ROMANIA

Ministry of Regional Development and Public Administration

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

– Version 1/2014 –

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1. INTRODUCTION

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.

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 1.

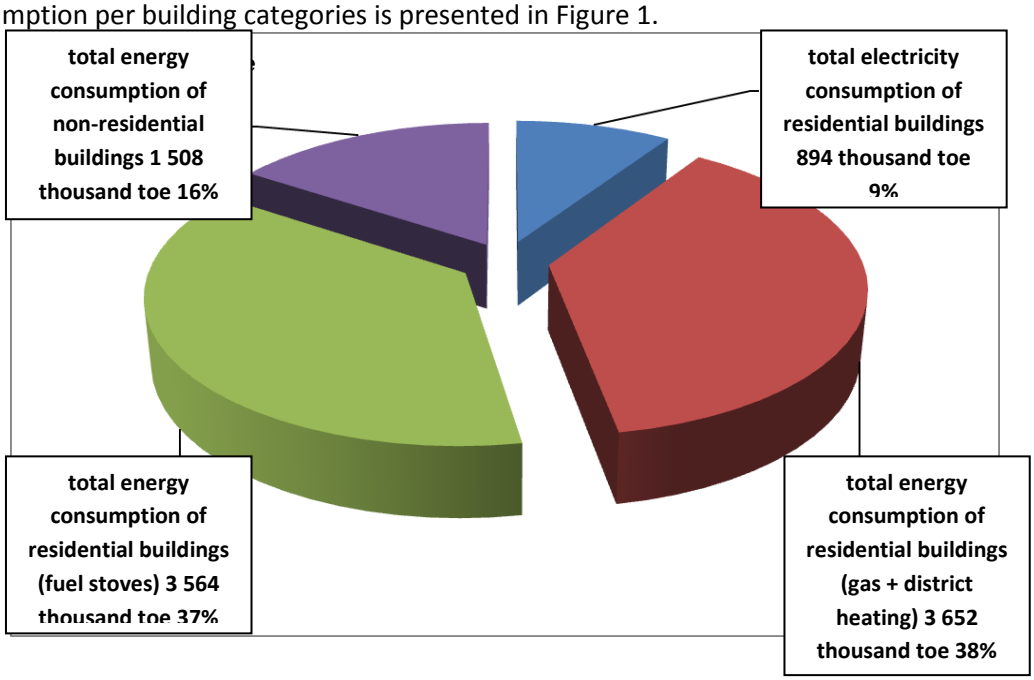


Figure 1 – Energy consumption of buildings: 2005-2010 average (residential buildings), estimate (non-residential buildings)

(Source: National R&D 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 national objectives concerning medium-term energy efficiency, but also in order to attain the long-term national 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 in recent years, first of all by recasting the Directive on the energy performance of buildings – EPBD, (*DIRECTIVE 2010/31/EU*[1]) in 2010, and more recently by the Directive on energy efficiency – EED (*DIRECTIVE 2012/27/EU*[2]) repealing the Directives on energy services and on the promotion of cogeneration. All these requirements as well as others such as the necessity to take into consideration the use of renewable energy sources for new buildings or those that are subject to major renovation, set out in the Directive on the promotion of the use of energy from renewable sources (*DIRECTIVE 2009/28/EC*[3]), provide a framework which enables 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.

[1] http://europa.eu/legislation_summaries/energy/energy_efficiency/en0021_ro.htm
[2] http://ec.europa.eu/energy/efficiency/eed/eed_en.htm
[3] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj:L:2009:140:0016:0062:ro:PDF

The statistical data relating to energy consumption, available from the Energy balance and energy equipment structure for the period 2008–2010[4] and for 2010, respectively, allow the breakdown of data on final consumption according to the main areas of economy, as presented in Figure 2 and Figure 3:

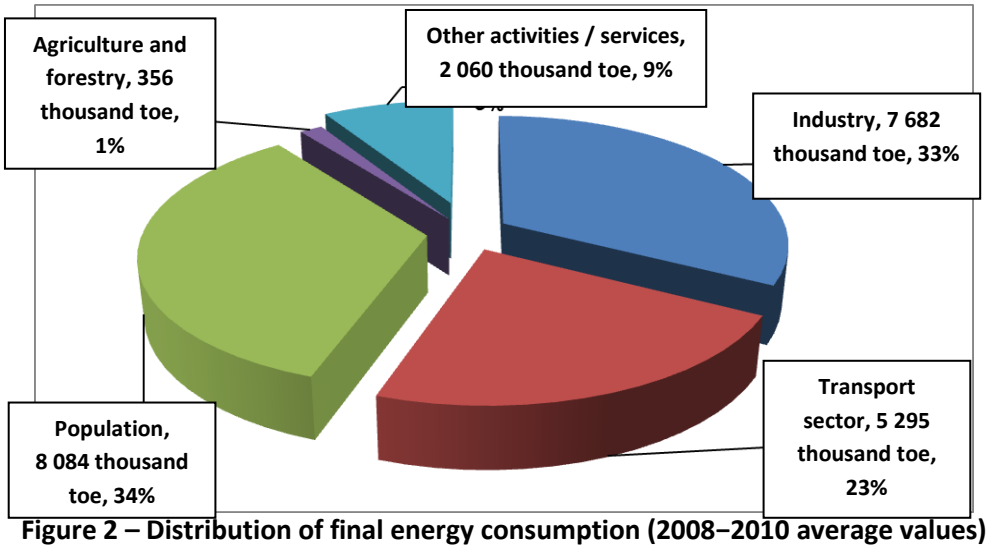


Figure 2 – Distribution of final energy consumption (2008–2010 average values)

(Source: Romanian National Institute of Statistics, INCD URBAN-INCERC)

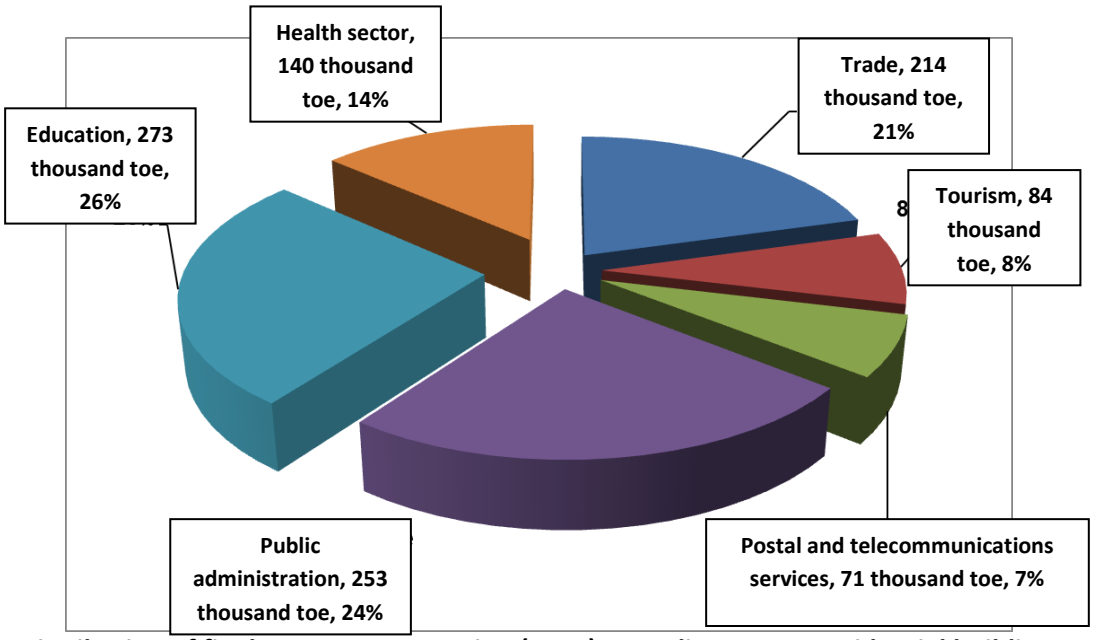


Figure 3 – Distribution of final energy consumption (2010) according to non-residential building categories

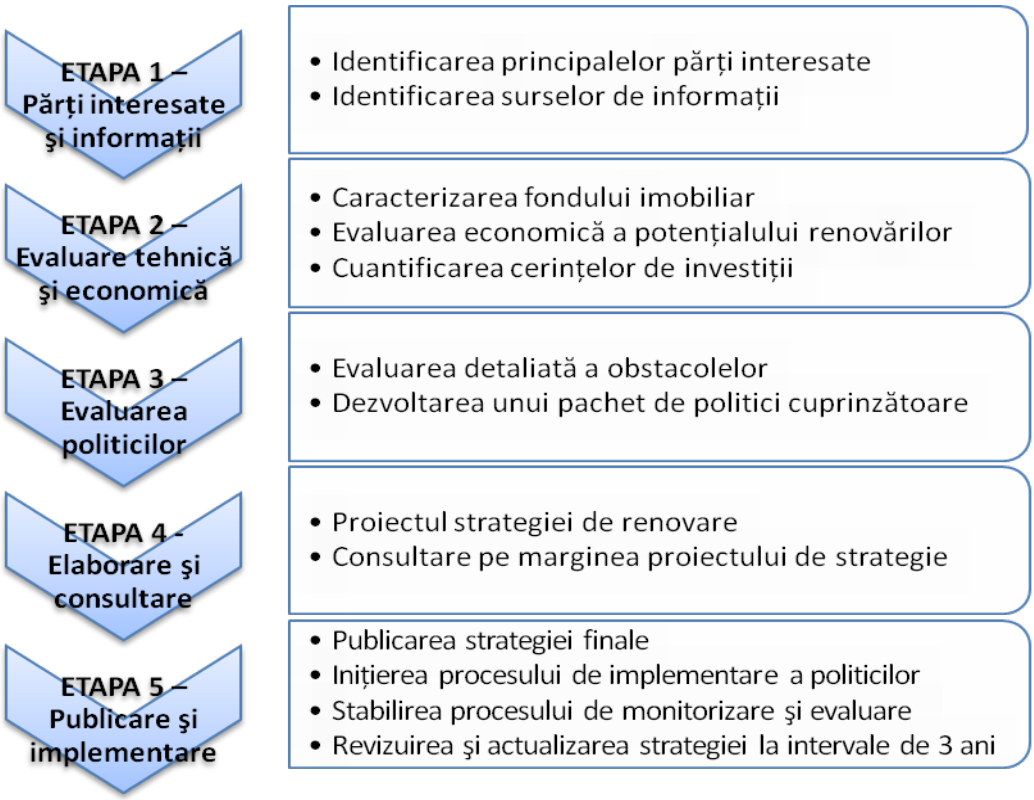
(Source: Romanian National Institute of Statistics, INCD URBAN-INCERC)

2. AIM OF THIS 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 4:

[4] Romanian National Institute of Statistics (2002−2011), Energy balance and energy equipment structure in 2008, 2009 and 2010.



