the investments. However, the difficulty remains that finance needs to be secured to make the initial investment, against a backdrop of modest means, coupled with low levels of motivation and awareness.

The following financing sources of energy efficiency measures were identified:

- the State budget;
- EU funds.

a) Funds from the State budget for the energy renovation of buildings and results

In the period 2009-2016, 62 559 apartments in existing multi-family buildings were renovated through the National programme for the improvement of energy performance of blocks of flats, provided for by Government Emergency Order No 18/2009, as further amended.
According to the programme, energy efficiency works have been performed in respect of the envelope of multi-family buildings to reduce the annual specific energy consumption for heating below 100 kWh/square meter.
620 apartments and 3 single-family dwellings were rehabilitated through the Programme for thermal rehabilitation of residential buildings with funding by bank loans guaranteed by the Government, provided for by Government Emergency Order No 69/2010.
63 368 apartments were rehabilitated through the local programmes financed pursuant to the provisions of Article II of Government Emergency Order No 63/2012 amending and supplementing Government Emergency Order No 18/2009 on the increase of energy performance of multi-family buildings.

b) EU funds for the energy renovation of buildings[28] and results

Buildings are at the heart of the EU's strategy to achieving smart, sustainable and inclusive growth by 2020; investing in energy efficient renovation of the building stock is a win-win-win solution for businesses, for households, and the environment. As a result, energy efficiency and the transition to a low-carbon economy feature as a core thematic objective for the upcoming 2014–2020 funding period, along which the partnership agreements and operational programmes must be aligned. The scope of eligibility for investments in energy efficiency in buildings has also been expanded beyond the **European Regional Development Fund (ERDF)** to also encourage investments from the **Cohesion Fund** (where the housing sector was previously excluded) and the **European Social Fund** (supporting the up-skilling of the labour force for green jobs).
The EU support for energy efficiency in buildings aims at upholding energy efficiency and the use of renewable sources in public infrastructure, (public buildings and dwellings), together with the reduction of greenhouse gas emissions.

To maximise project impact and to achieve better integrated development, Member States are encouraged to combine various funds into "Multi-Fund" Operational Programmes for the next funding period. Energy efficiency in buildings (both public and private) is upheld as a funding opportunity in several Funds: **ERDF** (minimum percentages mandated), the **Cohesion Fund** (where public and private housing are fully eligible) and the **European Social Fund** (supporting the up-skilling of the labour force for green jobs).
Information on the use of the Cohesion Fund to finance building renovation can be found in the 2014 publication "*Financing the energy renovation of buildings with Cohesion Policy funding*"[29]. The European Commission's webpage "*Financing Energy Efficiency*"[30] provides additional information on sources of finance.

The results obtained further to the implementation of the measures concerning the energy efficiency in buildings through the Regional Operational Programme financed from the Regional Development Fund for the period 2007-2013, Priority axis *1 - Supporting the sustainable development of cities - urban growth poles, KAI 1.2 Supporting investments in energy efficiency of residential buildings*: 41 311 apartments in existing multi-family buildings were rehabilitated.
The total allocated amount was EUR 89 million, of which EUR 71.8 million from ERDF.

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[28] Adapted from the Renovate Europe Campaign leaflet on Structural Funds: http://www.renovate-europe.eu/uploads/Renovate%20Europe%20Structural%20Funds%20Leaflet.pdf
[29] http://ec.europa.eu/energy/efficiency/studies/doc/2014_guidance_energy_renovation_buildings.pdf
[30] http://ec.europa.eu/energy/efficiency/financing/financing_en.htm

The Regional Operational Programme for 2014-2020 includes Priority axis 3 - *Supporting the transition to a low-carbon economy*, which aims at achieving energy efficiency in residential and public buildings and to which the following amounts were allocated:

- EUR 538 million for residential buildings;
- EUR 409 million for non-residential buildings and public lighting.

For the period 2014-2021, the contribution of the EEA Financial Mechanisms for 2014-2021 and Norwegian Financial Mechanism for 2014-2021 aims at *promoting clean energy and energy efficiency to support a low-carbon economy* and **at reducing the average residential electricity consumption**, with an allocated budget of EUR 40.55 million (of which, from ERDF, EUR 34.5 million).

PHASE 3 - POLICY APPRAISAL

3.1. Policies and incentives for the renovation of existing buildings

Romania has several policies affecting energy use, as follows:

- The energy roadmap for Romania (Government Decision No 890/2003) aiming at a final electricity consumption of 57.59 TWh in 2015;
- The strategy on renewable energy sources (Government Decision No 1535/2003) reinforced by the Renewable Energy Action Plan;
- The national programme 'Heating 2006-2015: heat and comfort' (Government Decision No 462/2006) for the rehabilitation of the district heating systems and thermal rehabilitation of buildings;
- The National Development Plan 2007-2013, in conjunction with ERDF sectoral programmes and with three major sub-programmes on efficient and sustainable energy, renewable energy sources and interconnection networks;
- Romania's national energy strategy 2007-2020 (Government Decision No 1069/2007) aiming at reaching a primary energy intensity of 0.32 in 2015 and 0.26 in 2020;
- The national strategy on the sustainable development of Romania – Horizons 2013–2020–2030 (Government Decision No 1460/2008).

Romania's energy strategy for 2007–2020 includes the energy consumption forecasts made in 2007. However, such forecasts do not consider the influence of the economic crisis.

The main measures identified and included in the strategy related to buildings are:

- intensifying the information campaigns for the public and the business environment;
- continuing the 'Heating 2006-2020: heat and comfort' programme;
- continuing the Programme for the improvement of energy efficiency of blocks of flats;
- expanding the National programme for energy efficiency (retrofitting the heating system, retrofitting public buildings) for the period 2016-2020;
- the compulsory acquirement of the energy performance certificates, starting with 2010, for residential buildings (i.e. single-family homes and apartments) that are sold or leased out;
- the enforcement of legislation on energy efficiency by the central and local public authorities and the promotion of the use of energy from renewable sources by final consumers.
- ***continuing the Casa Verde (Green House) programme and launching the Casa Verde Plus programme financed from the Environmental Fund***

3.2. Forecast perspectives for the guidance of investment decisions

Phase 3 of the renovation strategy is the development of an appropriate policy landscape – an essential component for the successful delivery of the building energy renovation strategy. It requires a strategic appraisal of the barriers and concerted efforts to address those barriers in building renovation, as well as the design of a policy framework that acts to remove barriers, while, at the same time, providing building owners, occupiers and investors with the right information, incentives and capability to take the necessary steps:

- **Financial instruments**: the use of fiscal and financial instruments such as taxation, tax breaks or other incentives plays an important role in communicating information to consumers, as well as to market actors. The legislative acts that govern the activities of energy service companies (ESCOs) are important in determining whether or not a market is suitable for third party financing; the development of green loan initiatives with preferential interests or lending terms offered by banks to attract private investments for the funding of renovations aiming at high energy efficiency and sustainability standards.
- **Energy**: energy policy is usually dominated by supply-side concerns. Consequently, the role of demand-side measures, such as energy efficiency in buildings, is often underplayed, although various international studies have shown that the energy saved through demand-side measures can be comparable to, or even exceed, the energy supplied by the various fossil fuels used.
- **Economy:** the economic crisis still has a significant impact on the economy, and the view that measures to improve the environment are detrimental to economic growth is

erroneous. The programmes for boosting energy performance of buildings clearly show that these investments are favourable to the development of economy, while also creating jobs.

