

RENOVATING ROMANIA

A STRATEGY FOR THE ENERGY RENOVATION OF ROMANIA'S BUILDING STOCK



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The Buildings Performance Institute Europe (BPIE) is a European not-for-profit think-tank with a focus on independent analysis and knowledge dissemination, supporting evidence-based policy making in the field of energy performance in buildings. It delivers policy analysis, policy advice and implementation support. The Brussels-based institute is partnering with the Global Buildings Performance Network (GBPN).

PART II of the study dealing with the evaluation of policy options for building stock renovation in Romania will be published in the summer of 2014



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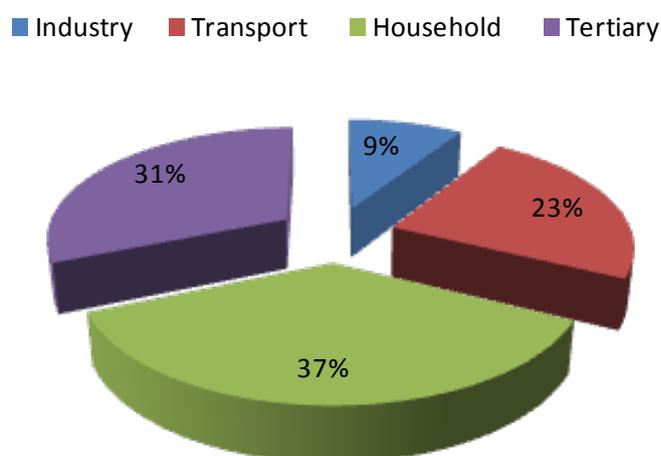
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PART I
A STRATEGY FOR THE
ENERGY RENOVATION OF
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I INTRODUCTION

Buildings account for the largest share of energy use in Romania, as illustrated in the figure below. Together, the household sector and the tertiary sector (i.e. offices, retail premises and other non-residential buildings) account for 46% of total national energy consumption.

Figure 1: Breakdown of Romanian energy consumption by end use (source - ODYSSEE¹)



At a time of growing importance of environmental, economic and societal concerns, ranging from the impacts of climate change, energy security and resource depletion to issues of affordability for industry and consumers alike, reducing energy use in the buildings sector has become an issue of strategic importance, both nationally and internationally. Alongside efforts to construct new buildings with little or no requirements for energy, addressing the high consumption levels in existing buildings is essential.

It is with the above strategic concerns in mind that EU policy addressing energy use in buildings has been strengthened in the last few years, firstly with the recast of the Energy Performance of Buildings Directive, EPBD, (DIRECTIVE 2010/31/EU²) in 2010, and more recently the new Energy Efficiency Directive, EED, (DIRECTIVE 2012/27/EU³), which, in 2012, replaced the former Energy Services and Co-generation Directives. Together, these and other requirements, such as the need to consider the scope for installation of renewable technologies in new buildings and buildings subject to major renovation, contained in the Renewable Energy Directive (DIRECTIVE 2009/28/EC⁴), provide a framework within which Member States need to implement policy measures to cut energy use, notably in the buildings sector.

In accordance with the requirements set out in the Energy Efficiency Directive (Article 4), this study outlines a proposed strategy for renovating Romania's building stock. The strategy uses the methodology developed in BPIE's "A Guide to Developing Strategies for Building Energy Renovation⁵" published in February 2013, in particular the 5-phase approach illustrated in Figure 1 below.

¹http://www.odyssee-indicators.org/publications/PDF/romania_nr.pdf http://www.odyssee-indicators.org/publications/PDF/romania_nr.pdf

²http://europa.eu/legislation_summaries/energy/energy_efficiency/en0021_en.htm

³http://ec.europa.eu/energy/efficiency/eed/eed_en.htm

⁴<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj:L:2009:140:0016:0062:en:PDF>

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

Figure 2: Five-Phase Stepwise Approach to Renovation Strategy Development (source: BPIE)

PHASE 1	<ul style="list-style-type: none">• Identify key stakeholders• Identify information sources
PHASE 2	<ul style="list-style-type: none">• Building stock characterisation• Economic appraisal of renovation potential• Quantification of investment requirements
PHASE 3	<ul style="list-style-type: none">• Comprehensive appraisal of barriers• Development of holistic policy package
PHASE 4	<ul style="list-style-type: none">• Draft renovation strategy• Consultation on draft strategy
PHASE 5	<ul style="list-style-type: none">• Publish final strategy• Commerce policy implementation process• Establish monitoring and evaluation process• Review and update strategy every three years

II AIM OF THIS STRATEGY

RENOVATING ROMANIA has been developed in order to assist the Romanian Government in fulfilling its commitment with regard to Article 4 of the EED, entitled “Building Renovation”. The Directive requires all Member States to report their national renovation strategies by 30th April 2014. At the same time, the strategy is designed to stimulate debate among stakeholders, with a view to securing a broad consensus around the future direction of policies and initiatives addressing building energy performance in Romania. RENOVATING ROMANIA provides an opportunity to encourage the Government and other stakeholders to consider a level of ambition that would be appropriate with regard to improving the quality of the nation’s homes and workplaces, for the current and long term benefit of Romanian citizens and the good of the economy.

To illustrate the scale of that ambition, this strategy proposes the renovation or rebuilding of all of Romania’s homes, farmsteads, workplaces, hospitals, factories, retail premises and the myriad of other buildings to high energy performance standards by 2050. We recognise this is a significant challenge and a significant commitment. Nevertheless, it is one we believe is in the best interest of the nation as it will:

- create much needed employment now and for decades to come,
- improve living conditions in Romanian homes and workplaces,
- reduce dependence on foreign energy suppliers,
- make best use of Romania's natural resources and human resourcefulness, and in the process,
- provide Romania with a modern, efficient building stock fit for the 21st century and beyond.

As a benchmark illustrating the level of ambition, we believe a reduction in CO₂ emissions from buildings by as much as 80% by 2050 (compared to 2010) is both achievable and desirable. This can be secured through a combination of energy efficiency measures and widespread deployment of renewable resources in and on buildings.

80% CO₂ reduction is an ambitious target, which cannot be achieved in one step. That is why the approach adopted within RENOVATING ROMANIA is a step-wise one, with three key phases:

- PHASE 1 - the priority is to establish the conditions whereby deep renovations, saving at least 60%, become the norm within 5 years.
- PHASE 2 - Technological development will then provide the means of achieving 80-100% energy savings (i.e. down to net zero energy levels) in a highly cost effective manner as standard in renovations within around 10 years.
- PHASE 3 - Thereafter, achieving positive energy building renovation will be realistic, practical and cost effective within 20 years.

Romania has a legacy of many buildings from the communist era that are no longer fit for purpose. RENOVATING ROMANIA will address this historic legacy and provide Romania with a building stock in which all citizens can share a common pride.

III 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 1990 levels;
- Raising the share of EU energy consumption produced from renewable resources to 20%;
- A 20% improvement in the EU's energy efficiency.