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 4 – Phases identified for the development of the strategy
(Source: BPIE guide to developing strategies for building energy renovation [5])

Mainly, the STRATEGY has the following roles:
- stimulate debate between 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;
- 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 renovation of residential and**

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

commercial buildings, both public and private. It should be noted that this is a major challenge and an equally important commitment as it will:

- create much needed employment now and for decades to come;
- improving living conditions in residential buildings and workplaces;
- reduce dependence on external energy suppliers;
- make best use of Romania's 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.

Thus, a substantial reduction of energy consumption in buildings may be considered as achievable, in phases, 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, resource utilisation and carbon emissions, the building sector is subject to numerous policies, strategies and long term goals which seek to reduce its impact. The wider environmental goals have been formulated into the so-called "20-20-20" targets, which is a set of three key objectives for 2020:

- A 20 % reduction in EU greenhouse gas emissions from 1999 levels;
- Raising the share of EU energy consumption produced from renewable resources to 20 %;
- A 20 % improvement in the EU's energy efficiency.

In a longer perspective, the EU has a set of longer term objectives, contained within roadmaps to 2050. As far is the buildings sector is concerned, the main three 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. By constructing better buildings and by 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 essential also from an environmental perspective, in order to tackle the three challenges of climate change, energy security and exhaustion of resources.

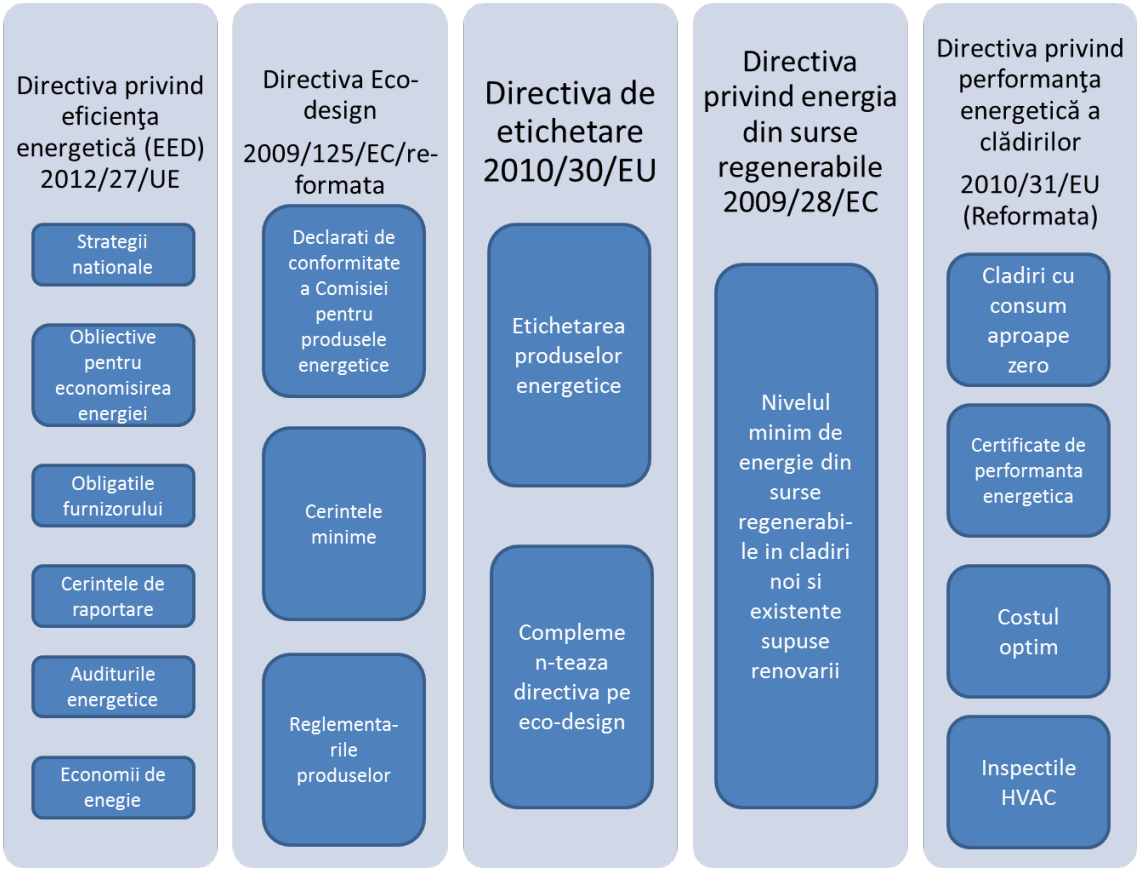
European directives affecting the building sector

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.



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

4. BENEFITS

The renovation of the existing building stock in order to increase the energy performance thereof 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 efficiency 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 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[6];
- **Societal benefits** – The improvement of energy efficiency in buildings, especially in homes 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[7] estimate that the health benefits of energy renovation could have approximately the same value as saving in energy costs. A draft assessment report of the UNDP/GEF[8] 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 CO_2 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 saving 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[9]. These accrue to all users.

Quantification of the multiple benefits

By applying the following multipliers to saving in energy costs, the additional benefits for society may be almost 5 times the value of saving in energy costs as a result of the energy renovation of buildings, as seen below:

[6] Please also consult the model developed by BPIE, which indicates potential energy savings for businesses, households and public budgets, if the renovation strategy, and the renovation scenarios proposed within, are about to be implemented

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

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

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

Benefit element	multiplier
1. Energy cost saving	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**

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 and Public Administration (MDRAP) – 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 registration of energy performance certificates;
- Ministry of European Funds – co-ordination and management of EU structural instruments;
- Department of Energy – a specialised body with legal personality, established within the Ministry of Economy, responsible for the co-ordination of the energy and energy resources fields at national level, and for the implementation of renewable energy sources in buildings;
- Ministry of Public Finance (MFP) – co-financing budgetary sources;
- Ministry of the Environment and Climate Change (MMSC) – responsible for financing mechanisms under the Kyoto Protocol;
- National Energy Regulatory Authority (ANRE) – implications for energy services providers, including the role of energy efficiency obligations

The following organisations were identified in the consultation process:

- *Asociația Producătorilor de Materiale de Construcții din România – Association of Romanian Construction Materials Manufacturers (APMCR)*;
- *Asociația Română a Antreprenorilor din Construcții – Romanian Association of Construction Entrepreneurs (ARACO)*;
- *Patronatul Societăților din Construcții – Construction Companies Employer's Organization (PSC)*;
- *Asociația Inginerilor de Instalații din România – Association of Romanian Installation Engineers (AIIR)*;
- *Asociația Auditorilor Energetici pentru Clădiri din România – Association of Energy Auditors in*
- *Constructions (AAECR)*;
- *Liga Asociațiilor de Proprietari Habitat – League of Habitat Owners Associations*;
- *Federația Asociațiilor de Proprietari din România – Federation of Property Owners Associations in Romania* [10];
- *Asociaţia Patronală Surse Noi de Energie – Association of Renewable Sources Producers (SunE)*;
- *Asociația Municipiilor din România – Romanian Association of Cities*;
- *Asociația Oraşelor din România – Association of Romanian Towns (AOR)*;
- *Societatea Română Geoexchange Romanian Geoexchange Society (SRG)* – representing users of geothermal energy in buildings.

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

Sources of information

The main sources of information used in the development of the present 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 the copyright holder thereof;

[10] Owners living in multifamily buildings are organised in Owners Associations which are legally created according to Romanian Law no. 230/2007 regarding the creation, the organisation and the operation of Residential Multifamily Buildings Owners Associations. Homeowners' association is defined as a legal person with legal authority to act, through elected or appointed representatives, on behalf of all of the homeowners within a multifamily building.

- The project called ENTRANZE, financed by the Intelligent Energy Europe (www.entranze.eu) programme, 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 penetration of nZEB and renewable energy use within existing national building stocks;
- The project on Implementing nearly Zero-Energy Buildings (nZEB) in Romania, National definition and roadmap, developed by BPIE (http://bpie.eu/low_energy_buildings_east_eu.html);
- The project called "*Build Up Skills Romania – Analysis of the National Status Quo*", co-ordinated by the National R&D Institute for Construction, Urban Planning and Sustainable Territorial Development "Urban-Incerc" (INCD URBAN-INCERC) (http://www.buildupskills.eu/național-project/romania; http://www.iee-robust.ro/);
- Romania's Second National Action Plan for Energy Efficiency;
- Romanian Statistical Yearbook;
- Census data.

PHASE 2 – APPRAISAL OF TECHNICAL AND ECONOMIC POTENTIAL

2.1. Overview of the existing building stock

In Romania, the total building floor area is of 493 000 000 m², 86 % of which are accounted for by residential buildings. Of the 8.1 million of 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)

The below can be stated with reference to the residential sector:

- 88.5 % of dwellings are permanently inhabited;
- Almost half of the total number of all homes (47.5 %) are located in rural areas, which means that the proportion of rural population in Romania above the European average;
- In rural areas, 95 % of dwellings are individual family houses;
- In urban areas, 72 % of dwellings are located in multi-family houses (which comprise an average of 40 apartments per block of flats);
- Over 60 % of the block of flats are 4 storeys high, while 16 % are 10 storeys high;
- The dominant form of tenure is private ownership, which represents 84 % of the total building stock, 1 % being public property, and the remaining 15 % of the buildings are owned in some form of mixed ownership;
- Multi-family dwellings have an average heated area of 48 m², which compares with 73 m² 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, as presented in Figure 5. During this period, the vast majority of residential buildings in Romania were built without there being 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, therefore, 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 housing consumes an average of 24 % more energy per m² as opposed to a flat (apartment) within a block of flats[11].

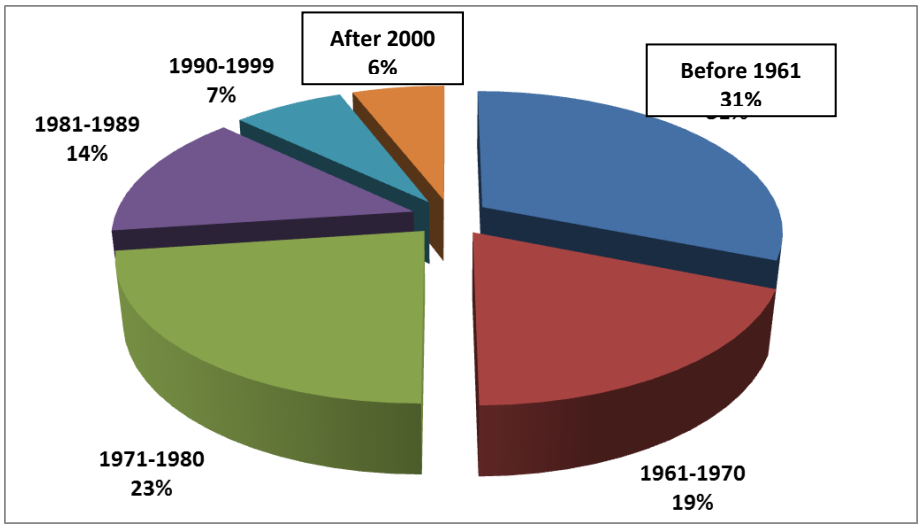


Figure 5 – Age profile of residential buildings (dwellings), by year of construction
(Source: Romanian National Institute of Statistics [12], INCD URBAN-INCERC[13])

[11] BPIE estimates based on the survey conducted for the BPIE report called *"European Buildings under the Microscope"*, 2011.