- **Environment/ climate change**: while much of the focus is on the thermal rehabilitation of buildings, it cannot be ignored that they increasingly contribute to CO_2 emissions, and, therefore, they need to be tackled internally as a priority area of action.
- **Housing**: as in many other countries, issues such as housing quality, amenities and affordability are a national concern. Energy costs are a key component of housing costs, and the only long-term, sustainable solution to providing affordable heating is through improving the energy performance of the building stock.
- **Regional development**: regeneration and other regional development initiatives are often associated with cosmetic and infrastructure improvements, while energy saving measures are rarely considered a high priority that could significantly influence the prioritisation of spending.
- **Health**: whilst not an obvious policy area with a role to play in building renovation, the reality is that poor quality housing (under or overheating, condensation on construction elements, mould growth and indoor air pollution, etc.) may lead to significant health issues, which determine costs to the population (lost working days and impact on healthcare services).

3.3. Barriers

Three main types of barriers have been identified as being of most relevance to the building sector[31]:

- Legal/strategic;
- Economic;
- Skills, employment and education system.

Table 7 below lists selected barriers under each of the three headings:

Table 7 – Appraisal of barriers (simplified)

BARRIER TYPE: legal/strategic
There are a number of authorities of the central public administration with responsibilities for buildings, with a lack of correlation between them and their respective departmental regulations and laws.
There is no common national strategy on deployment of sustainable energy technologies and solutions.
BARRIER TYPE: economic
The financial crisis, lack of or insufficient funds to support building renovation works
Lack of private investment in the rehabilitation of residential and non-residential buildings
High costs of energy service companies (ESCOs).
Low demand for low-energy building technologies, leading to higher prices
National tendency to “maximise profit with minimal effort” instead of optimal use of the cost method, resulting in sub-optimal execution of works
The high rate of unemployment and the duration of time until re-employment
Energy prices (gas, electricity etc.) vs. real prices (i.e. energy subsidies)
BARRIER TYPE: skills, employment and education system
Lack of skilled workers or low levels of training in the use of new technologies designed for EE and RES

3.4. Developing policy solutions

Introducing an obligation scheme for 2016-2020 may be considered only in the event that the impact on energy prices[32] and best practices[33] show the

[31] The above list has been adapted from the presentation at Euro Constructii in 2012: http://euroconferinte.ro/prezentari/Tema1-17.pdf

[32] http://ec.europa.eu/energy/efficiency/eed/doc/article7/2013_ro_eed_article7_ro.pdf

significant benefits that can be achieved, and the net benefits to consumers far outweigh the modest increase in energy bills.

For an alternative approach, the following range of possible policy measures were identified:

- Establishment of an energy efficiency investment fund to tap into private funds, structural funds, auctioning revenues under EU ETS provisions and possibly the State budget;
- Conducting building energy audits and applying the proposed energy efficiency measures within the validity period of energy performance certificates;
- Continuous training of energy auditors;
- Awareness and advice campaigns for end users, meant to raise awareness among building owners/administrators of the benefits of building energy audits;
- Promoting regulations or voluntary agreements;
- Supporting energy service companies (ESCOs), including developing the regulatory framework for the establishment and operation of ESCOs, developing the market of these companies and promoting energy performance contracts by 2020.
- developing attractive financing products for final beneficiaries of renovations through initiatives of private banks (e.g. 'Green Mortgages/ Green Loans')
- continuing the 'Casa Verde' investment pay-back programme and the new 'Casa Verde Plus' programme.

These measures are aimed at improving the regulatory framework for building renovation and at mobilising investments in building renovation.

The full policy option list is presented below, along with a proposed indication as to the relevance to the current situation:

[33] The Regulatory Assistance Project has produced numerous documents on EEOs, e.g. on global best practice http://www.raponline.org/document/download/id/5003.

Table 8 – Policy actions to underpin the renovation strategy

	INDICATIVE LIST OF POLICY INITIATIVES[34] (non-exhaustive)	APPLICABILITY TO THE RENOVATION STRATEGY
Strategic	Establishing support for deep renovation of the building stock	**High** – support across the political spectrum and society for a renovation programme will help establish a climate that provides long-term certainty and confidence in the market
	Undertaking systematic appraisal of barriers to renovation in each segment of the market and develop policy responses to address each barrier	**High** – this strategy identifies some of the key barriers and possible solutions
	Establishing an objective to eradicate fuel poverty through enhancing energy performance of the building stock.	**High** – addressing the poor energy performance in the housing sector for many disadvantaged Romanian citizens would be a major boost to their quality of life
	Developing holistic cross-policy targets that integrate with and deliver on goals in related fields (e.g. sustainable urbanisation, resource efficiency, sustainable construction etc.)	To be considered in the next period
	Establishing a wide stakeholder group as a forum for consultation, policy formulation and feedback on practical issues and barriers to renovation	The stakeholders identified in this document could form the basis of an ongoing stakeholder forum
	Demonstrating leadership through accelerated deep renovation of public buildings, thereby developing supply chain capacity and providing a knowledge base for private/commercial renovation activities	In addition to the 3% p.a. Central Government target (Article 5 of EED) from 2017, **serious consideration** should be given to implementing a similar objective in the remainder of the public sector, starting with 2018
	Encouraging/developing initiatives of private banks for the purpose of creating financial products (e.g. 'Green Mortgages/Green Loans') with attractive terms for owners who wish to renovate their buildings at high energy efficiency and sustainability standards (deep renovation).	

[34] SOURCE – BPIE Guide to Renovation Strategy Development.

	INDICATIVE LIST OF INITIATIVES (non-exhaustive)	APPLICABILITY TO THE RENOVATION STRATEGY
Legislative and regulatory	Identifying trigger points and develop the related regulations that could be used to encourage, or require, building energy performance improvement[35]	**High** – Any intervention on a building should be used as an opportunity to maximise the improvement in energy performance of a building element or technical system
	Designing energy efficiency obligations that encourage the delivery of deep renovation	This should be considered **a top priority** action for the next period
	Facilitating the upgrade of all social housing to high energy performance levels	Not a priority given the limited amount of social housing in Romania
	Addressing restrictive practices concerning local deployment of low/zero carbon technologies to ensure a positive environment for the integration of renewable energies in buildings	**High** – renewable energies integrated in buildings should be actively supported, within the bounds of EU rules on State aid
	Removing restrictive tenancy laws, which impose disincentives or otherwise inhibit energy performance improvement	**High** – willing investors should not be prevented from undertaking renovation by inappropriate legislation
	Mandatory improvement of least efficient stock to higher energy performance levels (e.g. through restrictions on sale or rental of buildings in lowest energy performance categories)	It is being currently analysed together with the central public authorities.

[35]Example of trigger points: audits, issue of energy performance certificates, boiler and air conditioning inspections, change of ownership or tenancy, change of building use, other building work (e.g. extensions).