Looking out across a more distant horizon, the EU has a set of longer term objectives, contained within roadmaps to 2050. As far as the building sector is concerned, the three principal ones are:

- *EU Roadmap for moving to a competitive low carbon economy in 2050*, which identifies the need of reducing carbon emissions in residential and services sectors (collectively, the building sector) by 88%-91% by 2050 compared to 1990 levels.
- *Energy Roadmap 2050* states that '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* identifies buildings as being among the top three sectors

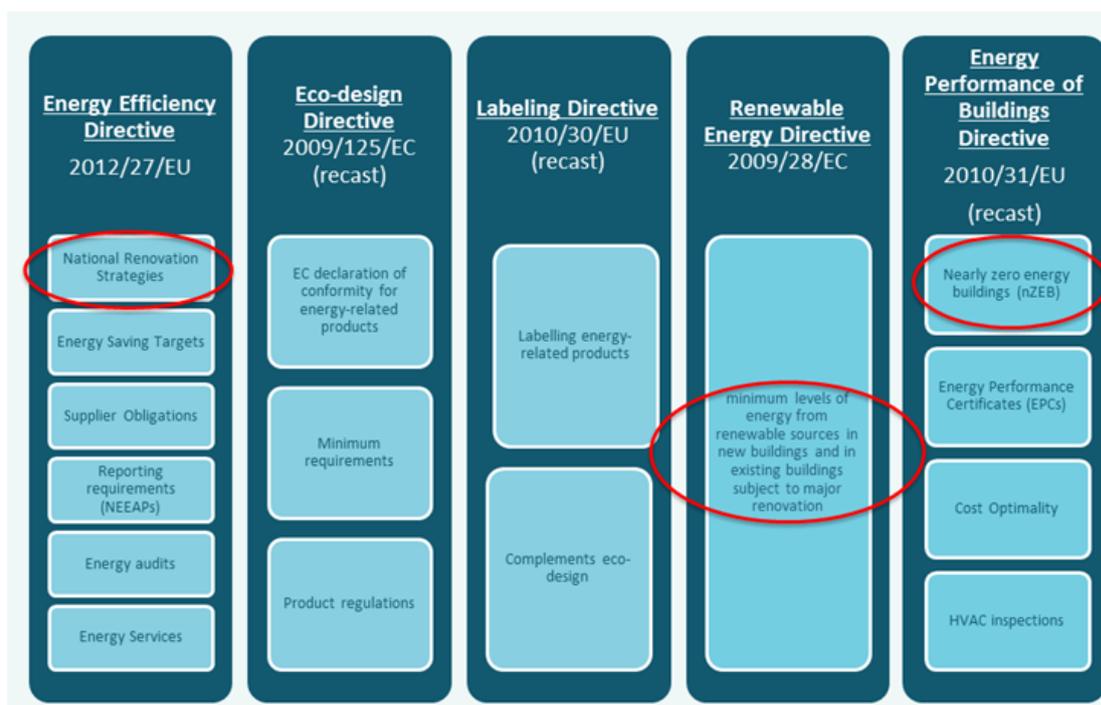
responsible for 70%-80% of all environmental impacts. Better construction and use of buildings in the EU would influence more than 50% of all extracted materials and could save up to 30% of water consumption.

These roadmaps set a long term aspiration which is not only socially and economically desirable, but also environmentally essential if the triple challenges of climate change, energy security and resource depletion are to be tackled.

EUROPEAN DIRECTIVES AFFECTING THE BUILDING SECTOR

Of more immediate concern are the current European regulations and directives pertaining to the energy performance of the building stock, summarised below.

Figure 3 – Summary of main EU Directives and relevant articles affecting energy use in buildings



These provide a common framework within which Romania and other Member States are required to set standards and performance levels regarding energy use in buildings. For the most part, these regulations apply equally to commercial, public sector and residential buildings alike. The main Directives are:

- The Energy Performance of Buildings Directive (EPBD), originally introduced in 2002, and recast in 2010 (2010/31/EU);
- The Energy Efficiency Directive (EED) 2012/27/EU, introduced in 2012;
- The Renewable Energy Directive (RED), 2009/28/EC, introduced in 2009.

The main provisions in EPBD and EED, as they relate to sustainable retrofitting of buildings, are described in more detail below. As regards the Renewable Energy Directive, the main point of relevance to the building sector is the requirement to introduce minimum levels of energy from renewable sources in new buildings and in existing buildings that are subject to major renovation.

ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE (EPBD) - MAIN PROVISIONS

The first major attempt to set a European framework for the energy performance of buildings came in 2002 when the EPBD set out a number of requirements on Member States, ranging from the establishment of certification schemes for buildings (so-called energy performance certificates, or EPCs), inspection regimes for major heating and air conditioning plant, and performance requirements on building regulations. In many ways, EPBD simply raised the bar in terms of standards across all EU Member States to the performance of some of the best. For example, Denmark and The Netherlands had already established certification schemes for buildings, and EPBD required other Member States to introduce similar mechanisms.

Whilst the original EPBD made good progress in a number of areas, implementation at Member State level was slow and incomplete, while some of the provisions were not having the desired effect. With that in mind, the European Commission commenced a review in 2009, resulting in the recast Directive introduced in 2010. EPBD now contains the following main provisions:

- **Methodology for calculating the energy performance of buildings and setting of minimum energy performance requirements:** Member States are required to apply a common methodology for calculating the energy performance of buildings, and set minimum energy performance requirements at cost-optimal levels, using a comparative methodology framework developed by the Commission.
- **Requirements for nearly Zero-Energy Buildings (nZEB):** From the end of 2020, all newly constructed buildings will have to consume 'nearly zero' energy, with the low level of energy coming 'to a very large extent' from renewable sources. For buildings occupied and owned by public authorities, this requirement must be met two years earlier, from the end of 2018. Furthermore, Member States are required to prepare national plans for increasing the number of nZEB, across new and existing building stocks. These plans may include targets differentiated according to building category.
- **Requirement to improve the energy performance of existing buildings undergoing major renovation:** The recast extended the scope of the initial EPBD to almost all existing and new buildings, as well as removing the previous 1 000m² threshold for major renovations in the 2002 EPBD. This threshold had excluded 72% of the building stock. When existing buildings undergo 'major renovation', their energy performance should be upgraded in order to meet minimum energy performance requirements.
- **Technical building systems:** In order to optimise the energy use of technical building systems such as heating, ventilation & air conditioning (HVAC) plant and lighting systems, Member States need to set system requirements in respect of the overall energy performance, the proper installation, sizing, adjustment and control of such systems which are installed in existing buildings. Member States may also apply these system requirements to new buildings.

- **Financial incentives and market barriers:** Member States are required to review and publish details of existing and proposed measures/instruments, including those of a financial nature, which address market barriers and which seek to improve the energy performance of buildings and aid the transition to nearly zero-energy buildings.
- **Energy Performance Certificates (EPCs):** EPCs must be issued for all buildings when sold, rented, or newly constructed. For certain larger buildings visited frequently by the public, these certificates must be displayed in a prominent place. Annual reports on the quality of EPCs need to be produced by the relevant authorities with responsibility for implementing the control system.
- **Inspection of heating and air-conditioning systems:** Larger heating and air conditioning systems need to be inspected on a regular basis. These inspections must be undertaken by suitably qualified experts, and a report issued to the owner or tenant of the buildings after each inspection. This report must include recommendations for the cost-effective improvement of the energy performance of the inspected system.

ENERGY EFFICIENCY DIRECTIVE (EED) - MAIN PROVISIONS

Whilst the EED takes a wider perspective across all end uses and not just the building sector, a number of provisions are geared specifically towards encouraging the sustainable retrofit of buildings. These include:

- **Building Renovation (Article 4):** All Member States are required to set out national strategies for the renovation of building stocks, including commercial, public and residential buildings. RENOVATING ROMANIA is primarily concerned with the delivery of the requirements in Article 4, as well as Article 5 below.
- **Exemplary role of public bodies (Articles 5 and 6):** National governments are required to show leadership in improving the energy performance of their building stocks by renovating 3% by floor area of buildings owned and occupied by central governments every year (Article 5). Furthermore, central governments are required to only purchase buildings (as well as products & services) with high energy efficiency performance (Article 6).
- **Metering and billing (Articles 9-12):** Measures to increase transparency and accuracy of energy costs are intended to raise awareness amongst building owners and occupiers as to the opportunities for saving money through improving the energy performance of buildings they own and/or occupy.