[12] Romanian National Institute of Statistics (2002–2011). Web Page: TEMPO-Online time series, Economic Statistics, www.insse.ro;

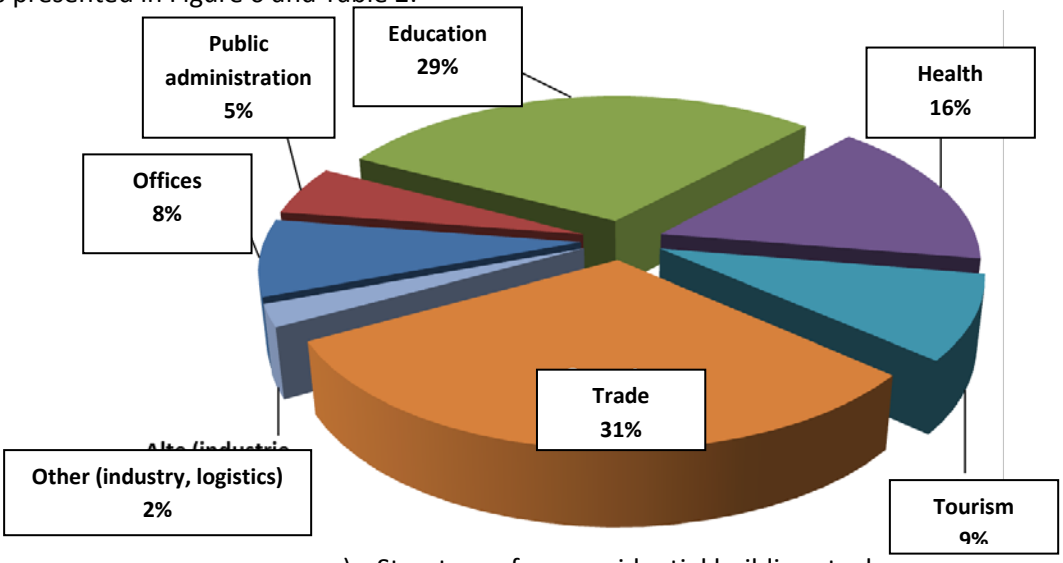
[13] The project called *"Build Up Skills Romania – Analysis of the National Status Quo"*, http://www.buildupskills.eu/national-project/romania; http://www.iee-robust.ro/

Year of construction	Thermal characteristics U [W/(m²K)]		Final energy consumption (kWh/m² 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

Table 1 – Energy performance characteristics – residential buildings

(Source: INCD URBAN-INCERC)

The total area of non-residential buildings is 67 200 000 m², and the structure of the non-residential building stock is presented in Figure 6 and Table 2:



a) Structure of non-residential building stock

Figure 6 – Breakdown of the building stock according to building categories (m²)

(Source: Romanian National Institute of Statistics[14], Colliers[15], INCD URBAN-INCERC[16], BPIE Data Hub[17])

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 %

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

(Source: BPIE data platform)

[14] Romanian National Institute of Statistics (2002–2011). Web Page: TEMPO-Online time series, Economic Statistics, www.insse.ro;

[15] Romania Real Estate Review (2011), Colliers International, Bucharest, Romania, www.colliers.com/country/romania/

[16] The project called *"Build Up Skills Romania – Analysis of the current situation"*, http://www.buildupskills.eu/national-project/romania; http://www.iee-robust.ro/

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

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

Building category	Thermal characteristics U [W/(m²K)]		Final energy consumption (kWh/m² 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

Table 3 – Energy performance characteristics – non-residential buildings

(Source: INCD URBAN-INCERC)

Energy systems

Three main heating sources are highlighted: biomass, gas and district heating system (Figure 7). Three out of four single-family houses have a biomass heating system, while over half of the multi-family houses are connected to a district heating network. Almost all (92 %) of the energy supplied by the district heating network is delivered through cogeneration systems (CHP)[18]. 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 %).

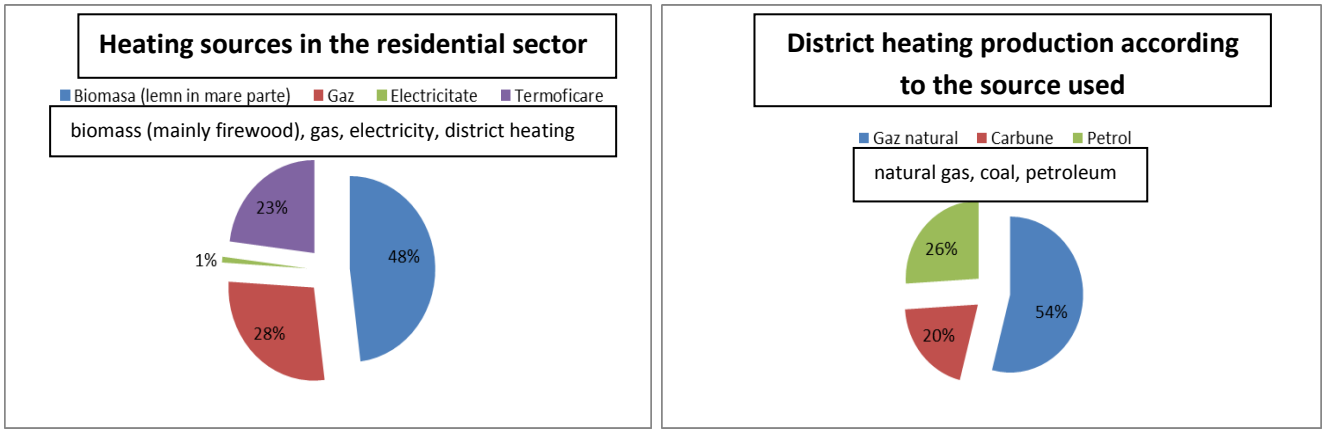


Figure 7 – Source of heating in the residential sector (Source: BPIE's Data Hub)

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)[19]. In rural areas, heating of individual rooms is still widespread, mainly by burning wood in furnaces. 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 encountered in the old district heating systems, such as reduced efficiency (an improvement potential of 30 %), high carbon footprint and increasing prices (determined also by the ongoing policies for the reduction of heating subsidies)[20]. There is a general absence of metering systems in both multi-family houses and at individual level. However, there is an ongoing programme aimed at improving district heating networks and to metering and controlling systems for heating, which reduced the number of disconnections from the network (PNAEE Romania).

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

[18] Euroheat & Power statistics http://www.euroheat.org.

[19] Please consult the website of the project called TABULA: http://www.building-typology.eu/

[20] 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

Energy supply composition 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	713.84 M€
Share of citizens served by district heating	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	14.54 €/GJ
Number of district heating utilities	89
Total installed district heating capacity	13 619 MWth
Total investment in district heating	168 M€
Estimated employment figures in district heating sector	19,360
District heated floor space	55 590 000 m^2
New connections to district heating	166,000
CO_2 emissions per TJ of District Heat generated	81.7 tons CO_2/TJ
Total heat demand	243 367 TJ
Total share of CHP of national electricity production	10.9 %
CHP heat autoproduction	89 TJ
Average energy use of buildings per m^2	0.883 GJ/m^2

TABLE 4 – Use of district heating networks in Romania in 2011, except if otherwise indicated
(Source: Euroheat & Power)

As far as air-conditioning systems are concerned, these are becoming more widespread in the residential sector: the share of dwellings equipped with an air-conditioning system has risen from a 0.4 % in 2000 to 5 % in 2010. On the other hand, an increase in the household use of renewable energy heating was observed. According to the EurObserv'ER barometer concerning renewable energy[21], the total installed solar-thermal collectors area in 2010 in Romania was at around 144 000 m², registering a 38.4 % increase compared to 2009. 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 state of the buildings, mainly as a result of the neglect of repairs, in particular, in the case of multi-family houses in urban areas, and partially, in the case of single-family houses in rural areas[22], approximately **58 % of the existing multi-family houses (about 2.4 million apartments) built before 1985 require rehabilitation and thermal modernisation.**

[21] 12 EurObserv'ER (2011): The state of renewable energy in Europe. 11th EurObserv'ER Report, available at: http://www.energiesrenouvelables.org/observer/stat_baro/barobilan/barobilan11.pdf
[22] UN ECE 2001; TrainRebuild 2012.

Non-residential sector

Non-residential buildings represent 18 % of total floor area. This includes most of Romania's public buildings[23], amounting to some 5 % of the total building stock. Public administration, educational and commercial buildings together represent approximately 75 % of non-residential energy use (fig 9), each representing 20-25 % of the total. Premises occupied by public administration institutions, educational and commercial buildings jointly represent about 75 % of the non-residential energy consumption (Figure 8), each one of them representing 20–25 % of the overall value.

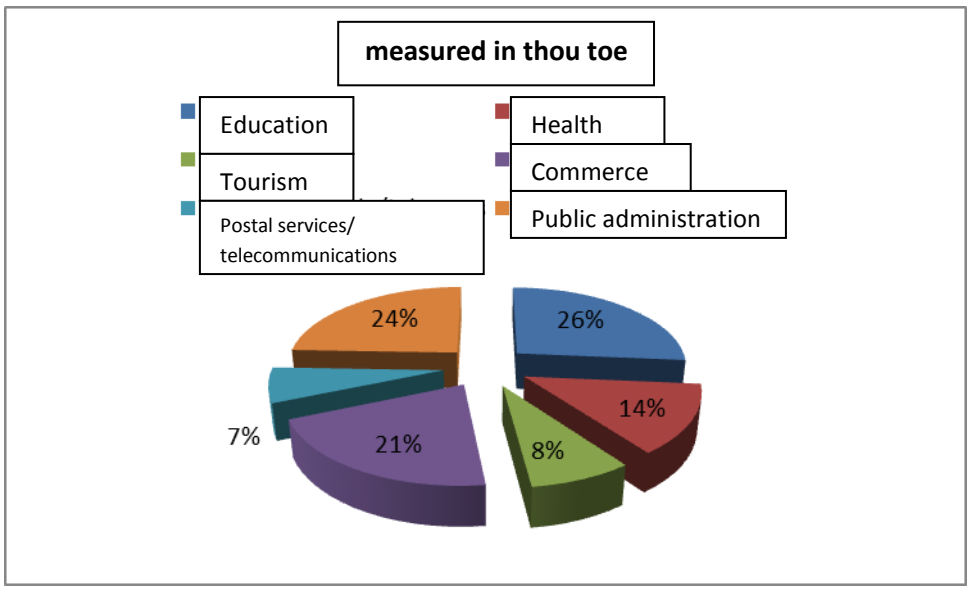


Figure 8 – Distribution of final energy consumption by type of non-residential building
(Source: INCD URBAN-INCERC)

In terms of energy performance, educational buildings (354 kWh/m^2 per annum) stand out as the highest consumers of energy, with other sectors in the range 200–250 kWh/m2 p.a. (Figure 9).
Note that these figures represent total energy use, inclusive of 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 fixed lighting. The energy use of appliances and other plug loads is covered by other policy areas, notably eco-design and sustainable procurement.