	INDICATIVE LIST OF INITIATIVES (non-exhaustive)	APPLICABILITY TO THE RENOVATION STRATEGY
Technical	Developing renovation standards that are progressively and regularly strengthened in response to experience and new technological	As required by EPBD
	Analysing potential for district heating systems to provide efficient, low carbon energy	**High** – taking measures to improve the efficiency and public acceptability of the large number of existing district heating systems, and also to stem the tide of disconnections
	Ensuring proper monitoring and enforcement of compliance with building codes	As required by EPBD
	Developing packaged solutions that can be readily replicated in similar building types	Establishing a database of technical solutions that serves as a learning point for future projects/investments
	Introducing quality certification for installations and products	As required by EPBD
Fiscal/ financial	Securing sources of finance, including those identified in Article 20 of EED and EU/international funding sources, together with mechanisms that effectively leverage private capital	**Top priority** – maximising the application of EU Cohesion Fund and structural funds under the 2014–2020 budget with a view to the deep renovation of buildings.
	Considering the monetary value of co-benefits (e.g. health, employment) in public funding decisions	**High** – Establishing a cross-ministerial group to appraise the co-benefits from energy performance improvement, and reflect the value in policy making in areas such as health and employment
	Developing funding vehicles, tailored to specific market segments, that provide a simple ('one-stop-shop') and commercially attractive source of finance for deep renovation	**High** – The proposed Energy Efficiency Investment Fund could be developed as the main funding vehicle for renovation
	Developing mechanisms to encourage deep renovation via third party financing (TPF) e.g. ESCOs, EPCs	**High** – developing the regulatory framework for the establishment and operation of ESCOs, developing the market of these companies and promoting energy performance contracts after 2016
	Strengthening energy/carbon pricing mechanisms to provide the right economic signals	For consideration in the next period, once fossil fuel subsidies have been largely removed
	Removing fossil fuel subsidies to eliminate perverse incentives that discourage investment	The removal of existing subsidies for electricity, natural gas and the district heating system is being currently implemented.
	Considering 'bonus-malus' mechanisms, e.g. property taxation systems (which reward high energy performing buildings while penalizing poorly performing ones) and energy pricing	To be considered in the next period

	INDICATIVE LIST OF INITIATIVES (non-exhaustive)	APPLICABILITY TO THE RENOVATION STRATEGY
Communication / Capacity Building	Establishing publicly accessible databases demonstrating energy performance of renovated buildings and information on how to undertake deep renovation	**Medium** – improved knowledge on renovation solutions will encourage replication
	Gearing up skills and training programmes covering the key professions and disciplines in building renovation	**High** – implementing the findings from projects on the up-skilling of installers in renewable energy
	Establishing knowledge and experience-sharing networks across regions/Member States	Understanding how other Member States have addressed specific issues can help in their resolution within the Romanian context
	Encouraging development of local supply chain industry to maximise macro-economic benefits and minimise embedded CO_2 emissions	**High** – Maximising the economic potential for new employment in the area of manufacture and supply of low carbon solutions
	Developing promotional and dissemination activities that sensitise building owners to opportunities for deep renovation and that provide stepwise support throughout the renovation process	**High** – The success of any policy is dependent on effective engagement with building owners in both residential and non-residential sectors
	Communicating regularly and publicly on progress within the renovation strategy	**High** – Maximising the economic potential of the effective engagement with building owners in both residential and non-residential sectors
R&D	Supporting research, development and demonstration projects into new and improved technologies and techniques to deliver deep renovation, including how to scale up best practice to multiple buildings	Reviewing existing EU R&D initiatives and consider the scope for application of the results in Romania

4. CONCLUSIONS

4.1. Forecast perspectives for the guidance of investment decisions

Building renovation represents a major opportunity to modernise the existing building stock in a sustainable way that provides multiple benefits for households, businesses and the public sector. A strategic approach may stimulate the market in a way that current piecemeal initiatives have failed to do. Moreover, given the envisaged increase of energy efficiency and CO2 emission reduction targets and the potential for reduction of energy consumption in this sector (the most significant potential of the economic sectors presented in Table 9), building renovation must become a national priority in order to achieve both the internal and external objectives set out by Romania.

Table 10: Estimated potential for reduction of final energy consumption by sectors (%)

Sector	Share of sector consumption in final energy consumption in 2010	Potential for reduction of final energy consumption
MU	**%**	**%**
Buildings	**36**	**41.5**
Transport	**22**	**31.5**
Services	**11**	**14**
Industry	**31**	**13**

Source: EBRD, ANRE

The building renovation strategy sets out a long-term framework for the renovation of the existing building stock to high energy performance levels. To achieve this goal, it is necessary to mobilise building owners to undertake deep renovation of their buildings by creating the right market conditions and policy context for action. The vast supply chain, from producers of construction materials, builders and installers to professional service providers, needs to be engaged in the process.

Funding renovation is key to success. There are significant funding sources available, and the Energy Efficiency Investment Fund should be designed to facilitate investments in building renovation.

The policies which are considered the most important in the next three-year period are presented below:

- Ensuring support for a national programme to renovate the building stock;
- Introducing, as a matter of priority, in thermal rehabilitation programs the buildings owned by disadvantaged people, which would result in a major boost to their quality of life;
- Ensuring a 3% renovation rate for central public administration buildings;
- Establishing high performance requirements for replacement/renovating envelope building elements and technical components (heating, ventilation and air-conditioning systems);
- Providing support for the use of renewable energy in buildings;
- Continued improvement in the efficiency and public acceptability of the existing district heating systems;
- Developing an Energy Efficiency Obligation (EEO) scheme to support deep renovation for the period from 2017 onwards;
- Maximising the absorption from the EU Cohesion Fund and structural funds under the 2014–2020 budget with a view to the deep renovation of buildings;
- Designing the Energy Efficiency Investment Fund as the main funding vehicle for renovation;

- Developing the regulatory framework for the establishment and operation of ESCOs, developing the market of these companies and promoting energy performance contracts;
- Encouraging the development of local suppliers (economic operators in constructions) for the implementation of building renovation measures;
- Developing promotional and information dissemination activities that sensitise building owners to opportunities for deep renovation and that provide support throughout the renovation process;
- Establishing a stakeholder forum to assist in the implementation and ongoing refinement of the strategy.
- Encouraging the initiatives of private banks (e.g. 'Green Mortgages/Green Loans') with attractive terms for owners who wish to renovate their buildings at high energy efficiency and sustainability standards (deep renovation); in June 2017, EBRD's Green Economy Financing Facility (GEFF) project was launched, with a value of EUR 100 million.

In order to explore the impact of policy initiatives for improving energy performance of buildings, several sets of policies were identified through the project called IEE ENTRANZE[36], which were appraised based on the INVERT (TU Vienna) and EE Lab (Fraunhofer ISI) simulation programmes, while the macro-economic evolution developed in the project was elaborated using the POLES (ENERDATA) model.
According to the project results for Romania, three sets of policies for buildings were identified, which correspond to the three scenarios with the potential of achievement, as follows:

- **Policy set 1 (PS1) – BaU ('business as usual')**
- **Policy set 2 (PS2) – Growing-up**
- **Policy set 3 (PS3) – Market transformation**

The developed scenario took 2008 as year of reference ('no policies scenario').

Each of the identified sets of integrated policies was based on the following:

1. Technical regulations/energy performance requirements;
2. Education, training, qualification and compliance/quality control
3. Information, motivation and guidance
4. Economic instruments in support of building renovation;
5. Measures on primary energy, industry, research, technology and development;
6. Evolution of energy prices in the EU, namely:
   a) slow evolution of energy prices - Figure 15;
   b) accelerated evolution of energy prices - Figure 16;

The details of the defined policies relating to the identified scenarios are provided in the Annex.