IV BENEFITS



Renovating the existing building stock to high energy performance standards represents one of the most significant and strategic investments a nation can make. To quote the President of the European Council Herman Van Rompuy⁶:

“Energy Efficiency is the highest impact measure governments can take to save energy”

“Buildings represent the greatest potential sector for energy savings in the EU”

“Energy efficiency in buildings is not a cost, but an investment with a great rate of return”

While the key driver in EED is the achievement of the EU’s 20% energy saving target by 2020 and the longer term 2050 environmental goals in the Energy and Low Carbon Roadmaps, the benefits in doing so reach into many corners of the economy and society . Broadly speaking, the impacts of undertaking sustainable energy renovation of buildings can be summarised under the headings:

- **Economic Benefits** – The increased economic activity resulting from the jobs created and investment stimulated has been estimated by the US Environmental Protection Agency to generate 1.5 times the value of energy cost savings in additional output. Additional unquantified benefits arise through increased property values.
- **Societal Benefits** – Improving the energy efficiency of homes has long been recognised in some Member States (e.g. UK, Ireland) as vital to achieving affordable warmth for families on low incomes and addressing the problem of fuel poverty, estimated to affect 10-25% of the total EU population. There are also health benefits from warmer homes with fewer cold spots and draughts, less condensation/mould and improved indoor air quality. Copenhagen Economics estimate that the health benefits from energy retrofits could be worth around the same value as the saving in energy costs. A UNDP/GEF draft study⁷ notes that there is no official definition of fuel poverty in Romania. However, it concludes 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 biggest source of CO₂ emissions, and hence the biggest contribution to climate change. The value of the environmental benefit from renovation could be worth of the order of 10% of energy cost savings .
- **Energy System Benefits** – In addition to the energy security benefits of being less dependent on energy imports, saving in peak loads through sustainable energy improvements in buildings, including self-generation, are worth approximately the same as the energy cost savings, according to a study by Ecofys⁸. These accrue to all users.

In summary, the following multipliers could be applied to the energy cost saving, in order to gain an indication of the overall societal benefit from building renovation:

TABLE 1 –Valuing the Multiple Benefits from Building Renovation

ITEM	MULTIPLIER
Energy Cost Saving	1.0
Economic Stimulus	1.5
Societal (health) Benefits	1.0
Environmental Benefits	0.1
Energy System Benefits	1.0
TOTAL	4.6

⁶Opening Address at Renovate Europe Day, Brussels, 9th October 2013

⁷[http://www.undp.ro/libraries/projects/EE/Assesment%20Report%20on%20Fuel%20Poverty%20-%20DRAFT\(1\).pdf](http://www.undp.ro/libraries/projects/EE/Assesment%20Report%20on%20Fuel%20Poverty%20-%20DRAFT(1).pdf)

⁸Saving energy: bringing down Europe’s energy prices for 2020 and beyond”, Ecofys, 2013

It can be seen that the total societal benefit could be approaching five times the value of the energy cost savings alone. For the most part, these benefits accrue to society at large, rather than the building owner/investor. This “benefits gap” is a major factor behind the current underinvestment in building renovation. Providing support measures (be they financial or otherwise) that encourage investment in building renovation is one way in which this benefits gap can be addressed. Such measures are discussed later in this report.

The remainder of this paper is devoted to elaborating a building renovation strategy for Romania, following the BPIE guidelines.

V PHASE 1 - IDENTIFYING STAKEHOLDERS AND INFORMATION SOURCES

KEY STAKEHOLDERS

The following ministries have been identified as needing to play a key role in developing and delivering the strategy:

- Ministry of Regional Development and Public Administration (MDRAP) – overall EPBD responsibility and lead Ministry in the elaboration of the national strategy;
- Ministry of European Affairs – oversight of European funds;
- Ministry of Economy, Trade and Business Environment (MECMA) – application of renewable sources of energy in and on buildings;
- Ministry of Public Finance (MFP) – co-financing budgetary sources;
- Ministry of the Environment and Forests (MMP) – Kyoto funding mechanisms;
- National Regulatory Authority for Energy (ANRE) – implications for energy utilities, including the role of Energy Efficiency Obligations. ANRE now includes the former Romanian Agency for Energy Conservation (ARCE);
- National Institute for Building Research (INCERC) – Management of the Energy Performance Certificate (EPC) register (all EPCs are reported to this Institute).

In addition, the following organisations have been invited to the consultation process and have provided valuable input into strategy development:

- Asociația Producătorilor Materialelor de Construcții din România (APMCR) – Association of Romanian Construction Materials Manufacturers;
- Asociația Română a Antreprenorilor din Construcții (ARACO) – Romanian Association of Construction Entrepreneurs;
- Patronatul Societăților din Construcții (PSC) – Construction Companies Employer’s Organization
- Camera de Comerț și Industrie a României (CCIR);
- Romania Green Building Council (RoGBC);
- Asociația Inginerilor de Instalații din România (AIIR) – Association of Romanian Installation Engineers;
- Asociația Auditorilor Energetici din Construcții (AAEC) – Association of Energy Auditors in Constructions;
- Liga Asociațiilor de Proprietari Habitat – League of Habitat Owners Associations);
- Federația Asociațiilor de Proprietari din România – Federation of Property Owners Associations in Romania⁹;
- Asociația Producătorilor de Surse Regenerabile (SUNE) – Association of Renewable Sources Producers;
- Asociația Română Pentru Promovarea Eficienței Energetice (Arpee) – Romanian Association For Promoting Energy Efficiency;
- Asociația Municipiilor din România – Association of Romanian Municipalities;
- Asociația Orașelor din România – Association of Romanian towns;
- Confederația Producătorilor Industriali din România (CONPIROM)- Confederation of Industrial Producers from Romania;
- Societatea Română Geoexchange - representing users of geothermal energy in buildings.

It is important that the engagement with these organisations continues on an ongoing basis during strategy implementation and in revising and updating the strategy every three years.

The key information sources used for this strategy are:

- BPIE’s Data Hub (www.buildingsdata.eu), including data collected by BPIE during the 2011 survey;
- ENTRANZE, an Intelligent Energy Europe project (www.entranze.eu), in which BPIE is a project partner. The objective of the ENTRANZE project is to actively support policy making to achieve a fast and strong penetration of nZEB and renewable energy use within existing national building stocks.;
- Implementing nearly Zero-Energy Buildings (nZEB) in Romania – towards a definition and roadmap, BPIE 2012 (http://bpie.eu/low_energy_buildings_east_eu.html);
- “Build Up Skills România - Analysis Of The National Status Quo”, National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development (URBAN-INCERC) (www.buildupskills.eu/national-project/romania, www.iee-robust.ro/);
- Romania’s 2nd National Action Plan for Energy Efficiency;
- Statistical Yearbook of Romania;
- Census data.

⁹Owners 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. The owners association will be represented by a committee formed of several representatives. According to the Government Emergency Ordinance no. 69/June 2010 the decision for building renovation can be taken based on agreement of two thirds of owners.