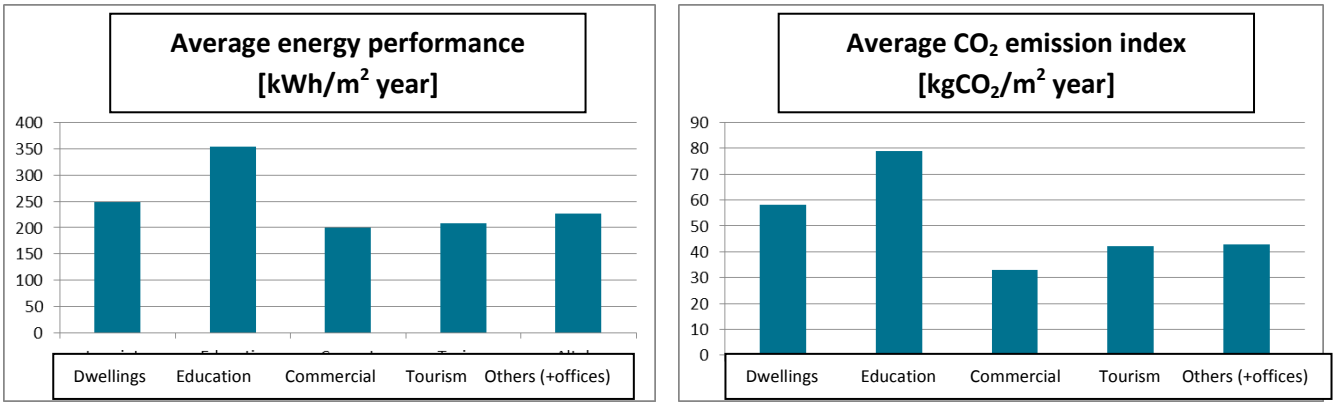
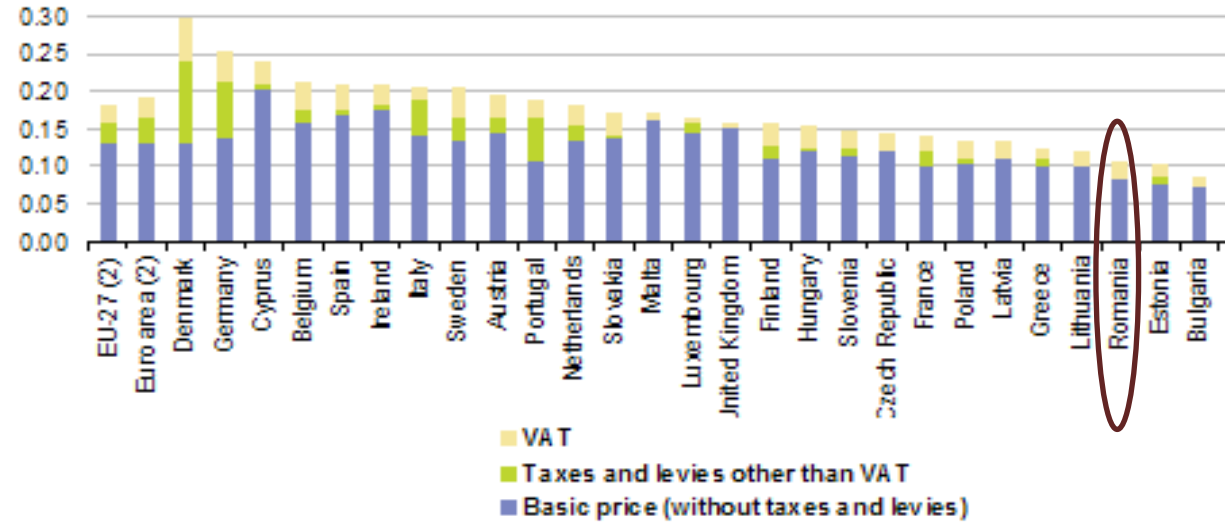


Figure 9 – Energy performance and CO_2 emissions by building sector
(Source: INCD URBAN-INCERC)

[23] Publicly owned housing is almost non-existent in Romania.

Energy prices

Romania currently enjoys among the lowest price of energy across the EU, due to subsidies on both electricity and gas. The comparison is illustrated in figures 10 and 11 below for electricity and gas respectively[24].



(1) Annual consumption: 2 500 kWh < consumption < 5 000 kWh.
(2) Provisional.
Source: Eurostat (online data code: nrg_pc_204)

Figure 10 – Electricity price comparison for households across the EU – 2011
(Source: Eurostat)

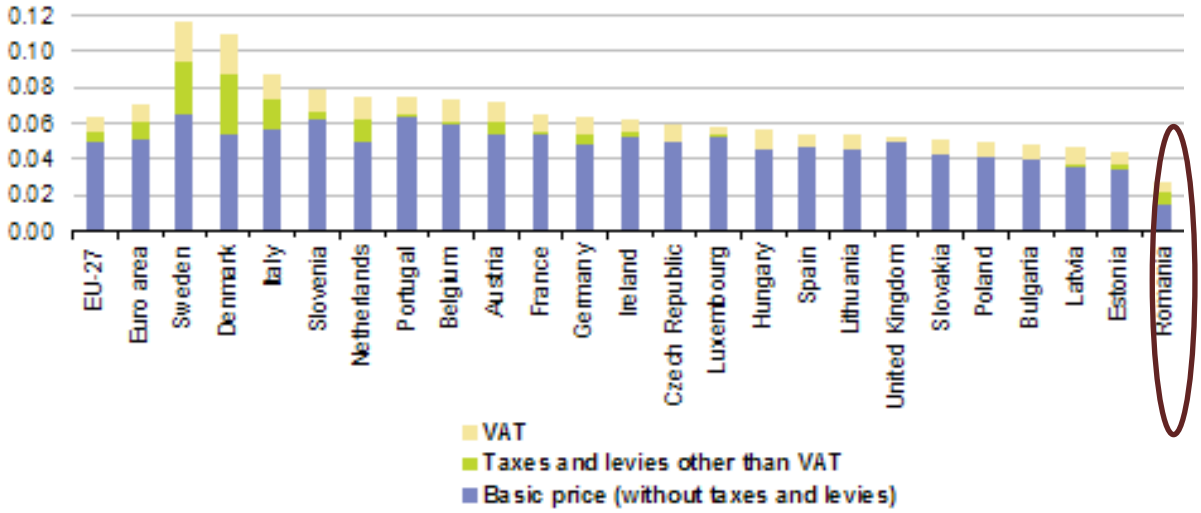


Figure 11 – Gas price comparison for households across the EU – 2011
(Source: Eurostat)

However, regulated prices remain below market prices, reducing the incentive to adopt energy saving measures. ANRE[25] will develop a price comparison tool and 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, BPIE utilised its model that was developed to underpin the analysis of the EU renovation potential, as published in "*Europe's Buildings under the Microscope*"[26].

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

2.2. Identification of solutions for renovation

A renovation model has been developed which allows scenarios to be examined that illustrate the impact on energy use and CO_2 emissions of different rates (*i.e. percentage of buildings renovated each year*) and depths of renovation (*i.e. level of energy achieved*) in the residential and non-residential building sectors up to 2050. The model allows a number of scenarios to be tested to illustrate the financial, economic, environmental, employment and energy use 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 saved;
- CO_2 emission reductions;
- Total investment required to install renovation measures;
- Saving in energy costs;
- Employment impact – the number of full time equivalent jobs created over the period to 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 saving in energy costs and lifetime investment. Both figures are discounted to give net present values;
  - **Net saving to society,** including the value of externalities – the sum of the lifetime saving in energy costs and value of externalities, less the lifetime investment. 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 Modelling 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, (Government buildings make up 5 % of all non-residential buildings[27])
- Commercial and industrial buildings.

There are around 1 million abandoned houses in Romania[28], consequence of strong migration and emigration trends in the 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 dwellings being abandoned 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 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 would prevent the application of further energy savings measures is likely to be very small, of the order of 1 % of the existing stock.

[27] Romania cost optimality study

[28] 2nd NAPEE – Energy Efficiency Action Plan Romania EN – annex 2.4 p. 122.

- **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 HVAC equipment. Also, 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 1990–2012 average useful floor area of finished dwellings. 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) to 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.

Rate of renovation

The main variables concerning renovation rates and considered by this model 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 assumption, this model proposes two main growth pathways: SLOW and MEDIUM. These are benchmarked against a BASELINE which assumes that the current renovation rate remains unchanged from today's rate (assumed to be 1 % p.a.).

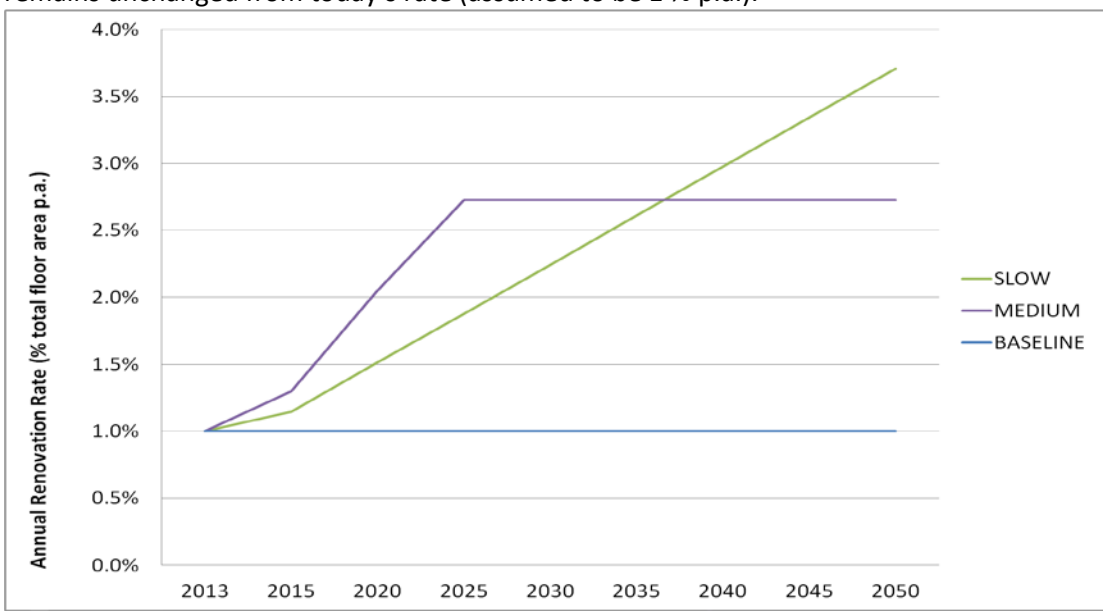


Figure 12 – Modelled pathways for renovation rates

In the case of residential buildings, the chosen rate of renovation is adjusted in order to prioritise the two older age bands (pre-1960 and 1961–1990), of which a great proportion is renovated between now and 2030.