[36] www.entranze.eu

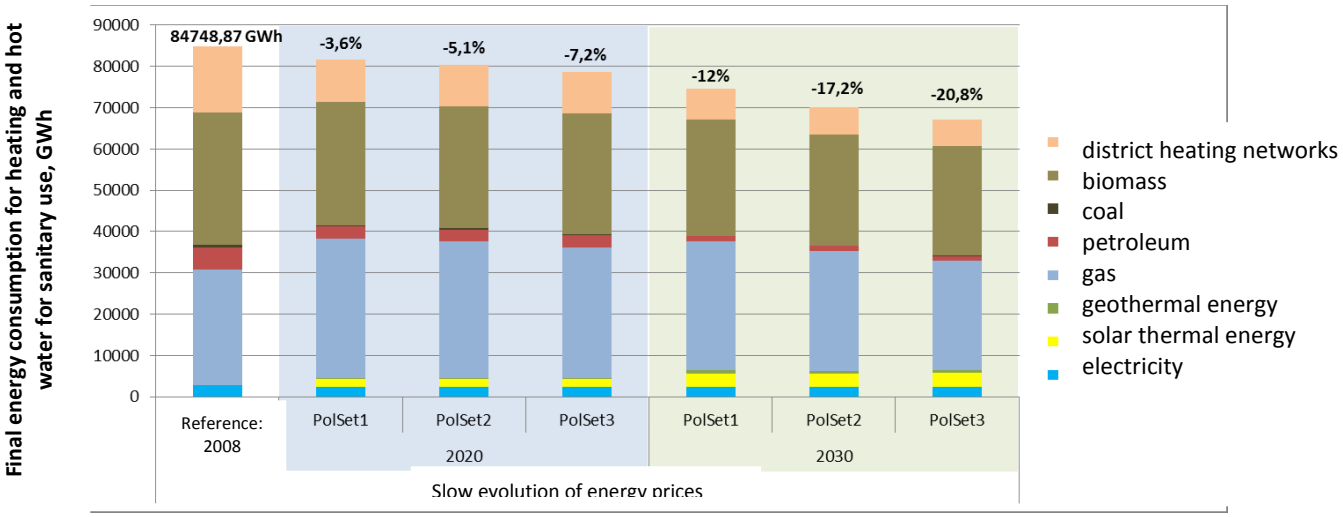


Figure 15: Evolution of the energy mix in the final consumption for heating and hot water for sanitary use in the context of the slow evolution of energy prices

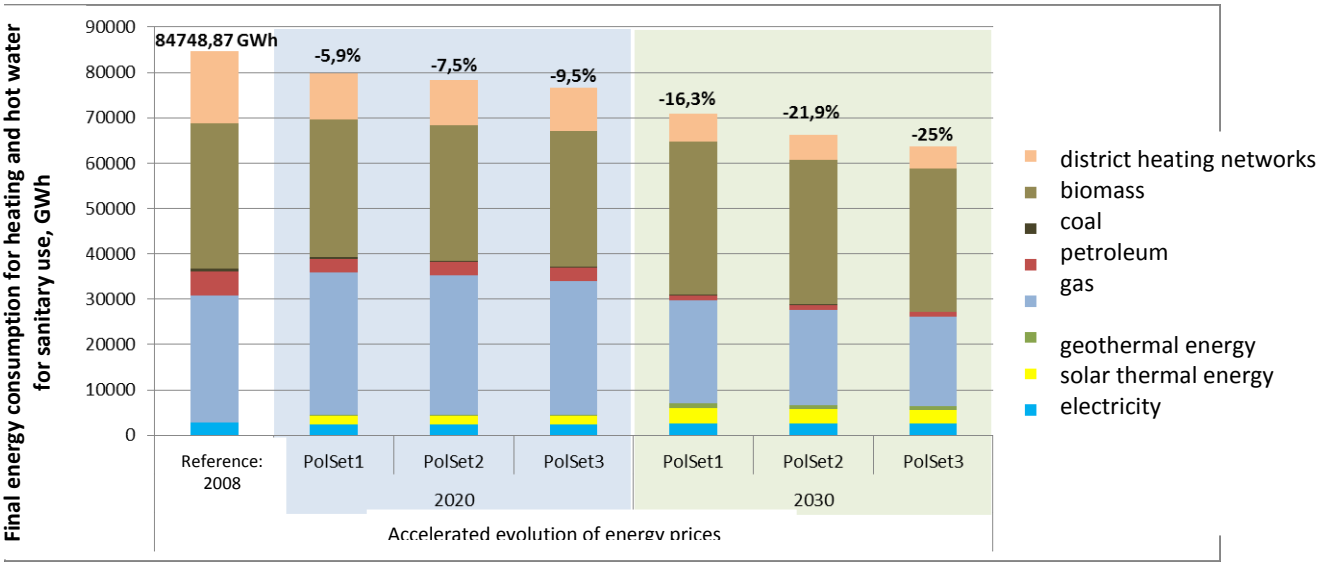


Figure 16: Evolution of the energy mix in the final consumption for heating and hot water for sanitary use in the context of the accelerated evolution of energy prices

4.2. Economic instruments in support of the improvement of energy performance of buildings

The improvement of the energy performance of buildings entails high investment costs even if the investment is amortised with time.

The improvement of energy performance at nearly zero consumption levels requires mixed measures for energy efficiency (increase of thermal insulation, ventilation etc.) and a high integration rate of renewable energy.

The benefits of passing onto high energy performance levels in construction and renovation of buildings are of two types:

- direct benefits to building owners/tenants, namely the reduction in energy bills and of dependence on energy price variants, increased thermal/air comfort in buildings, reduction of respiratory diseases
- indirect benefits to society, namely the creation/consolidation of jobs in construction, increase in the revenues of public local and national budgets by the reduction in additional unemployment benefits, taxes, social and health insurance of employees and related businesses, reduction in investment requirements in the creation of new energy capacities, as well as capacities for fuel import/ operation for energy generation.

Economic instruments have a market stimulation role by reducing the impact of initial investment and by sharing investment risks between private and public levels according to the related benefits. Economic supporting instruments need to be developed on the long term (e.g. 2030), should have as final goal the transformation of the market (namely construction/renovation of buildings at nZEB level for commercial purposes), address all major categories of citizens and buildings, and be oriented towards clearly defined and quantifiable targets (e.g. renovation of all of the blocks of flats at an energy performance level of <40kWh/square meter/year by 2050).

For the above reasons, economic supporting instruments must be integrated at a macro-economic level in order to allow the assessment of all benefits and for the maximisation of the economic impact.

EU Cohesion Funds could have an important contribution to the transformation of the Romanian building stock, provided they are allocated and used with care.

Support instruments/programmes need to have long-term predictability, with any change to be announced in a timely manner in order to provide a solid framework for investment, as well as to stimulate activities carried out within the programme (e.g. the number of applications for funding increases if applicants are made aware of the prospective reduction of financial contribution available within the programme).

4.3. Measures for reducing the factor for primary energy, stimulation of local industry and research and development support

The improvement of energy efficiency in primary energy could significantly contribute to ensuring higher energy performance in buildings (estimated in primary energy as required by Directive 2012/27/EU on energy efficiency).

For these reasons, measures for increasing the rate of (electric and thermal) energy supply by systems based on renewable energy have an important role. Similarly, the increase of efficiency of district heating systems may have a significant contribution.

The stimulation of local industries involving energy-efficient materials and equipment and renewable energy providers may have a major contribution to market transformation, increase of the competitiveness level of the industry and last, but not least, to the creation of jobs. The stimulation of new techniques and technologies for the construction of buildings with low energy consumption or 'active/positive buildings' (buildings that generate more renewable energy than the energy they consume) has also an important role in the development of know-how and in maintaining close contact with similar researches in EU Member States.

4.4. Energy savings and benefits

4.4.1. Energy consumption following renovation

The energy consumption targets for the following categories of buildings subject to renovation are presented below:

- Multi-family houses (MFH)
- Single-family houses (SFH)
- Office buildings, schools, hospitals and hotels.

The minimum energy consumption values proposed for the above-mentioned categories of buildings subject to renovation are expressed in primary energy, and the share of renewable sources is already included in the proposed values, as illustrated in Table 10.

In cases where the share of renewable energy is impossible to achieve in the building or in its surroundings, two alternative variants may be taken into consideration:

- purchase of renewable energy from the grid (e.g. purchasing electricity generated through renewable energy sources based on certificates of origin);
- achieving the minimum energy performance requirements exclusively through efficiency measures (possibly with a reduction of up to 15%).

The presented estimates of energy consumption in buildings correspond to climatic zone II, namely Bucharest – climatic zone representative for Romania.