VI PHASE 2 - APPRAISAL OF TECHNICAL AND ECONOMIC POTENTIAL



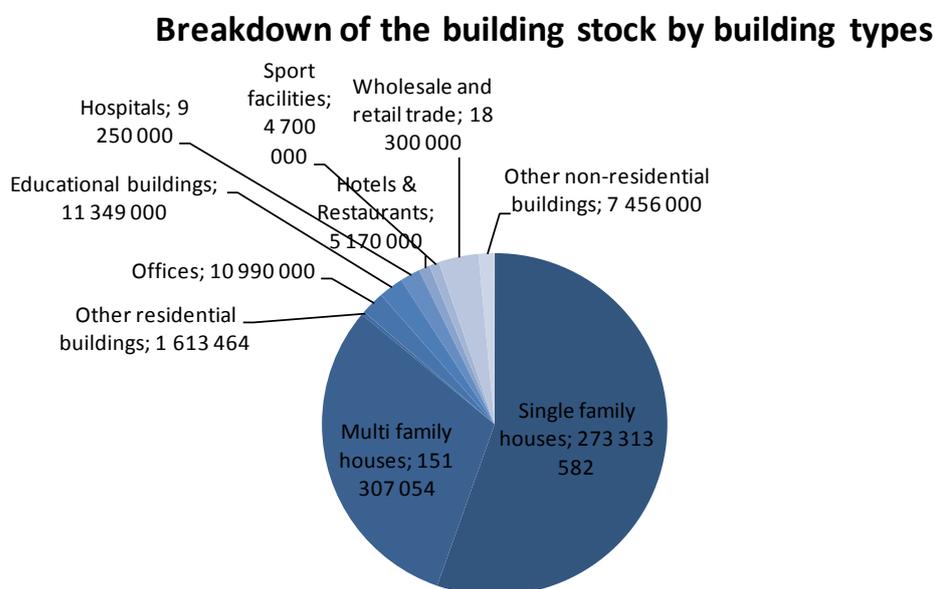
BUILDING STOCK CHARACTERISATION

There are 493,000,000 m² of building floor area in Romania, of which 86% are accounted for by residential buildings. Of the 8.1 million dwellings, single family houses dominate, accounting for 61% of the total. In the non-residential stock, the total floor area sums up to 67,200,000 m². The non-residential stock is distributed across different building types as set out in table 1.

TABLE 2 –Breakdown of non-residential building stock by type (source: BPIE’s Data Hub)

Offices	16.3%
Educational buildings	16.9%
Hospitals	13.8%
Hotels & Restaurants	7.7%
Sport facilities	7.0%
Wholesale and retail trade	27.2%
Other non-residential buildings	11.1%

Figure 4 – Breakdown of building stock by building category (m²) (source: BPIE’s Data Hub)



Some of the key statistics for the residential sector are:

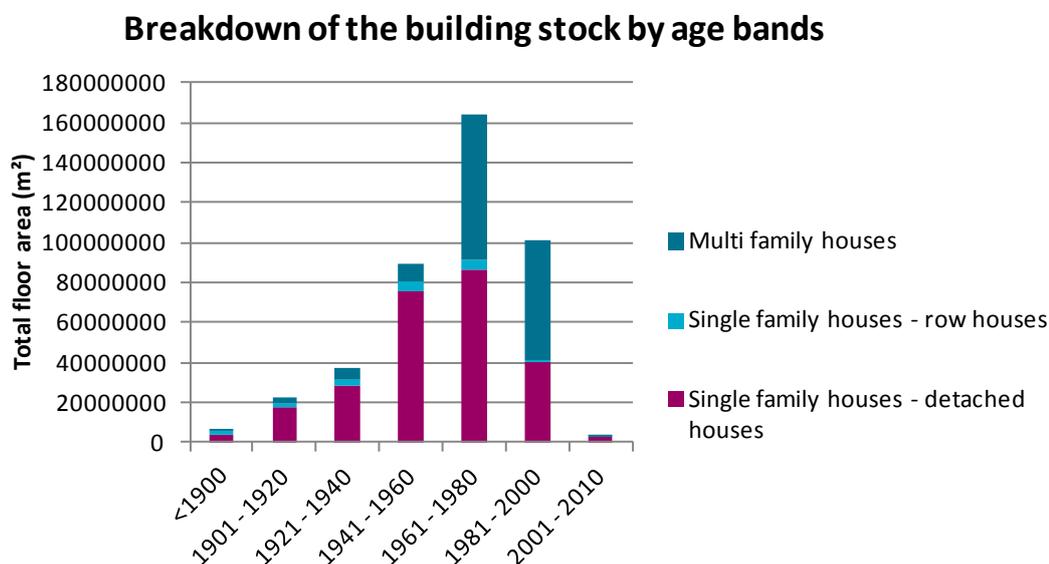
- 88.5% of dwellings are permanently inhabited.
- Nearly half of all homes (47.5%) are located in rural areas, meaning that Romania’s rural population is above the European average.
- In rural areas, 95% of dwellings are individual family houses.
- In urban areas, 72% of dwellings are found in large blocks of flats, averaging almost 40 apartments per block.
- Over 60% of the blocks of flats are 4 storeys high, while 16% are 10 storeys high.
- Private ownership is the dominant form of tenure, accounting for 84% of the total stock.
- Romania is unusual within the EU in having only a tiny proportion, 1%, of buildings in public ownership; the remaining 15% are 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.

According to data from the 2011 Census, while Romania’s population decreased by more than 2 million registered inhabitants since 2002 to 19 million, the residential floor area has been increasing, standing at 559 million m². This can be partially explained by the general trend towards larger dwellings – historically, the average living floor area per inhabitant was around 55 m². There is increasing sprawl in Romanian cities, due to construction of individual dwellings in suburban areas.

In terms of age profile, most residential buildings were constructed in the latter half of the 20th century, with the period 1961-1980 standing out as the most significant construction time, as illustrated in figure 5. The vast majority of Romanian dwellings were constructed at a time when no specific thermal requirements were set, or when such requirements were not demanding. This can be seen in figure 6. From an energy use point of view, therefore, there remains a very significant potential for the existing stock to be brought up to higher energy performance standards, which underlines the importance of an ambitious building renovation strategy for Romania.

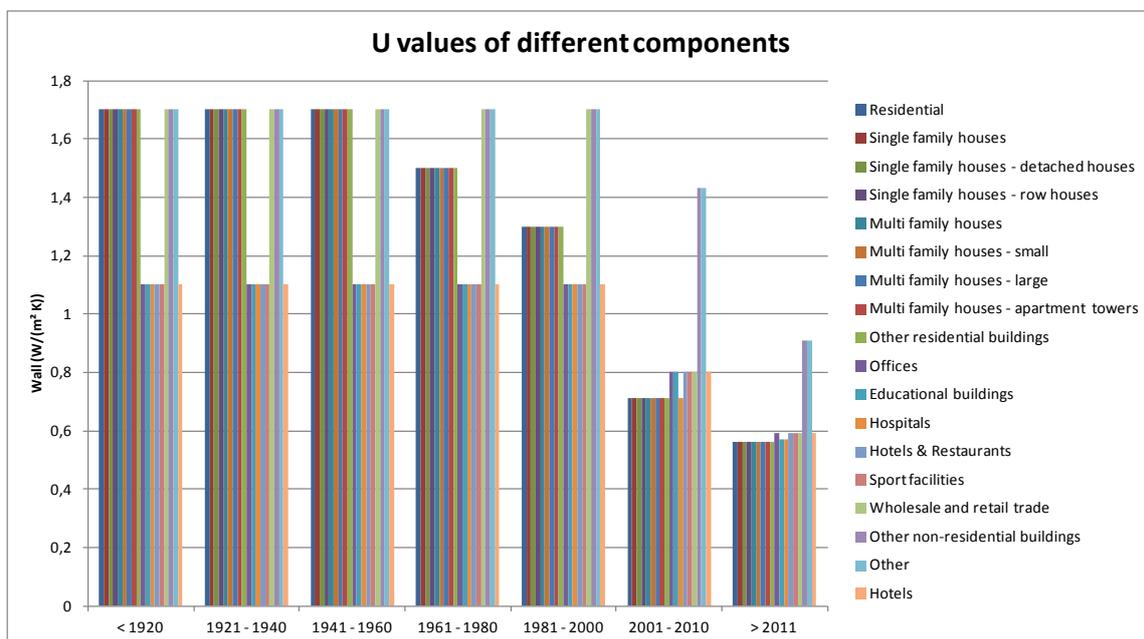
More than 90% of the total residential floor area was built before 1989. Heating energy represents around 55% of the overall energy use in apartments and up to 80% in individual houses. Depending on the climatic zone, a single family house consumes on average 24% more energy per m² than a multi-family dwelling¹⁰.