Depth of renovation

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

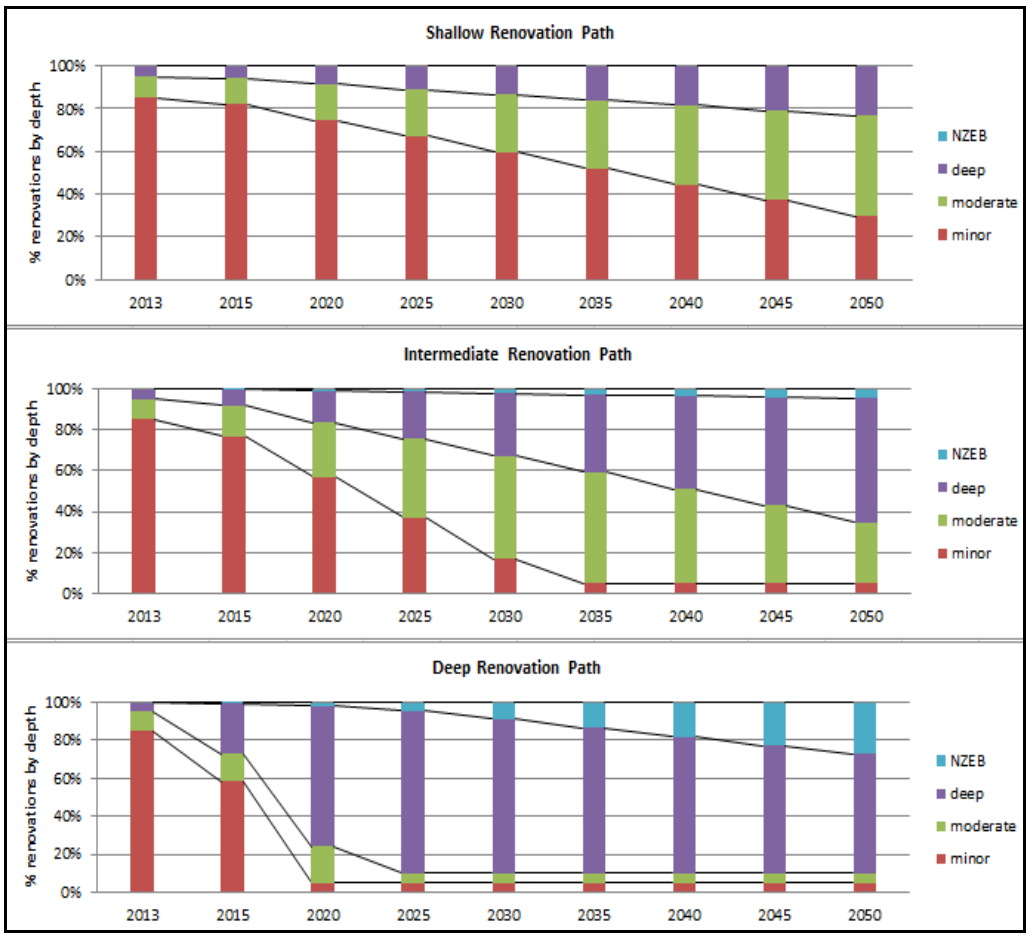


Figure 13 – Renovation type (depth)

RENOVATION MEASURES

In all scenarios, the assumed renovation activity is "technology neutral". In other words, no assumptions have been made regarding specific measures to be installed 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, taking also into consideration the locations in Romania's climatic zones. The package could include a range of measures, including some or all of the following:

- Fabric insulation (walls, floors, roofs)
- Upgrading of windows and doors
- Solar shading – notably to reduce the requirement for air conditioning
- Reducing air infiltration
- Upgrade of HVAC system
- Installation of combined heat and power systems
- Connection to district heating system
- Installation of mechanical ventilation heat recovery
- Upgrade of lighting systems
- Improved controls of the energy used;
- Installation of renewable energy measures (solar hot water, PV, heat pumps, biomass boilers, mini wind turbines...);

Various renovation scenarios can be modelled based on combinations of renovation rates 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 p.a.) and current rates of decarbonisation
- MODEST – assumes the SLOW renovation rate, and the SHALLOW renovation path
- INTERMEDIATE – assumes the MEDIUM renovation rate, and the INTERMEDIATE renovation path
- AMBITIOUS – assumes the MEDIUM renovation rate, and the DEEP renovation path

RESULTS

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

SCENARIO		Baseline	Modest	Intermediate	Ambitious
Energy savings					
Energy saving 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
2050 CO_2 saved (% of 2010)	%	12 %	79 %	83 %	89 %
CO_2 abatement cost	€/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 EU 2050 Low Carbon Roadmap objectives.*

TABLE 5 – Results of scenario analysis

Example: *in Table 6 are presented the energy savings of a building with a specific energy consumption of 211 kWh/sqm/year and the energy performance following the application of the various energy efficiency scenarios.*

Renovation type	Energy saving (%)	Annual specific energy saving (kWh/m^2/an)	Resulting energy performance (kWh/m^2/an)
Minor	15 %	32	179
Moderate	45 %	95	116
Deep	75 %	158	53
nZEB	95 %	200	11

TABLE 6 – Energy saving and resulting energy performance by renovation depth for nominal average Romanian building consuming 211 kWh/m^2/year

THE FINANCING OF THE MEASURES

It can be seen that, when considered over the economic life of the measures, all scenarios are cost effective in that the present value saving 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 among, coupled with low levels of motivation and awareness.

EU funds for energy efficient renovation of buildings[29]

Buildings are at the heart of the EU's strategy to achieving smart, sustainable and inclusive growth by

[29] Adapted from the Renovate Europe Campaign leaflet on Structural Funds: http://www.renovate-europe.eu/uploads/Renovate%20Europe%20Structural%20Funds%20Leaflet.pdf

2020. Investing in energy efficient renovation of the EU 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 encourage investments also 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).

To maximise project impact on the ground 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*"[30]. The European Commission's webpage "*Financing Energy Efficiency*"[31] provides additional information on sources of finance.

As far as the Regional Operational Programme – financed from the European Regional Development Fund – is concerned, for the period 2014–2020 it includes a Priority Axis 3 – Energy efficiency in public buildings to which there have been allocated 300 million euros. This support from the European Union has the purpose of supporting energy efficiency and the use of renewable energy in public infrastructure, including in public buildings, and in the housing sector. The main expected results to be achieved through the promotion of investments with a view to improve energy efficiency in public buildings are the reduction of primary energy consumption in buildings, alongside the reduction of greenhouse gas emissions.
Furthermore, for the period 2014–2020, for Priority axis 4 – Urban development support, which has among its investment priorities the support of energy efficiency and use of renewable energy in public infrastructure, including in public buildings, and in the housing sector, was allocated 852.63 million euros.

[30] http://ec.europa.eu/energy/efficiency/studies/doc/2014_guidance_energy_renovation_buildings.pdf
[31] http://ec.europa.eu/energy/efficiency/financing/financing_en.htm

PHASE 3 – POLICY APPRAISAL

3.1. Policies and incentives for the renovation of existing buildings

Romania has several policies affecting energy use, these include the following:

- The energy roadmap for Romania (GD 890/2003) aiming at a final electricity consumption of 57.59 TWh in 2015;
- The strategy on renewable energy sources (GD 1535/2003) reinforced by the Renewable Energy Action Plan under the RE Directive;
- The national strategy on energy efficiency (GD 163/2004) integrating the National Energy Efficiency Action Plan under the ESD;
- The national strategy on the heating supply of localities through district generation and distribution systems (GD 882/2004);
- The national programme „Heating 2006–2015 heat and comfort" (GD 462/2006) for rehabilitation of the district heating systems and thermal rehabilitation of buildings;
- The National Development Plan 2007–2013, in conjunction with ERDF sectorial 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 (GD 1069/2007) aiming to reach 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 (GD 1460/2008).

Romania's energy strategy for 2007–2020 includes forecast of the energy consumption made in 2007. However, such forecasts do not consider the influence of the economic crisis. The main measures of the strategy related to buildings are:

- Intensifying the information campaigns of the population and of the business environment;
- Continuing the "Heating 2006–2015 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 2011–2015
- 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 by the central and local public authorities of legislation on energy efficiency and the promotion of the final consumer use of energy from renewable sources.

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 a building energy renovation strategy. It requires a strategic appraisal of the barriers that have held back the market thus far, and a concerted effort to address those barriers in a co-ordinated fashion. The challenge is to design 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 instruments such as taxation, tax breaks or other incentives plays a very important role in sending signals to consumers as well as to market actors. Rules governing treatment of energy service companies (ESCOs) are important in determining whether or not a country has a thriving market for third party financing;
- **Energy**: Policy is usually dominated by supply-side concerns. Consequently, the role of demand side measures such as energy efficiency in buildings is often overlooked or underplayed, yet various international studies have shown that the energy saved through demand-side measures can be comparable to, or even exceed, the energy supplied by individual fuels.
- **Economy**: The economic crisis still having a significant impact on the economy, and the view that measures to improve the environment are somehow 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 these 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 of national concern to Romanians. 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 housing stock.
- **Regional Development**: Regeneration and other regional development initiatives are often associated with cosmetic and infrastructure improvements, though 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 suffering problems such as under/overheating, condensation, mould growth and internal air pollution leads to significant health issues which has a cost to the nation in terms of lost working days and impact on health services.

3.3. Barriers

Three main types of barriers have been identified as being of most relevance to the building sector[32]:

- Legal/Strategic
- Economic
- Skills, employment and education system

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

BARRIER TYPE: Legal/Strategic
There are a number of ministries with overlapping 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
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

TABLE 7 – Appraisal of barriers (simplified)

3.4. Developing policy solutions

Introducing an obligation scheme for 2014–2016 may be considered as an option only in the event that the impact on energy prices[33] and best practices[34] show the significant benefits that can be achieved, and the net benefits to consumers far outweighs 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;

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

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

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

- Conducting energy audits;
- Training of energy auditors;
- Consumer awareness-raising and advice campaigns, to raise awareness among households of the benefits of energy audits through energy advisory services in building energy;
- Regulations or voluntary agreements;
- Supporting the development of ESCOs, including developing the regulatory framework for the effective operation of the ESCO, developing the market of these companies and promotion of energy performance contracts by 2016.