Table 10: Maximum specific energy consumption per year (compliance with the minimum energy performance requirements) for buildings in Romania [kwh/square meter/year primary energy], and share of renewable energy (SRE) in meeting the primary energy needs of a building [%].

Type of building	Year	Policy set 1 (BaU)		Policy set 2 ('Growing-up')		Policy set 3 ('Transformation')	
		New*	Renovated*	New*	Renovated*	New**	Renovated**
Multi-family buildings	2015	90	100	80	100	70	90
	2020	80	100	70 SRE>30%	90	60 SRE>40%	70 SRE>20%
	2030	70	80	60 SRE>40%	70	40 SRE>50%	50 SRE>40%
Single-family houses	2015	150	180	130	150	90	110
	2020	120	150	100 SRE>30%	120	80 SRE>40%	90SRE>20%
	2030	100	130	70 SRE>40%	90	40 SRE>40%	60 SRE>40%
offices, schools, hospitals, hotels	2015	120	140	100	120	90	110
	2020	100	120	90 SRE>20%	100	70 SRE>30%	100SRE>20%
	2030	80	100	70 SRE>30%	90	40 SRE>40%	60 SRE>30%

* only energy for heating
**energy consumption according to EPBD (energy for heating, cooling, ventilation, household hot water, auxiliary and lighting equipment, for non-residential buildings)

The analysis has revealed that the three identified policy sets will generate by 2030 primary energy savings of 24%–33% in the context of a slow evolution of energy prices and primary energy savings of 32%–40% in the context of an accelerated evolution of energy prices. In both cases generated by the energy price increase rate, in terms of the primary energy saving in the building sector resulting from the application of the three sets of policies, the target of minimum 27 % energy efficiency for 2030 is largely expected to be covered.

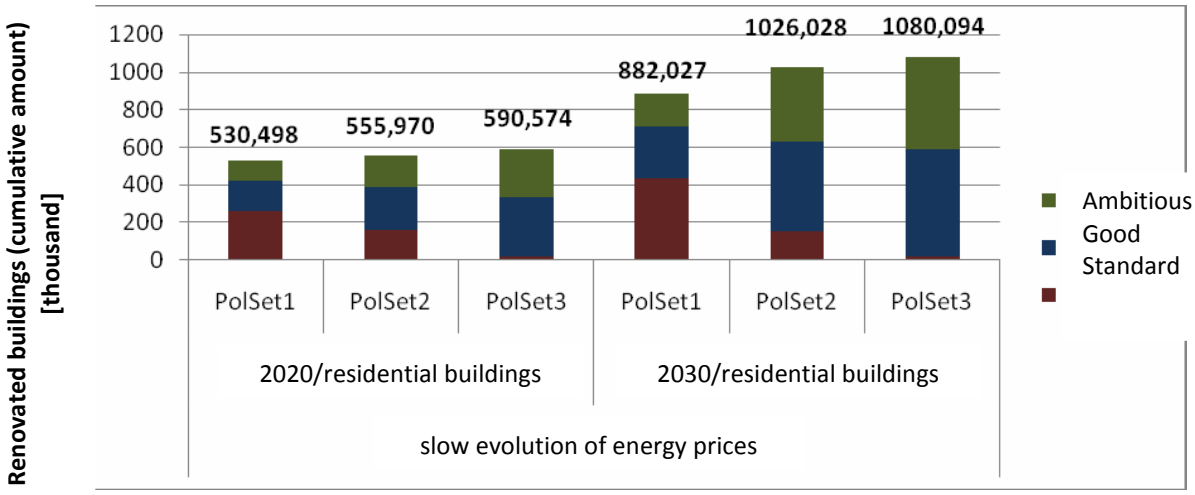
In the context of an accelerated evolution of energy prices, all simulated policy sets produce high energy savings by 2030. PS3 contributes to the reduction by a quarter of the final energy consumption in buildings.

As far as the energy mix in the final energy consumption for heating and hot water is concerned, the modelling of the three policy scenarios led to the following results:

- The final energy consumption for heating and hot water from the district heating network shows a decreasing tendency: from 18.8% in 2008 to 12–13% in 2020 and to 8–10% in 2030 (the highest reduction registered in PS3 in the context of an accelerated evolution of energy prices). This reduction is mainly the result of the decrease in the energy needs through the national programme for the rehabilitation of blocks of flats.
- Solar thermal energy registered a significant increase in all scenarios, namely from 0.05% of the final energy consumption in 2008 to approximately 5% in 2030. Geothermal energy is on the rise from negligible values in 2008 to approximately 1–1.16% in 2030. This is the result of support programmes and is positively influenced by the more accelerated evolution of energy prices.

- Biomass consumption remains dominant throughout the assessed period, preserving a relatively constant share (namely from 37.8% in 2008 to 37.6–39.6% in 2030) in the context of a slow evolution of energy prices and a relatively constant share in terms of the energy generated in the context of an accelerated evolution of energy prices (namely from 32 060 GWh in 2008 to 33 754–31 433 GWh in 2030). This evolution is explained by the promotion of efficient technologies for the use of biomass, which, in the context of higher energy prices, become more attractive on the market.
- The final coal consumption decreases from 0.78% in 2008 to 0.08%–0.13% in 2030. Similarly, the consumption of petroleum products decreases from a share of about 6.28% towards a share of 1.7%–1.9% in the final energy consumption for 2030.
- Gas consumption preserves its leading position in all three scenarios, from approximately 33 % in 2008, with a slight rise (up to 39 %–41 %) by 2020, but later dropping to 30 %–39 % in 2030. The highest reduction is registered in the context of an accelerated evolution of energy prices in the case of the PS3 policy set.
- In all three scenarios, energy consumption slightly decreases until 2020, after which it registers a slow increase until 2030, while preserving a relatively similar share to that in 2008, namely of 3%–4% of the final energy consumption for heating and hot water.

The results of the modelling of the policy sets for improving the energy performance of residential and non-residential buildings, depending on the evolution of energy prices, for the time frames up to 2020 and 2030, are presented in Figures 17 and 18.