Figure 5 – Age profile of residential building stock (source: BPIE’s Data Hub)



¹⁰BPIE estimation based on survey carried out for BPIE report “European Buildings under the Microscope”, 2011.

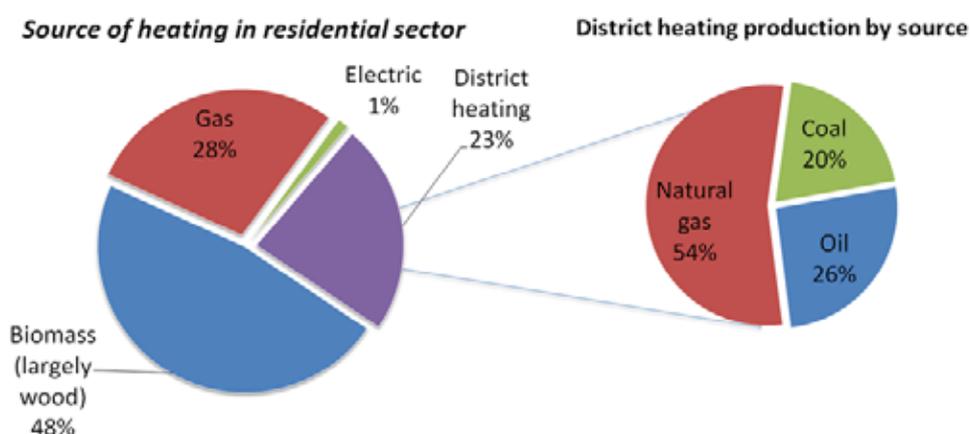
Figure 6 – Thermal performance standards (U-value) for walls for different building types and age bands (source: BPIE’s Data Hub)



ENERGY CARRIERS

There are three main heat sources in Romanian housing: biomass, gas and district heating (fig 7). Three out of every four single family houses have some form of biomass heating system, while over half of multi-family buildings are connected to district heating networks. Virtually all (92%) of the energy supplied by district heating is supplied by combined heat and power (CHP) systems¹¹. Just over half of the energy supplied to district heating systems is natural gas, with the remainder provided by oil (26%) and coal (20%).

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



¹¹Euroheat and Power Statistics <http://www.euroheat.org>

In the residential sector, thermal energy is used for heating, domestic hot water and cooking. Speaking in general, the efficiency of this thermal energy use is only 43% (63% in Bucharest)¹². In rural areas, room heating is still largely used, mainly by wood burned in stoves. In urban areas, around 1.5 million dwellings are connected to district heating systems, though over the last decade there has been a continuous trend of disconnections from district heating (DH) and shifting to individual apartment heating systems on gas. This could be the result of numerous problems with old DH systems: low efficiency (with 30% improvement potential); high carbon intensity and rising prices (also due to an on-going process of reducing heating subsidies)¹³. There is a general lack of metering systems in blocks of flats and at individual level. However, there is an ongoing programme of improvements to the DH network and on heating metering and controls, which has reduced the number of disconnections from the network (cf. Romania NAPEE).

The table below, adapted from Euroheat & Power (www.euroheat.org/Romania-90.aspx), provides the main statistics for use of district heating in Romania.

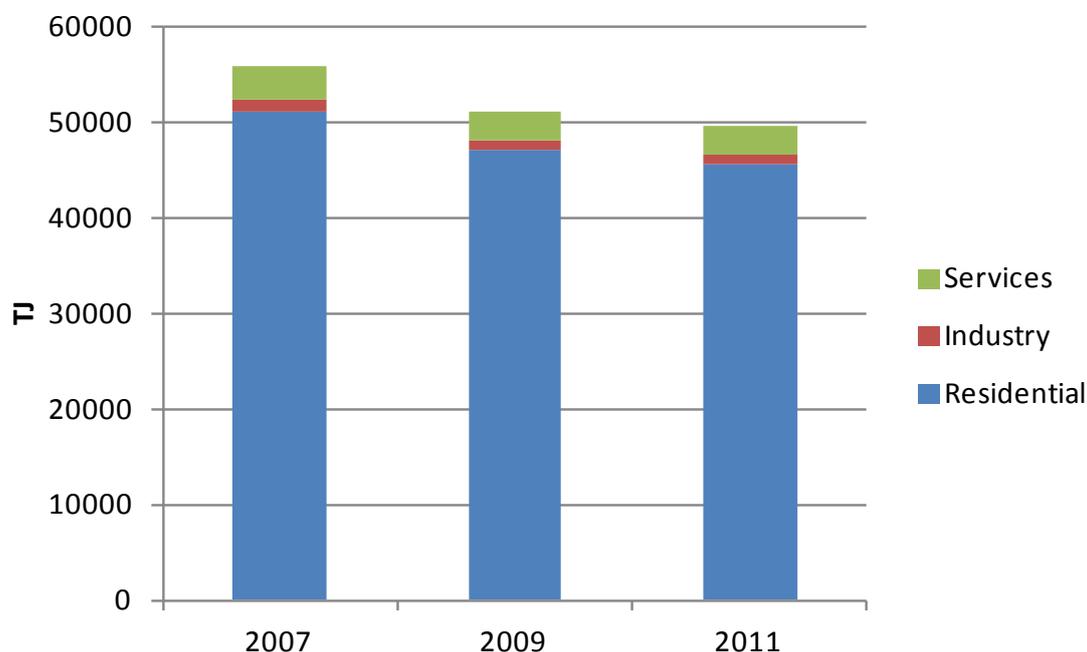
TABLE 3 – Key District Heating Indicators for Romania - 2011 unless otherwise indicated (source: Euroheat & Power)

Energy supply composition for District Heat generated	
Recycled heat incl. indirect use of Renewables	91%
Direct Renewables	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	6,055km
(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 Ton 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

¹²See TABULA project website: <http://www.building-typology.eu/>

¹³11 PWC Romania: Provocari si Oportunitati pentru sistemul de furnizare centralizata a energiei termice din Romania, June 2011, available at: http://www.pwc.com/ro/en/publications/assets/assets_2011/Provocari_Oportunitati_Energie_Termica.pdf

Figure 8 – District heating energy supply 2007-2011, by customer type



Diffusion of air conditioning has been steadily increasing in the residential sector: the share of dwellings with air conditioning increased from 0.4% in 2000 to 5% in 2010. On the other hand, there has been an increase in the installation of domestic renewables, which is mainly supported by the CASA VERDE programme¹⁴. According to EurObserver renewable energy barometer¹⁵, the total installed solar-thermal collectors area in 2010 in Romania was at around 144,000 m², a 38.4% growth from 2009. Most of this solar-thermal capacity is installed in commercial buildings (including hotels) and to a lesser extent in residential buildings. However, there is no public data available concerning the actual sales and installed solar-thermal power in Romanian buildings.

There are significant problems in the condition of buildings due to neglect of repairs, in particular, in urban high-rise apartment buildings and in part of the rural single-family homes¹⁶. **Some 58% of the existing blocks of flats (2.4 million apartments) built before 1985 are in need of rehabilitation and thermal modernisation.**

NON-RESIDENTIAL

Non-residential buildings represent 18% of total floor area. This includes most of Romania's public buildings¹⁷, 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.