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

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

TABLE 8 – Policy actions to underpin the renovation strategy

	LISTĂ INDICATIVE LIST OF POLICY INITIATIVES[35] (non-exhaustive)	APPLICABILITY IN THIS RENOVATION STRATEGY
Strategies	Establish support for deep renovation of the building stock	**High** – cross party and cross-society support for a renovation programme will help establish a climate that provides longer term certainty and confidence in the market
	Undertake 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
	Establish objective to eradicate fuel poverty through enhancing energy performance of the housing stock.	**High** – Addressing the poor energy performance of housing of the many disadvantaged Romanian citizens would be a major boost to their quality of life
	Develop 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
	Establish 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
	Demonstrate leadership through accelerated deep renovation of public buildings, thereby developing supply chain capacity and providing a knowledge base for private/commercial renovation activity	In addition to the 3 % p.a. Central Government target (Article 5 of EED) from 2014, **serious consideration** should be given to implementing a similar objective in the remainder of the public sector, commencing in 2015

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

	INDICATIVE LIST OF POLICY INITIATIVES (non-exhaustive)	APPLICABILITY IN THIS RENOVATION STRATEGY
Legislative & Regulatory	Identify trigger points and develop respective regulation that could be used to encourage, or require, building energy performance improvement[36]	**High** – Any intervention in a building should be used as an opportunity to maximise the improvement in energy performance of a building element or technical system
	Design energy efficiency obligations that encourage the delivery of deep renovation	This should be considered a **top priority** action for the next period
	Facilitate the upgrade of all social housing to high energy performance levels	Not a priority given the limited amount of social housing in Romania
	Address restrictive practices concerning local deployment of low/zero carbon technologies to ensure that a positive environment for buildings integrated renewables is established	**High** – buildings integrated renewables should be actively supported, within the bounds of EU state aid rules
	Remove 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
	Mandate 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	To be considered in the next period

[36] Example trigger points include: 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 POLICY INITIATIVES (non-exhaustive)	APPLICABILITY IN THIS RENOVATION STRATEGY
Technical	Develop renovation standards that are progressively and regularly strengthened in response to experience and new technological solutions	As required by EPBD
	Analyse potential for district heating systems to provide efficient, low carbon energy	**High** – take 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
	Ensure proper monitoring and enforcement of compliance with building codes	As required by EPBD
	Develop packaged solutions that can be readily replicated in similar building types	Establish database of technical solutions that serves as a learning point for future projects/investments
	Introduce quality certification for installers and products	As required by EPBD
Fiscal/Financial	Secure 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** – maximise the application of EU Cohesion and Structural Funds under the 2014–2020 budget to deep renovation of buildings.
	Consideration of monetary value of co-benefits (e.g. health, employment) in public funding decisions	**High** – Establish 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
	Develop 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
	Develop mechanisms to encourage deep renovation via third party financing (TPF) e.g. ESCOs, EPCs	**High** – develop the regulatory framework for effective operation of the ESCO, developing the market of these companies and promotion of energy performance contracts by 2016
	Strengthen energy/carbon pricing mechanisms to provide the right economic signals	For consideration in the next period, once fossil subsidies have been largely removed
	Remove fossil fuel subsidies to eliminate perverse incentives that discourage investment	In hand – existing subsidies for electricity, gas and district heating being progressively phased out
	Consider ”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 POLICY INITIATIVES (non-exhaustive)	APPLICABILITY IN THIS RENOVATION STRATEGY
Communication / Capacity Building	Establish 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
	Gear up skills and training programmes covering the key professions and disciplines	**High** – implement findings from projects on the upskilling of installers in renewable energy
	Establish 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
	Encourage development of local supply chain industry for maximising macro-economic benefits and to minimise embedded CO_2 emissions	**High** – Maximise the economic potential for new employment in the manufacture and supply of low carbon solutions
	Develop 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
	Communicate regularly and publicly on progress with the renovation strategy	**High** – Maximise the economic potential of the effective engagement with building owners in both residential and non-residential sectors
R&D	Support 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	Review 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

Renovating Romania represents a major opportunity to modernise Romania's building stock in a sustainable way that provides multiple benefits for households, business and the public sector. A strategic approach, as outlined in this report, will stimulate the market in a way that current piecemeal initiatives have failed to do so.

This strategy sets out a long term framework for the renovation of the nation's building stock to very 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 European funding sources available that need to be brought to bear, and the Energy Efficiency Investment Fund should be designed to make it easier for those who invest in building renovation.

The policies which are considered the most important in the next three year period are identified below.

- Ensuring support for a national programme to renovate Romania's building stock;
- Introducing, as a matter of priority, in thermal rehabilitation programs the housing of disadvantaged people, which would result in a major boost to their quality of life;
- Ensuring a 3 % renovation rate for central public administration buildings;
- Establish high performance requirements for replacement building elements and technical components such as heating ventilation and air-conditioning systems;
- Provide support for the use of renewable energy in buildings;
- Continue improvement in the efficiency and public acceptability of the large number of existing district heating systems;
- Develop an Energy Efficiency Obligation (EEO) scheme to support deep renovation for the period from 2017 onwards;
- Maximise the application of EU Cohesion and Structural Funds under the 2014–2020 budget to deep renovation of buildings;
- Design the Energy Efficiency Investment Fund as the main funding vehicle for renovation;
- Develop the regulatory framework for effective operation of ESCOs, develop the market of these companies and promote energy performance contracts;
- Modify restrictive tenancy laws which impose disincentives or otherwise inhibit energy performance improvement;
- Encourage development of a home-grown local supply chain industry for the supply and installation of retrofit measures;
- Develop promotional and dissemination activities that sensitise building owners to opportunities for deep renovation and that provide stepwise support throughout the renovation process;
- Establish a stakeholder forum (comprising the organisations identified in this report) to assist in the implementation and ongoing refinement of the strategy.

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[37], which were appraised based on the INVERT (TU Viena) and EE Lab (Fraunhofer ISI) simulation programmes, while the macro-economic evolution developed in the project was elaborated using the POLES (ENERDATA) model.

[37] www.entranze.eu

According to the project results for Romania, three sets of policies for buildings were identified, which correspond with the three scenarios with the potential of achievement, as follows:

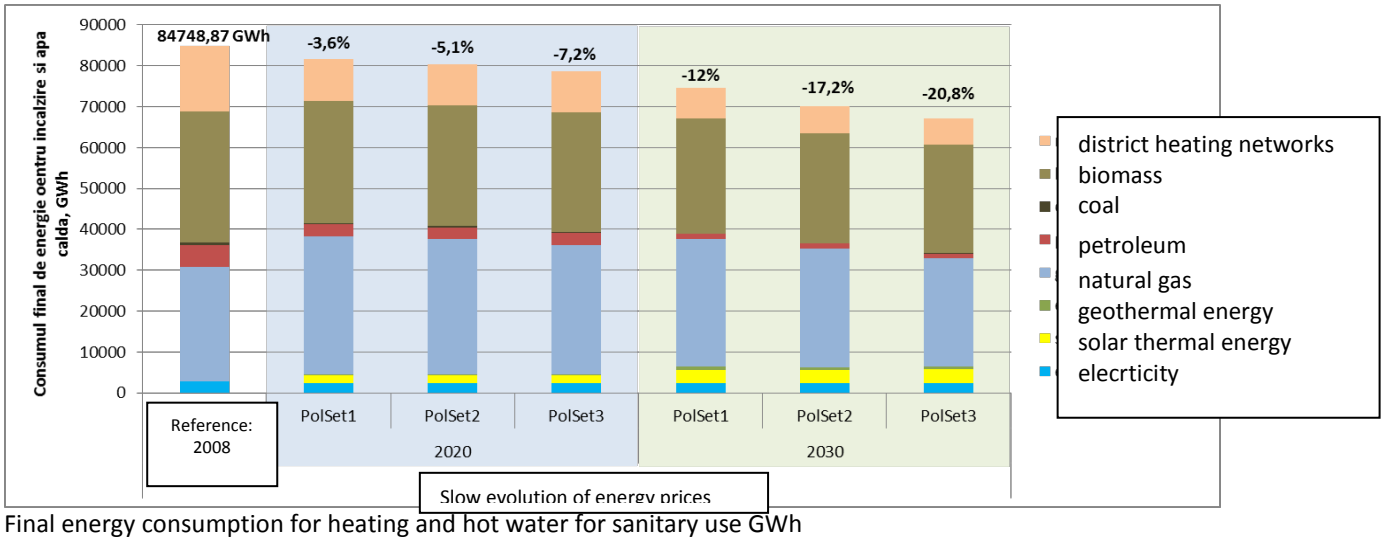
- **Policy set 1 (PS1) – BaU ('business as usual')**
- **Policy set 2 (PS2) – Growing-up**
- **Policy set 3 (PS3) – Market transformation**

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:

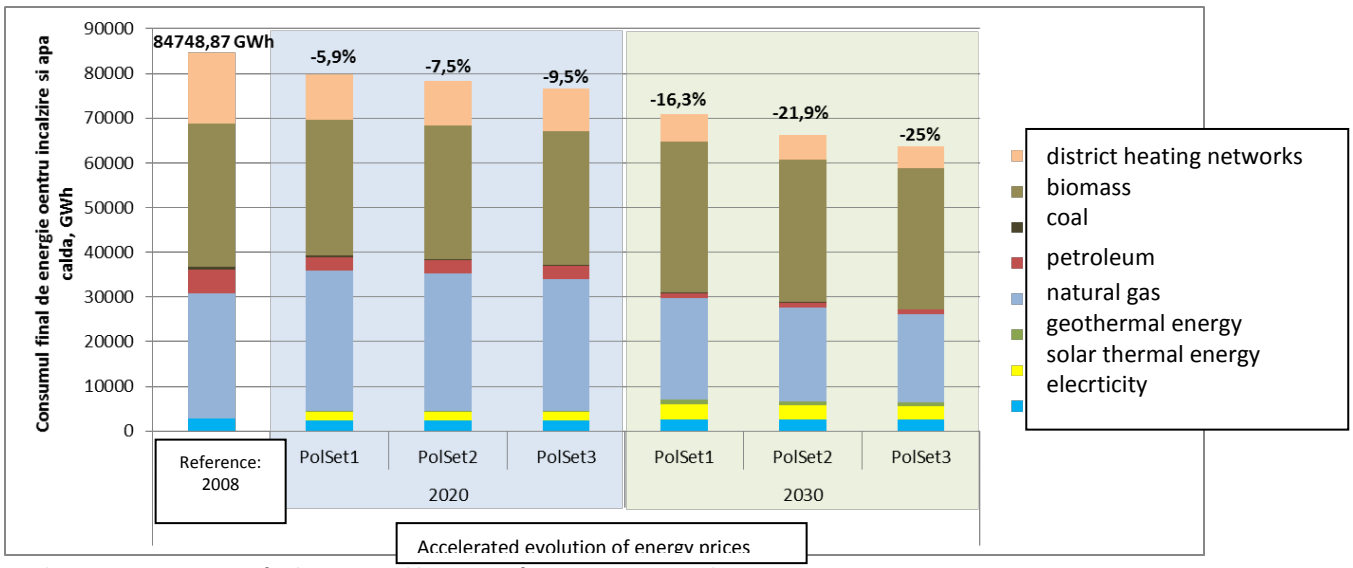
1. Technical regulations/energy performance requirements;
2. Education, training, qualification and compliance/quality control;
3. Information, motivation and guidance
4. Economic instruments in support for building renovation;
5. Measures on primary energy, industry, research, technology and development;
6. Evolution of energy prices in the EU, namely:
   a) slow evolution of energy prices – Figure 14;
   b) accelerated evolution energy prices – Figure 15.

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



Final energy consumption for heating and hot water for sanitary use GWh

Figure 14: 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



Final energy consumption for heating and hot water for sanitary use GWh

Figure 15: 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 higher 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 integration.