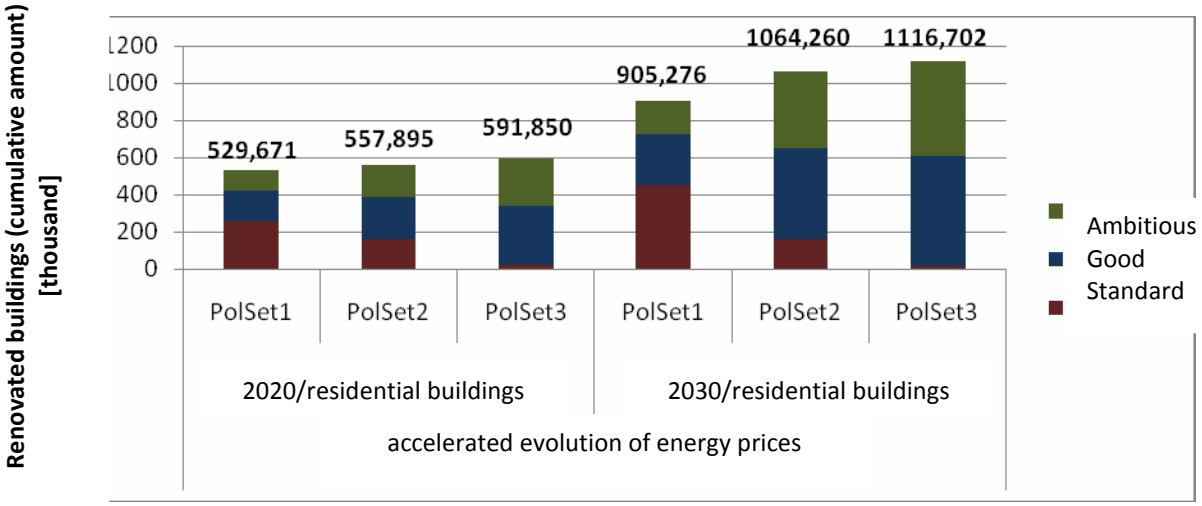
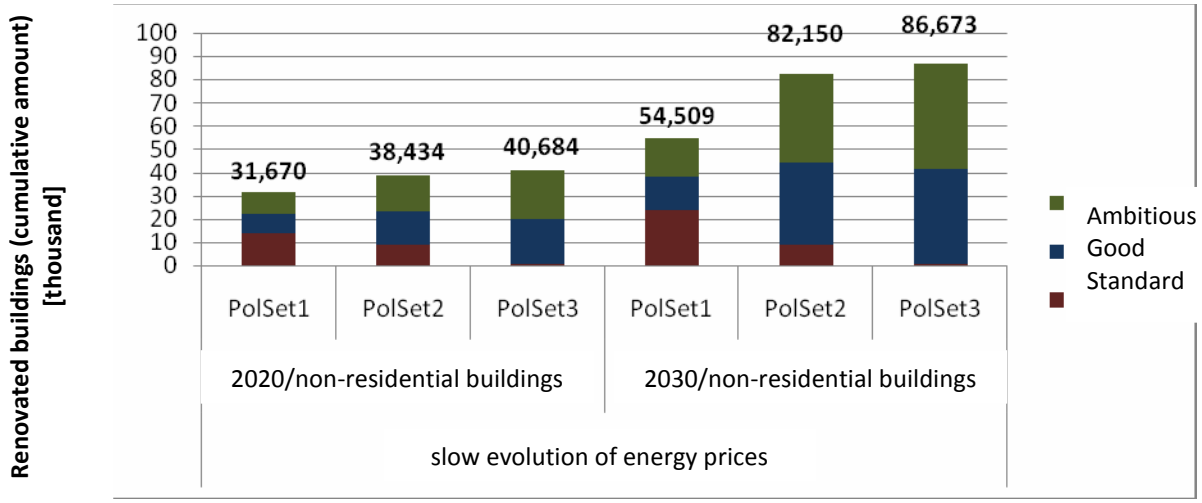


Figure 17: Evolution of the number of renovated residential buildings in all three scenarios, at different renovation levels and in the context of different types of evolution of energy prices



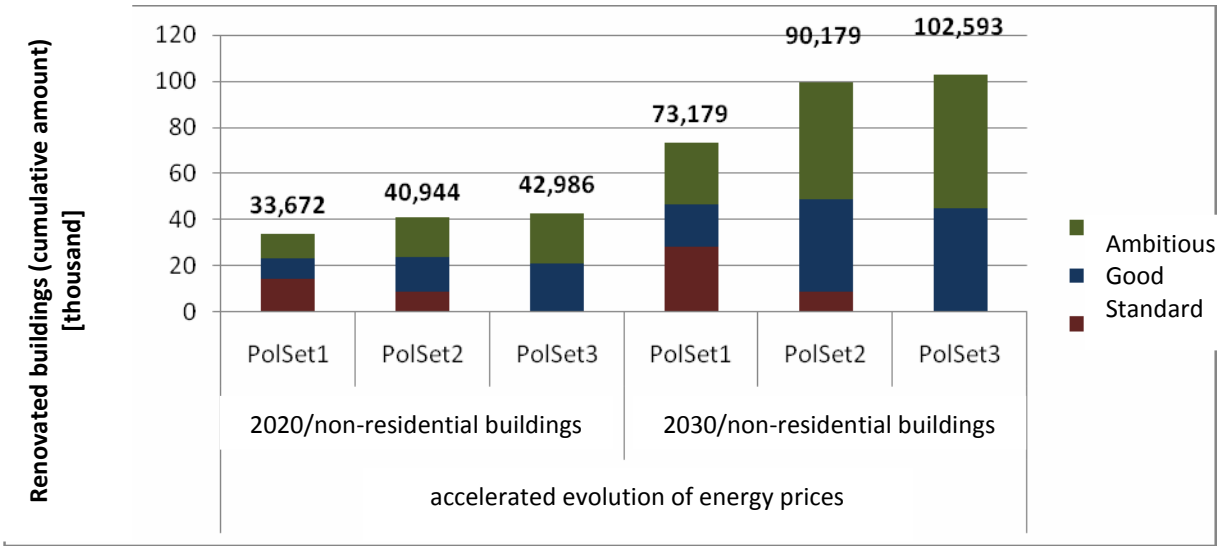


Figure 18: Evolution of the number of renovated non-residential buildings in all three scenarios, at different renovation levels and in the context of different types of evolution of energy prices

The level of the estimated required public funding (through the modelling conducted within the ENTRANZE project[37]) for implementing the proposed policy sets is between EUR 3.2 billion and EUR 7.4 billion by 2030, with an estimated annual average between EUR 144 and 336 million (Figure 19). Public funds include national, local and European sources of funding

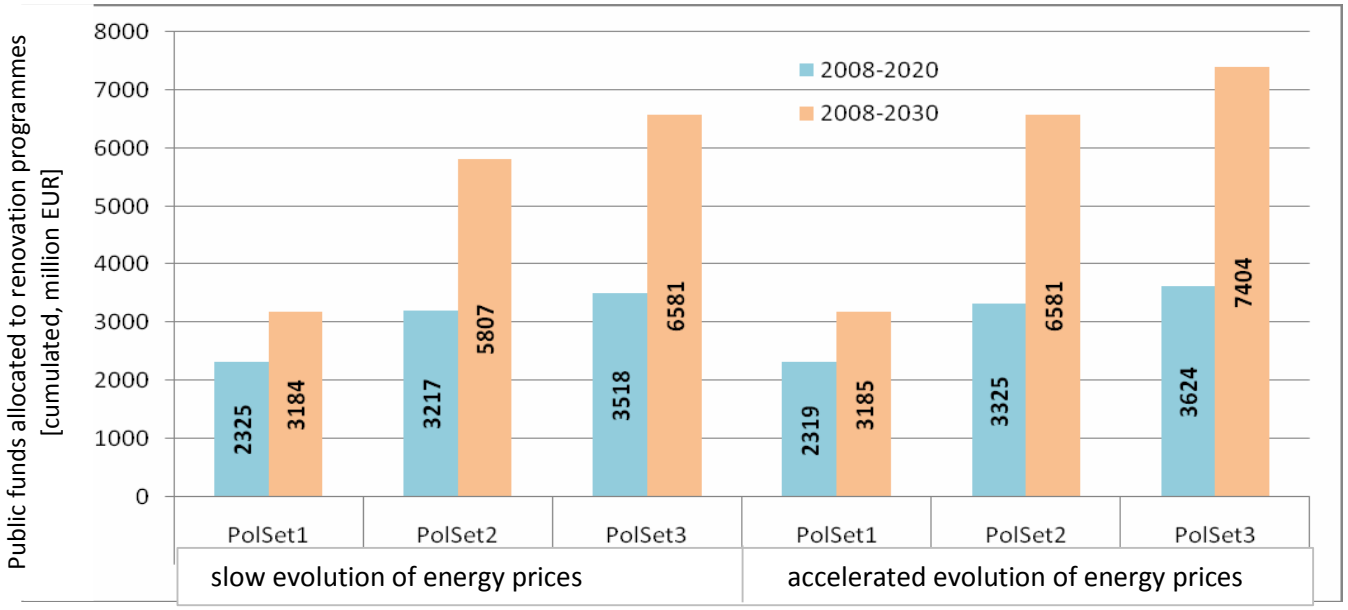


Figure 19: Public funds allocated to renovation programmes (values cumulated for the appraisal period)

The level of the overall investments attracted corresponding to the proposed policy sets is between EUR 34.3 and 43.6 billion until 2030, with an estimated annual average between EUR 1.56 and 2 billion (Figure 20). As it turns out, the allocation of funds to renovation programmes from public and EU budgets results in 6 to 10 times more investments for building owners and local administrations.