¹⁴<http://www.casa-verde.ro/>

¹⁵12 EurObserver (2011): The state of renewable energy in Europe. 11th EurObserver Report, available at: http://www.energieRenouvelables.org/observer/stat_baro/barobilan/barobilan11.pdf

¹⁶UN ECE 2001; Trainrebuild 2012

¹⁷Publicly owned housing is almost non-existent in Romania

Figure 9 – Distribution of final energy consumption by type of non-residential building (source: INCD URBAN-INCERC)



In terms of energy performance, educational buildings (354 kWh/m² per annum) stand out as the highest consumers of energy, with other sectors in the range 200-250 kWh/m² p.a. (fig 10). Table 4 provides the thermal performance (U-value) ranges for different building types.

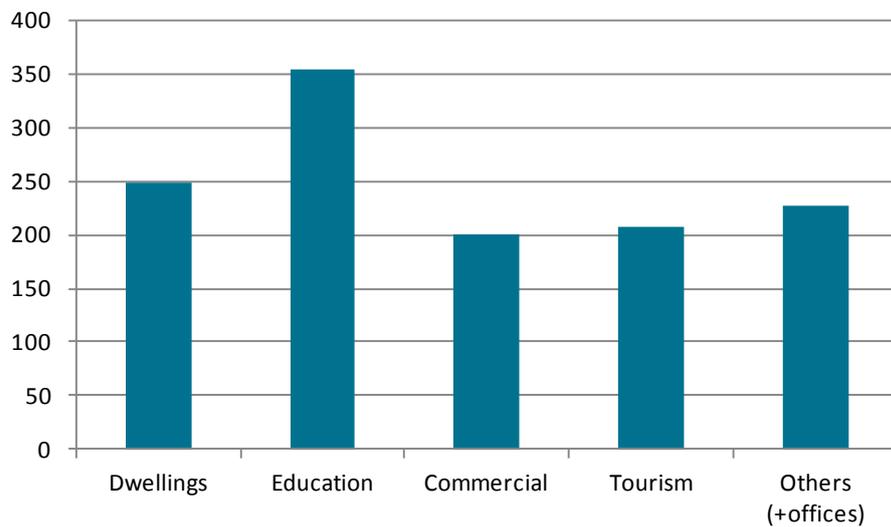
Note that these figures represent total energy use, inclusive of appliances and other plug loads. For modelling purposes, described in section 6, only the so-called “regulated” energy loads are included in the calculation of costs and benefits. Regulated loads are those covered by the Energy Performance 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.

³⁰ This value is to be understood as a maximum value.

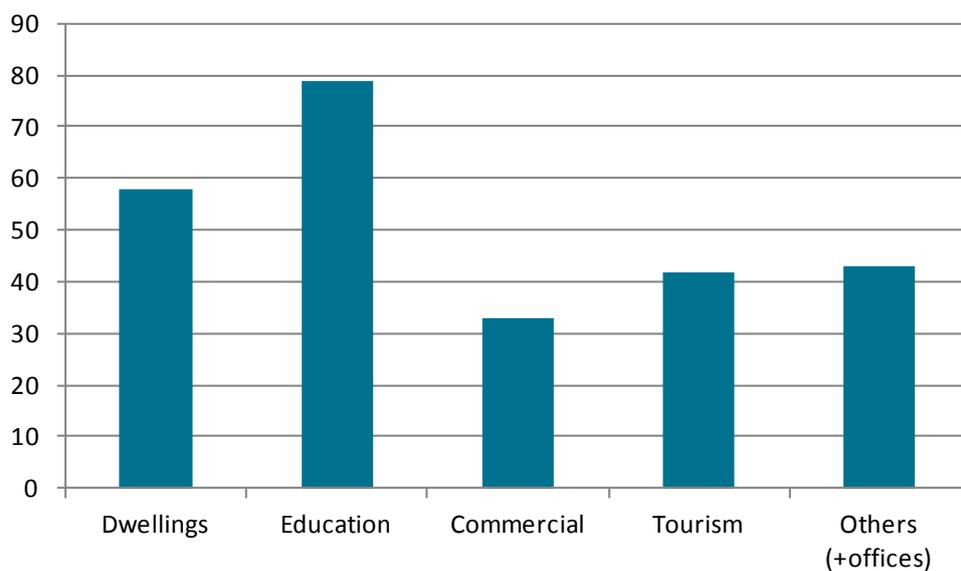
³¹ These values are to be understood as maximum values. For the hourly demand individual schedules for every zone have been considered.

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

Average energy performance [kWh/m² yr]



Average CO₂ emission index [kgCO₂/m² yr]



³² Passive house standard: major shell improvements, no heat bridges, airtight construction, highly efficient mechanical ventilation (> 90%), useful heating and cooling demand < 15 kWh/m²a

³³ V1 and V2 will be considered to have a low temperature floor heating system to get a better system efficiency

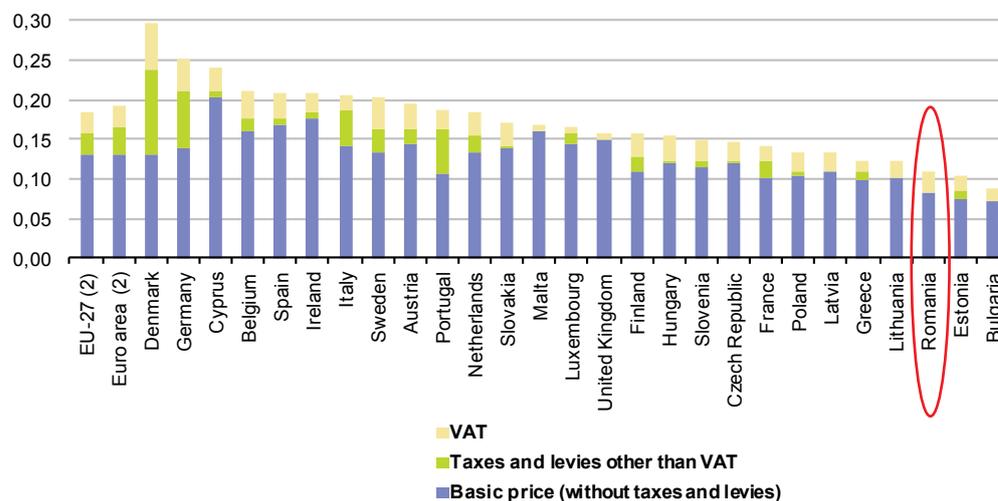
TABLE 4 – Energy performance characteristics of non-residential buildings (source: INCD URBAN-INCERC)

Building type	Thermal performance U-value [W/(m²K0)]		Final energy use (kWh/m²yr)
	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
Wholesale and retail trade services	0.70 - 1.50	0.35 - 1.30	150 - 300

ENERGY PRICES

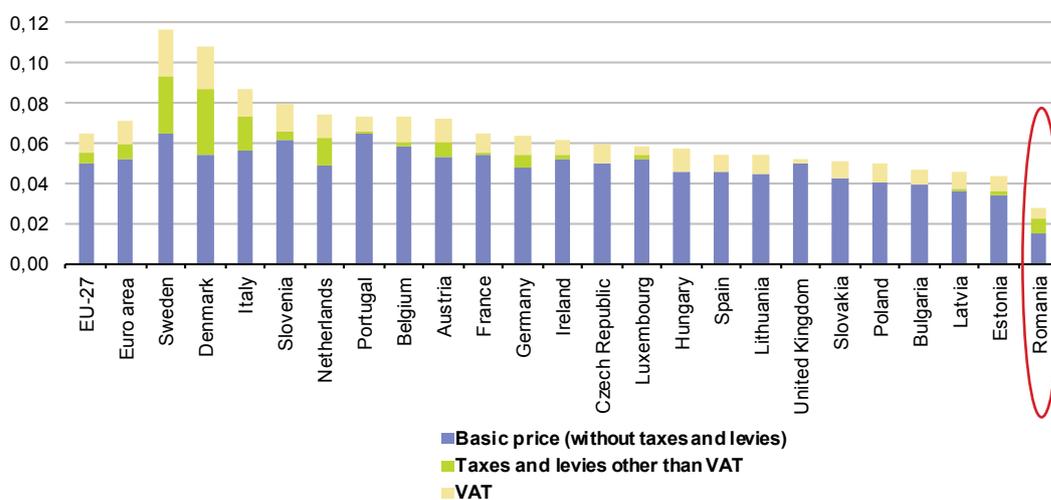
Romania currently enjoys among the lowest price of energy across the EU, due to subsidies on both electricity and gas. The comparison is illustrated in figures 11 and 12 below for electricity and gas respectively¹⁸.