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 incomes 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 the fuel import/ exploitation 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 to 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/m2/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 in the transformation of the Romanian building stock, provided they are allocated and used with care.

Support instruments/programmes need to have a 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

In the following are presented the energy consumption targets for the below building categories subject to renovation:

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

The minimum energy consumption values proposed for the above mentioned building categories subject to renovation are expressed in primary energy, and the share of renewables is already included in the proposed values and are presented in Table 9.

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 with climatic zone II, namely with Bucharest – climatic zone representative for Romania.

Table 9: Maximum specific energy consumption per year (compliance with the minimum energy performance requirements) for buildings in Romania [kwh/m^2/annum 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**
Single-family houses	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 %
Individual 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 %
Office buildings, schools, hospitals and 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 %
*heating energy only **energy consumption according to EPBD (energy for heating, cooling, ventilation, household hot water, auxiliary and lighting equipment, for non-residential buildings)							

The analysis conducted 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 the context of an accelerated evolution of energy prices, all simulated policy sets produce high energy savings by 2030. SP3 contributes to the reduction by a quarter of the final energy consumption in buildings.

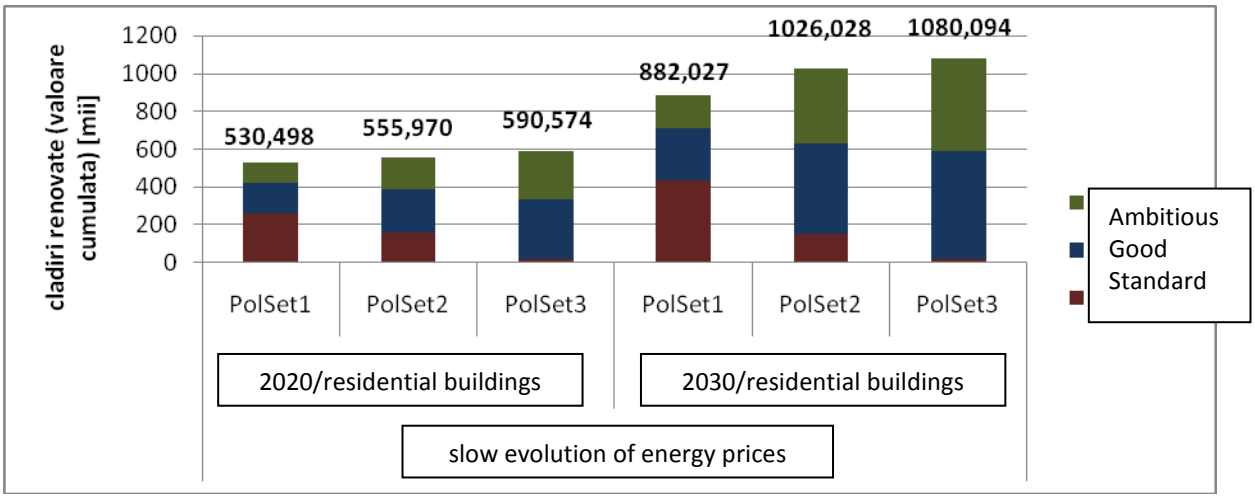
As far as the energy mix in the final energy consumption for heating and hot water is concerned, the modelling of the three policy scenarios led to the following results:

- 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 up 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 necessity through the national programme for the rehabilitation of blocks of flats.
- Solar thermal energy registered a sensible 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 relative to the energy generated in the context of an accelerated evolution of energy prices (namely from 32060 GWh in 2008 to 33754–31433 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 that is from approximately 33 % in 2008, with a slight rise (up to 39 %–41 %) by 2020, but later dropping

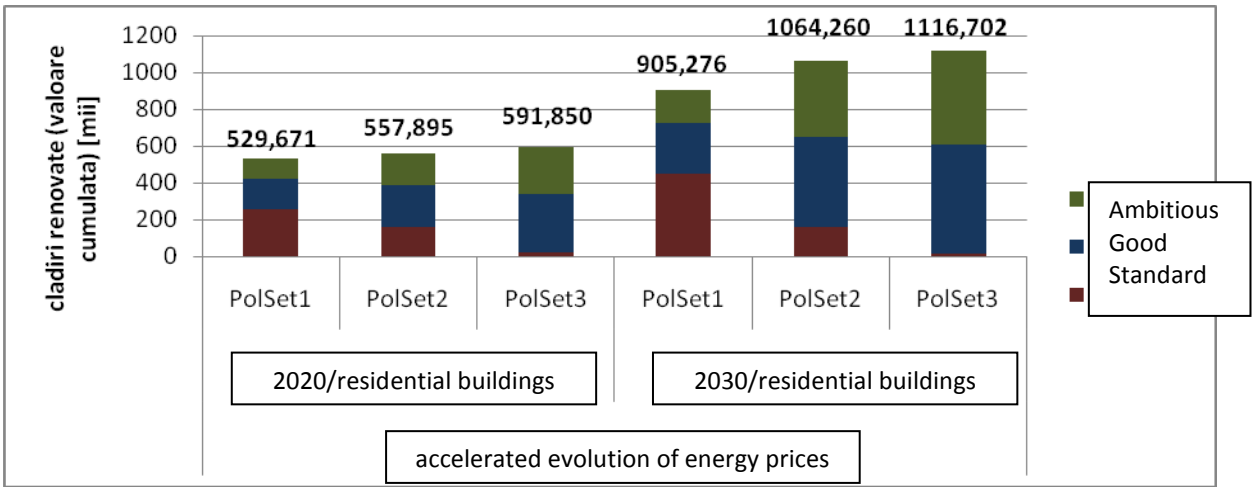
to 30 %–39 % by 2030. The highest reduction is registered in the context of an accelerated evolution of energy prices in the case of the PS3 policy set.

- 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 16 and 17.

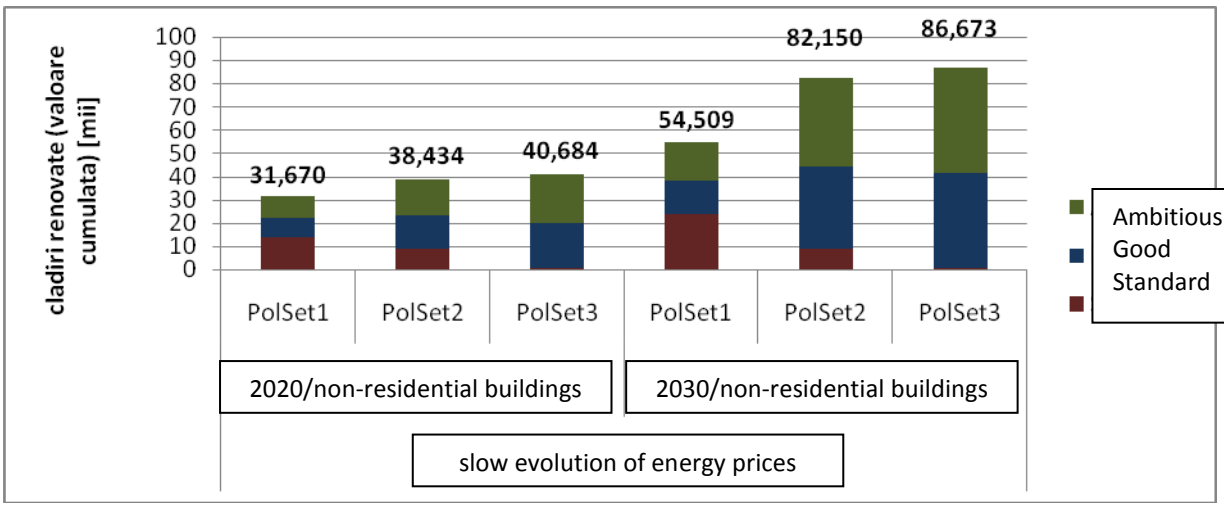


- renovated buildings (cumulative amount) [thousand]

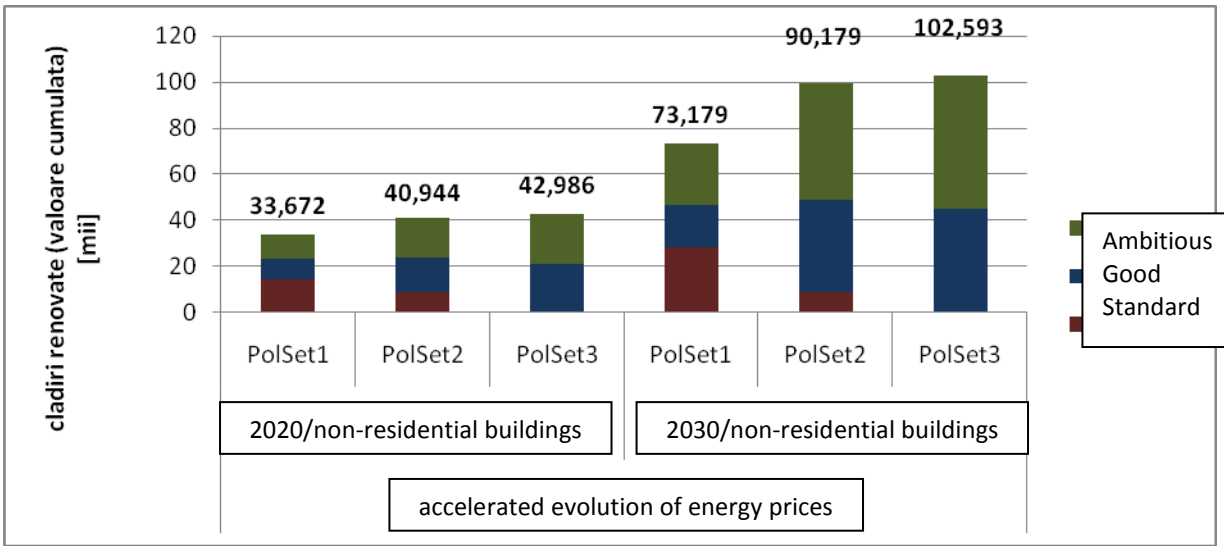


- renovated buildings (cumulative amount) [thousand]

Figure 16: Evolution of the number of renovated residential buildings in all three scenarios, at different renovation levels and in the context of the two types of evolution of energy prices