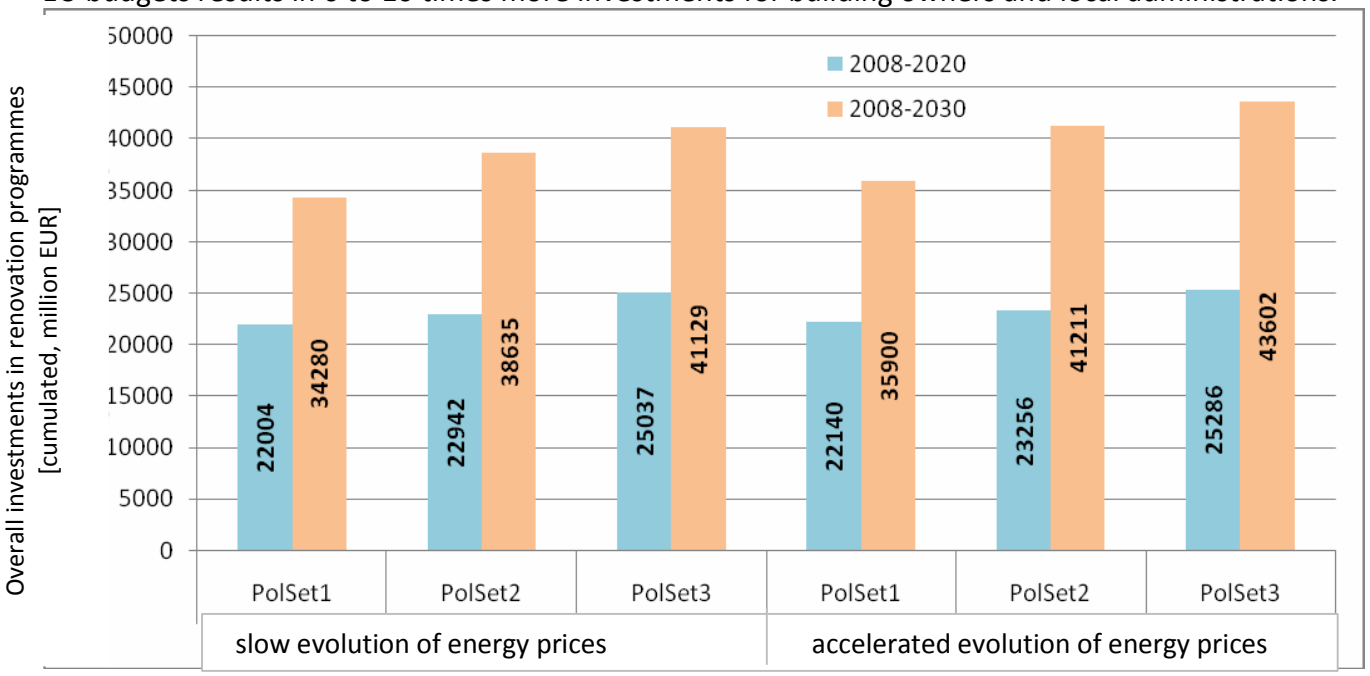


Figure 20: Overall investments that could be attracted in renovation programmes (values cumulated for the appraisal period)

[37] www.entranze.eu

4.4.2. Education, training, qualification and compliance/quality control

Compliance (verification/control/workers) with energy performance requirements is vital for buildings with very low energy consumption. The quality of execution becomes a key factor, otherwise it is possible that the result will be an expensive building with low energy performance. Therefore, the control of constructions for compliance with energy performance requirements needs to be duly consolidated.

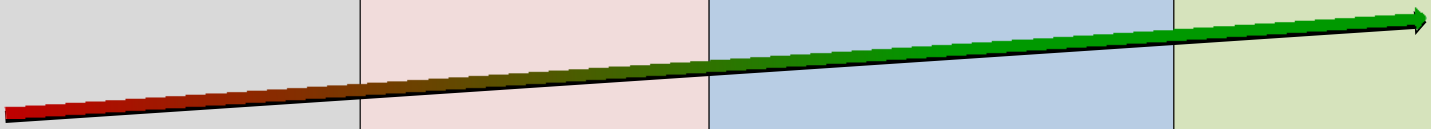
In order to reach high standards in the design and execution of buildings with very low energy consumption (both new and renovated), it is required to up-skill the workforce in construction, also including architects, designers and engineers involved in the construction/renovation process of buildings.

Furthermore, it is important to promote greater awareness among all stakeholders involved, including the wider public (namely home-owners) regarding the benefits of energy efficiency in buildings and the available support instruments.

Creation of capacities for providing information, support and guidance in the construction and renovation of buildings with nearly zero energy consumption and simplification of administrative conditions/requirements are other necessary measures.

Therefore, the policy sets (Table 11) include measures for boosting compliance, education and up-skilling of workforce and information-guidance of stakeholders involved.

Table 11: Measures for boosting the level of compliance in constructions, training of workforce and information and guidance of persons, businesses, construction companies and financial institutions

	Current phase	Policy set 1	Policy set 2	Policy set 3
Quality compliance control				
Training, education, qualification	Build-up Skills-Strategy and Quali-Shell Training programmes through European projects (officially not integrated at national level).	Qualification programmes in professions lacking enough workforce. As of 2020, the introduction of qualification programmes for the building sector in order to adhere to requirements for low energy consumption buildings.	Significant introduction, as of 2017, of training and qualification programmes in 'low-energy building' technologies for workers in the building sector.	Significant introduction of training and qualification programmes for workers in the building sector, improvement of study programmes in general and higher education in order to take account of the introduction of low and positive energy consumption buildings as of 2017 for all categories (architecture, civil engineering, workers). Training of trainers and of those involved in the guidance and information of market players.
Information, motivation and guidance	No specific information or awareness raising regarding the energy performance of buildings, except for the promotion of national thermal rehabilitation programmes and projects with a limited impact (particularly European). Limited information actions performed by associations of municipalities, cities, energy cities.	Better information and awareness, mainly within support programmes. Creation of a national programme for raising awareness among the population, using EU cohesion funds.	In addition to PS1: Development of a national information and guidance network in important cities: offices (within city halls, energy agencies) offering information and guidance concerning the energy efficiency of buildings, as well as funding and programmes. Development and promotion of several demonstrative projects in large urban areas for the main types of residential and office buildings.	In addition to PS2: Development of "one-stop-shop" information, guidance and orientation networks for all localities. Creation of 'online-expert' internet platforms and one-stop-shop for administrative formalities. Development of demonstrative projects in all important regions of the country.