Figure 11 – Electricity price comparison for households across the EU - 2011 (source: Eurostat)



¹⁸http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Energy_price_statistics

Figure 12 – Gas price comparison for households across the EU - 2011 (source: Eurostat)



Electricity price regulation continues to exist for both household and industrial customers. A roadmap was adopted by the Romanian government in March 2012 to phase out regulated electricity prices for non-household customers by the end of 2013 and for household customers by the end of 2017. However, regulated prices remain below market prices, reducing the incentive to adopt energy saving measures.

Almost all of the approximately three million **gas** consumers in Romania fall under the regulated segment, where prices are set by the regulator rather than being determined by market forces. A roadmap was adopted by the Romanian government in June 2012 to phase out regulated gas prices for non-household customers a year later than for electricity, namely by the end of 2014 and for household customers by the end of 2018.

The share of network costs in Romanian household prices was the highest in the EU-27 in 2010 (60.2%), while energy and supply costs accounted for only 39.8%.

It is to be expected that energy prices will rise in Romania over the coming years such that in due course, it is likely that prices will approximate to the European average, though it may be many years before this position arises. As discussed in the next section, for modelling purposes, we have assumed price parity between the EU average and Romania is achieved by 2050.

ANRE¹⁹ will develop a price comparison tool and set up a protection scheme for vulnerable customers. The Energy Act defines the concept of vulnerable consumers, which includes residential consumers who, for reasons such as illness or age and by decision of the government, benefit from subsidies and are ensured connection to the electricity supply service. In 2010, 1.2 million consumers out of a total of 8.3 million benefited from a social tariff.

¹⁹<http://www.anre.ro/>

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"²⁰. The model is described below.

OVERVIEW OF THE RENOVATION MODEL

A renovation model has been developed which allows scenarios to be examined that illustrate the impact on energy use and CO₂ 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;
- CO₂ emission reductions;
- Total investment required to install renovation measures;
- Energy cost savings;
- 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 energy cost savings 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 energy cost savings 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 CO₂ saved.

INITIAL DATA AND MODELLING ASSUMPTIONS

The model allows different input data for four building types:

- Single-family houses (SFH)
- Multi-family houses (MFH),
- Public buildings, (Government buildings make up 6% of all non-residential buildings²¹.)
- Commercial and industrial buildings.

There are around 1 million abandoned houses in Romania²², 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, as people continue moving from rural areas or deprived cities in search of employment and higher income in the major cities or abroad. 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.

²⁰http://bpie.eu/eu_buildings_under_microscope.html

²¹Romania cost optimality study

²²2nd NAPEE - Energy Efficiency Action Plan Romania EN – annex 2.4 p. 122

STOCK VARIATIONS

The model allows for the following stock variations:

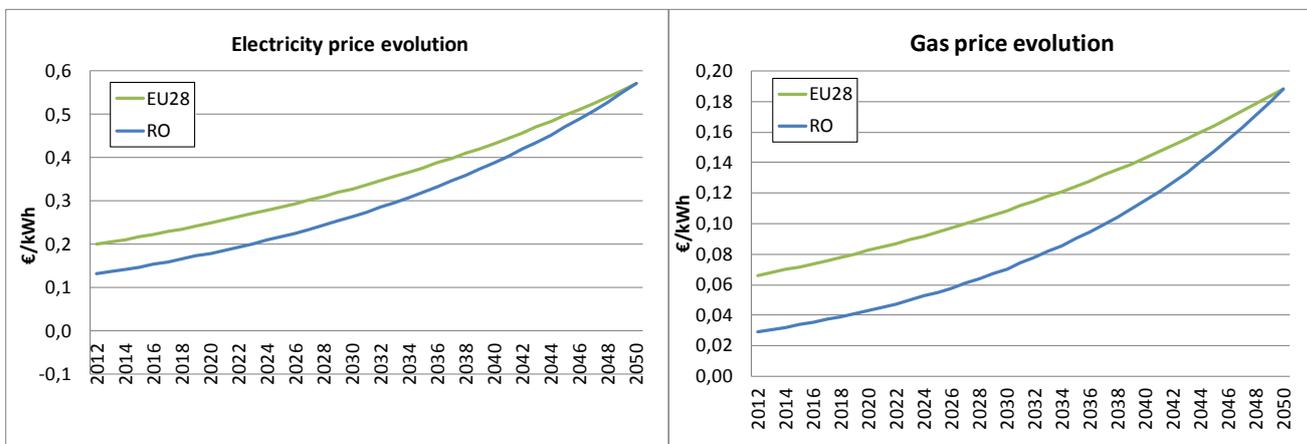
- **Demolitions and abandoned buildings:** The total building stock is reduced by 0.2% a year, half of which corresponds to the average demolition rate in 2005-2012 and the other half to abandoned buildings.
- **Heritage buildings:** Many buildings have historical, aesthetic and/or cultural value. As 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.
- **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.
- **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.

INPUT DATA

For modelling purposes, the following information and assumptions have been used:

- Current rates of activity will be taken as a baseline figure for the year 2013:
 - ◊ Prevailing renovation rates are 1% as the EU average;
 - ◊ Prevailing renovation depths are predominantly minor.
- When valuing societal benefits, externalities associated with energy use are included, in accordance with the cost optimality guidelines.
- The core discount rates used are:
 - ◊ Private Sector – 8%
 - ◊ Public Sector – 4%
- Two rates of decarbonisation of energy supplies are modelled.
 - ◊ The **slow** rate of decarbonisation is based on that witnessed since 1990 at EU level – approx. 0.5% p.a. and reflects a continuation of current activity.
 - ◊ The **fast** one takes the decarbonisation rate needed to achieve the levels of carbon reduction assumed in the EU 2050 Roadmap, i.e. approx. 5% p.a. for electricity and 2% for other fuels, where the latter reflects fuel switching from higher to lower carbon sources.
- The average annual price increase rate is 3.9% p.a. for gas, and 5% p.a. for electricity, in order to converge with EU average by 2050. As recommended by the European Commission's cost optimality methodology, the average EU price increase is set at 2.8% p.a. Please see figures below.

Figure 13 – Comparison of EU Romanian Evolution of Electricity and Gas prices



COSTS

Renovation costs are estimated at 60% of the average EU costs. Cost reduction factors are applied, reflecting the impact of increasing renovation activity over the period to 2050. Higher factors are applied to the deeper renovation profiles, given that there is a steeper learning curve as the volume of activity increases, and the cost of buildings-integrated renewable technologies in particular come down with increasing market maturity. As renovation costs are already very low for Romania, reductions range from 0.5% p.a. for minor renovations to 3% p.a. for nZEB renovations – this is up to half the rate of cost reduction than has been assumed for the rest of the EU. Note that these are cost reductions in real terms not adjusted for inflation.