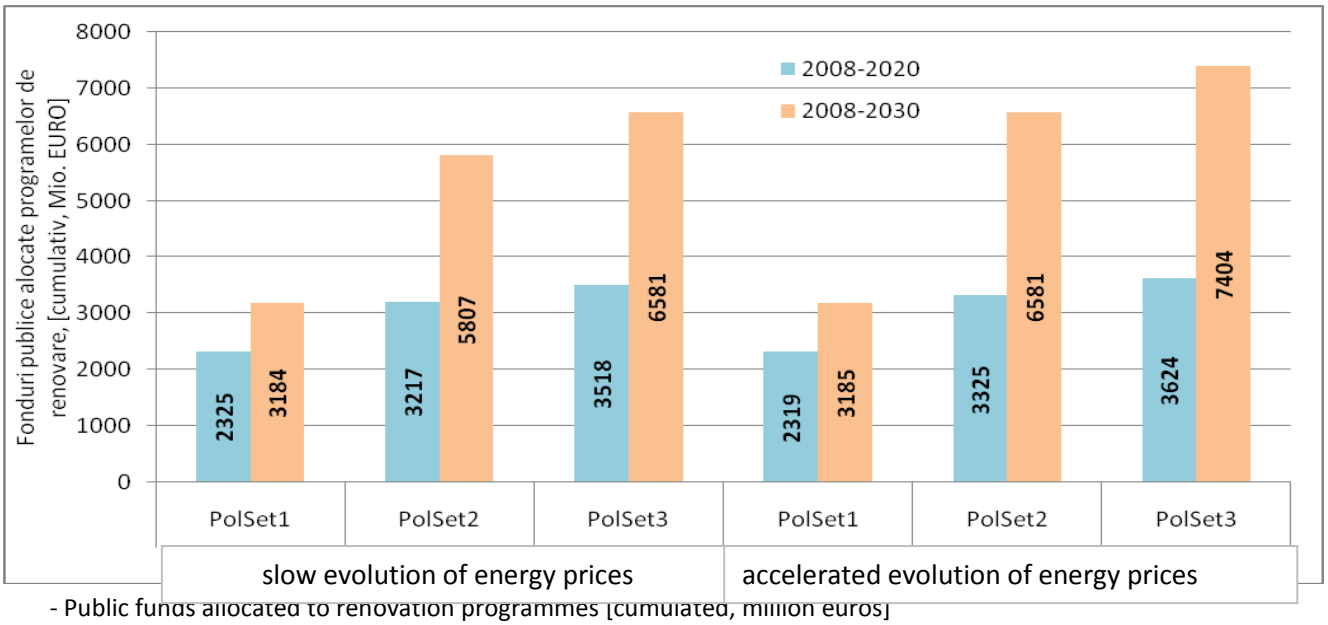
- renovated buildings (cumulative amount) [thousand]



- renovated buildings (cumulative amount) [thousand]

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

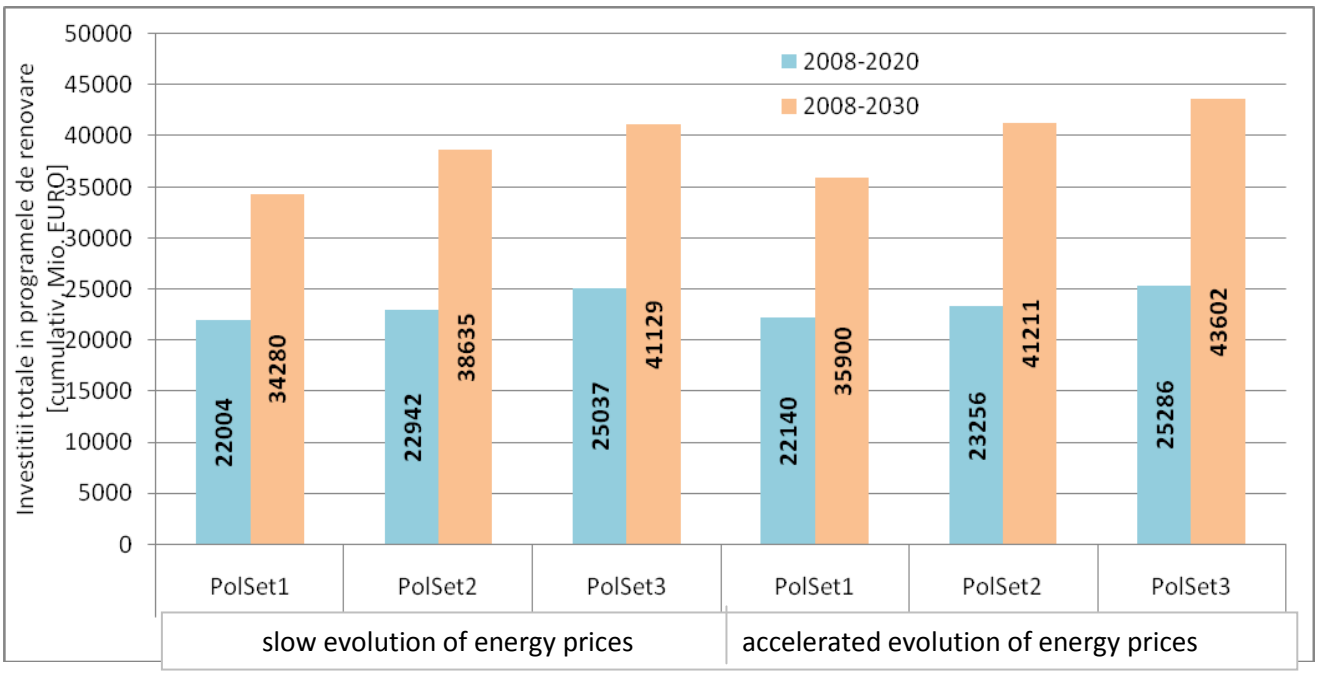
The level of the estimated required public funding (by the modelling conducted within the ENTRANZE[38] project) for implementing the proposed policy sets is between 3.2 billion euros and 7.4 billion euros by 2030, that is an estimated annual average of 144 and 336 million euros (Figure 18). The public funding includes national, local and European sources of funding.



- Public funds allocated to renovation programmes [cumulated, million euros]

Figure 18: Public funds allocated to renovation programmes (values cumulated for the appraisal period)

The level of the overall investments attracted corresponding with the proposed policy sets is between 34.3 and 43.6 billion euros until 2030, that is, an estimated annual average of between 1.56 and 2 billion euros (Figure 19). As it turns out, the funds allocated to renovation programmes from public and EU budgets results in a 6 to 10 times more investments for building owners and local administrations.



- Overall investments in renovation programmes [cumulated, million euros]

Figure 19: Overall investments that could be attracted in renovation programmes (values cumulated for the appraisal period)

[38] www.entranze.eu

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

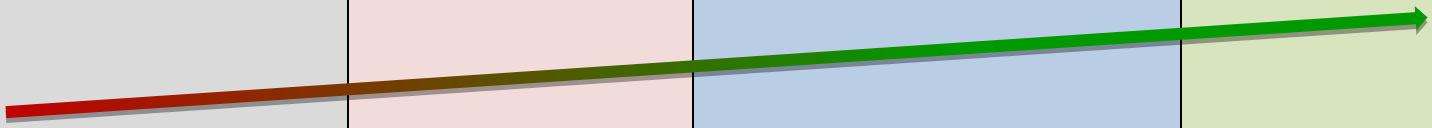
Compliance (verification/control/workers) of buildings with energy performance requirements is vital for buildings with a very low energy consumption. The quality of execution becomes a key factor, otherwise it is possible that the result will be an expensive building with low energy performance. Therefore, 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, including also architects, designers and engineers involved in the construction/renovation process of the buildings.

Furthermore, it is important to promote greater awareness among all involved stakeholders, including the wider public (namely homeowners) 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 10) include measures for boosting compliance, education and up skilling of workforce and information-guidance of involved stakeholders.

Table 10: 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 and qualification	BUILD-UP Skills Strategy and QualiShell Training programmes through European projects (officially unintegrated 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 2015, 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 2015 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. Limited information actions performed by associations of municipalities, cities, energy cities.	A better information and awareness raising, mainly through 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 other programmes. Development and promotion of several demonstrative projects in larger urban areas for the main types of residential and non-residential types of 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 residential buildings, funded from national funds and EU structural funds, in order to achieve a specific annual consumption for heating of less than 100kWh/m^2/year. Total budget of the programme: approximately 304 million EUR (approximately 50/50 of national/EU budgets, to which a 40 % contribution from the local/municipal (CB) is added). Programme for the renovation of residential buildings financed through bank loans with government guarantee: • Current term of loan is 5 years. • Budget: depending on requests, 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 200 million RON/year (~44	The same evolution of the existing programmes, showing a sensible increase in budgets. The same approach, based on budgets established on a yearly basis. The national multiannual programme for the improvement of energy performance of blocks of flats will be allocated a global multiannual budget of approximately 600 million EUR by 2020 and of 400 million by 2030.	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; up to 25 % in 2030. • Low-income families would receive more than the rest (namely from currently 80 % → 70 % in 2015, up to 55 % in 2020 and 35 % between 2020 and 2030) • Budget: A global budget of 1 billion EUR by 2020 and a global budget of EU funding of 700 million EUR 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 term of loans 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. 100 million EUR	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, up to 25 % in 2020 and 15 % between 2020 and 2030. • Low-income families would receive more (currently 80 % → 60 % in 2015; up to 35 % in 2020 and 25 % between 2020 and 2030) Budget: A global budget of 1 billion EUR by 2020 and a global budget of 700 million EUR 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 term of loans 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; • An annual budget of 120 million EUR

	million EURO/year), half of which is for residential buildings and the other half for public buildings) Programmes similar to the multiannual 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 multiannual programme, carried out by some of the municipalities (up to 5 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. 150 million EUR by 2020 and 100 million EUR/year by 2030 (until 2020, 100 million EUR are allocated for non-reimbursable funding and 50 million EUR in an ESCO fund, while until 2030, 75 million EUR are allocated for non-reimbursable funding and 25 million EUR in an ESCO fund). The Casa Verde Programme is only for new buildings and facilities are allocated 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: 75 million EUR/year by 2020 and 20 million EUR/year by 2030 • public sector: 75 million EUR/ year by 2020 and 20 million EUR/ year by 2030	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. 150 million EUR by 2030 (100 million EUR are allocated for non-reimbursable funding and 50 million EUR in an ESCO fund) The Casa Verde Programme is only for new buildings and facilities are allocated depending on energy performance and RES for heating/cooling, but not exclusively (more or less passive buildings with 55kW and 40kW – PassivHaus). Budget: • residential sector ~100 million EUR/ year by 2030 • public organisations ~100 million EUR/ year by 2030
Development of capacities, qualification and ensuring quality	There are no dedicated programmes for the energy performance qualification of buildings. The Build-Up Skills ROBUST and Quali-Shell projects for the	As of 2015, a qualification programme for the building sector will be introduced with the aim of adhere 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 categories (architecture, civil

	identification/development of needs concerning the qualification/training in professions related to building renovation.			engineering, workers).
Information, motivation and guidance	No specific information or awareness raising regarding energy performance of buildings, except for the national programme for the improvement of energy performance of blocks of flats.	A better information and awareness raising, mainly within support programmes.	A better information and awareness raising. Setting up of offices (within city halls, energy agencies) offering information and guidance concerning the energy efficiency of buildings, as well as funding and other programmes. Development and promotion of several pilot projects for the main types of residential and office buildings.	"One-stop-shop" type of information, guidance and orientation for all localities with associated internet platforms. Development of various 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, which are to be found in urban zones, have a high carbon footprint and an efficiency potential of 30 %, presenting energy savings of 20 %–40 % for consumers. Some of the municipalities have put in place measures	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): existing dwellings: 10 % by 2020 and 70 % by 2030, 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.

	for the improvement of the efficiency of the district heating system (generation and distribution networks).			