Policy sets	Current situation	Policy set 1 - BaU scenario	Policy set 2 – Growing-up scenario	Policy set 3 – Market transformation scenario
Economic instruments	National programme for the improvement of energy performance of blocks of flats, funded from national funds and EU structural funds, in order to achieve a specific annual consumption for heating of less than 100kWh/square meter/year. Total budget of the programme: EUR 304 million (approximately 50/50 of national/EU budgets, to which a 40% contribution from the local/municipal budget (CB) is added). Programme for the renovation of residential buildings financed through bank loans with government guarantee: • Current lending term is 5 years. • Budget: depending on demand, based on a ceiling approved annually. The 'Casa Verde – Green House' programme for natural persons and public organisations (non-reimbursable funding for RES H/C for existing and new buildings) - approximately RON 200 million /year (~EUR 44 million /year, half for residential buildings, half for public buildings)	The same evolution of the existing programmes, showing a significant increase in budgets The same approach, based on budgets established on a yearly basis. The national multi-annual programme for the improvement of energy performance of blocks of flats will have a multi-annual global budget of approximately EUR 600 million by 2020 and of EUR 400 million by 2030.	The national programme for the improvement of energy performance of blocks of flats: • Reduction of the level of non-reimbursable funding: currently 80 % → 60 % in 2015, 40 % in 2020; maximum 25 % in 2030. • Low-income families would receive more than the rest (namely from currently 80% → 70% in 2015, maximum 55% in 2020 and 35% between 2020 and 2030) • Budget: A global budget of EU funding of EUR 1 billion by 2020 and a global budget of EUR 700 million between 2020 and 2030. Continuation of the rehabilitation programme through loans with government guarantee for the renovation of residential buildings (loans with subsidised interest rate of up to 80% by 2015, up to 60% by 2020 and up to 40% by 2030): • Extending the current lending term from 5 years to 10–15 years. • Subsidising the interest rate according to savings (0% interest rate for NZEB, passive houses, energy-positive and similar buildings) • Continuing to integrate RES for heating/cooling as eligible measures (for the Casa Verde programme) • An annual budget of approximately EUR 100 million	The national programme for the improvement of energy performance of blocks of flats: • Reduction of the level of non-reimbursable funding: currently 80 % → 40% in 2015, maximum 25% in 2020 and 15 % between 2020 and 2030. • Low-income families would receive more (currently 80 % → 60 % in 2015; maximum 35 % in 2020 and 25 % between 2020 and 2030) Budget: A global budget of EU funding of EUR 1 billion by 2020 and a global budget of EUR 700 million between 2020 and 2030. Continuation of the rehabilitation programme through loans with government guarantee for the renovation of residential buildings (loans with subsidised interest rate of up to 100% by 2015, up to 70% by 2020 and up to 30% by 2030): • Extending the current lending term from 5 years to 15-20 years. • Subsidising the interest rate according to savings (0% interest rate for NZEB, passive houses, energy-positive and similar buildings) • Continuing to integrate RES for heating/cooling as eligible measures (for the Casa Verde programme) • Introduction of a favourable loan type – a type of revolving fund (with low interest rates) to support co-funding of the renovation of blocks of flats under the national programme referred to above;

	Programmes similar to the multi-annual programme, carried out by some municipalities and aimed at the complete renovation of blocks of flats (for example, the programme from Sector 1 of Bucharest, with a loan from EIB) All of the above-mentioned national programmes have an annual budget, which varies according to the availability of the public budget.	Programmes similar to the multi-annual programme, carried out by some of the municipalities (up to five in number).	Programme for the renovation of public buildings with two components: • non-reimbursable funding (from public funds, EU funds, financial institutions) for deep renovation and • an ESCO scheme for high-efficiency heating/cooling systems and RES for heating/cooling. • An annual budget of approximately EUR 150 million by 2020 and of EUR 100 million by 2030 (by 2020, EUR 100 million were allocated for non-reimbursable funding and EUR 50 million in an ESCO fund; by 2030, non-reimbursable funding of EUR 75 million and EUR 25 million in an ESCO fund) The Casa Verde Programme only for new buildings and allocation of facilities depending on energy performance and RES for heating/cooling (for example for the funding of passive houses, nearly zero buildings and energy positive buildings). Budget: • residential sector: EUR 75 million /year by 2020 and of EUR 20 million /year by 2030. • public sector: EUR 75 million /year by 2020 and of EUR 20 million /year by 2030.	• An annual budget of approximately EUR 120 million Programme for the renovation of public buildings with two components: • non-reimbursable funding (from public funds, EU funds, financial institutions) for deep renovation • ESCO scheme for high-efficiency and RES H/C associated with an ESCO fund (an open fund, created from public and private funding) • An annual budget of approximately EUR 150 million by 2030 (EUR 100 million for non-reimbursable funding and EUR 50 million in an ESCO fund) The Casa Verde Programme only for new buildings and depending on energy performance, including RES for heating/cooling, but not exclusively (more or less passive buildings with 55kW and 40kW – PassivHaus). Budget: • residential sector EUR ~100 million /year by 2030. • public bodies EUR ~100 million /year by 2030. The CASA VERDE PLUS programme Development of financial products offered by banks ('Green Mortgages/Green Loans") to encourage the mobilising of private investments of owners interested in the dep renovation of dwellings.
Development of capacities, qualification and quality assurance	There are no dedicated programmes for qualification in the energy performance of buildings. The Build-Up Skills ROBUST and Quali-Shell projects for the	As of 2015, a qualification programme for the building sector was introduced with the aim of adhering to requirements regarding buildings with low energy consumption.	Significant introduction of training and qualification programmes for workers in the building sector.	Significant introduction of training and qualification programmes for workers in the building sector, improvement of study programmes in general and higher education in order to build low and positive energy consumption buildings as of 2015 for all

	identification/development of needs concerning the qualification/ training in professions related to building renovation.			categories (architecture, civil engineering, workers).
Information, motivation and guidance	No specific information or awareness raising regarding energy performance of buildings, except for the promotion of the national programme for the improvement of energy performance of blocks of flats.	Better information and awareness, mainly within support programmes.	Better information and awareness. Offices (within city halls, energy agencies) offering information and guidance concerning the energy efficiency of buildings, as well as funding and programmes. Development and promotion of pilot projects for the main types of residential and office buildings.	One-stop-shop information, guidance and orientation for all localities. Related internet platforms. Development of several pilot projects in all important regions of the country.
Measures for market transformation (related with supplying)	Use of renewable energy (such as large wind farms, solar thermal and photovoltaic energy, to a lesser extent). The Green Certificates Scheme is focused on the "high" energy production For RES heating/cooling in buildings, there are no other support instruments (except for the Casa Verde Programme referred to above.) At present, district heating systems, found in urban areas, have a high carbon footprint and an efficiency potential of 30%, with energy savings of 20%–40% for consumers. Some municipalities have put in place measures for the improvement of the energy efficiency of the district heating system (generation and distribution networks).	Minor improvements of the district heating system (in terms of efficiency, namely 10% gradually by 2030), a slight increase in the share of RES in district heating, especially in small towns. A slightly higher integration rate of RES in heating/cooling in dwellings (mainly, solar thermal energy and biomass pellets for the replacement, to a lesser extent, of firewood): • existing dwellings: 5% by 2020 and 20% by 2030 • new buildings: 10% in 2015, 20% by 2020 and 100% by 2030. 'Soft' support programmes at local level and/or more favourable conditions for the RES industry for heating/cooling and energy-efficient materials.	Significant improvements of the district heating system (gradual increase by 20% of energy efficiency by 2030), increase in the share of RES in all cities. A higher integration rate of RES in heating/cooling in dwellings (mainly, solar thermal energy and biomass pellets for the replacement, to a lesser extent, of firewood): • existing dwellings: 5% by 2020 and 60% by 2030 • new buildings: 15% in 2015, 30% by 2020 and 100% by 2030. Support programmes and more favourable conditions for the RES industry for heating/cooling and energy-efficient materials. Support for research, technology and development.	Significant improvements of the district heating system (gradual increase by 30% of energy efficiency by 2030), increase in the share of RES in all cities (40%–50% by 2030). A very high integration rate of RES in heating/cooling in dwellings (mainly, solar thermal energy and biomass pellets for the replacement, to a lesser extent, of firewood): in existing buildings 10% by 2020 and 70% by 2030, in new buildings: 15% in 2015, 50% by 2020 and 100% by 2030. Support programmes and more favourable conditions for the RES industry for heating/cooling and energy-efficient materials. Support for research, technology and development.