Aggregate costs are indicated in the standard metric of €/m². The figures are deliberately technology-neutral, as the combination of measures (fabric insulation, HVAC, intelligent controls, glazing, lighting, renewables, and demand control measures) will vary both according to building type and over time as technology solutions are developed.

TABLE 5 – Cost assumptions for different renovation depths

Renovation Depth	Initial Cost (€/m ²) at today's prices	Learning curve	Costs in 2050 (€/m ²) at today's prices
Minor renovation - 15%	25	0.5%	21
Moderate renovation - 45%	90	1%	63
Deep renovation - 75%	200	2%	97
nZEB renovation - 95%	350	3%	117

RENOVATION VARIABLES

The main variables that influence the pathways for building renovation are:

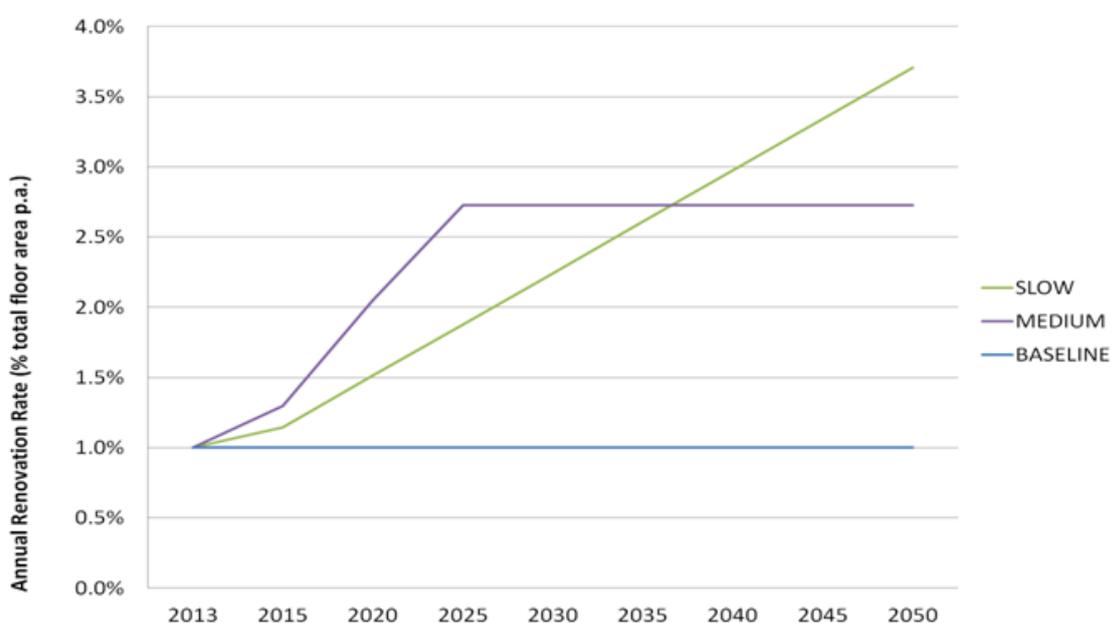
- The rate of renovation, expressed as a percentage (%) of the building stock in a given year;
- The depth of renovation, according to the four previously described levels:
 - ◊ minor,
 - ◊ moderate,
 - ◊ deep,
 - ◊ nZEB;
- The cost of renovation, which itself varies with depth.

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 14 – 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.

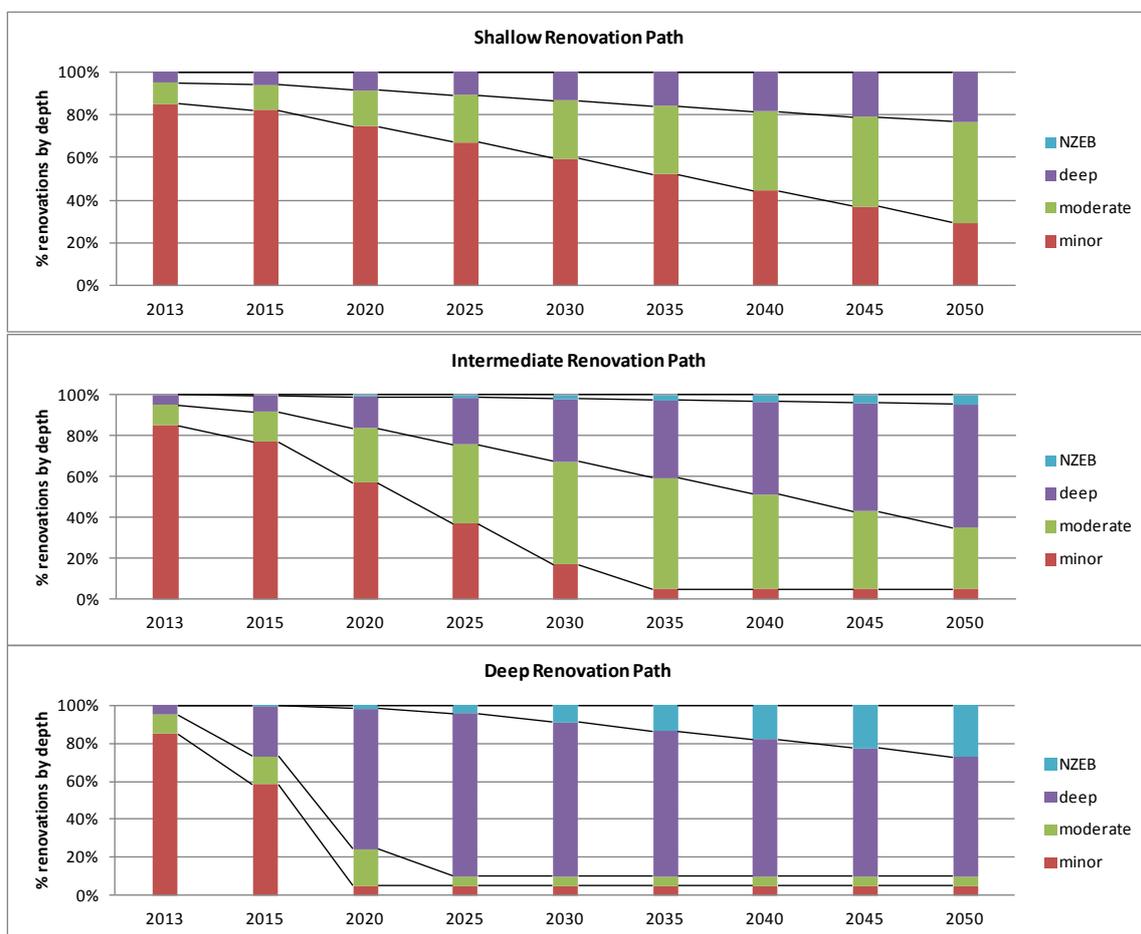
DEPTH OF RENOVATION

The other key variable in terms of activity is the renovation depth, by which we mean the proportion of energy savings achieved in a renovation.

Whilst it is not possible to say with certainty what the current depth of renovation is being undertaken within Europe, the available evidence points to a picture where the overwhelming majority of activity is in the minor category. Deep renovations, where they do occur, are frequently pilots or demonstration projects to assess the viability of achieving energy savings of 60% or more and to provide a learning opportunity.

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

Figure 15 – Split of renovation type (depth) across three indicative renovation paths



RENOVATION MEASURES

Note that 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. 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
- Installation of renewable energy measures (solar hot water, PV, heat pumps, biomass boilers, mini wind turbines...)

Over time, the balance of measures will vary as technologies develop, notably renewable energy technologies such as PV, where continuation of historic price reductions is likely to result in a situation where, within 10 years, electricity from PV systems will be cost competitive with conventional sources. Likewise, with R&D into new technological solutions, new ways of cutting energy use will come into play over time.

SCENARIOS

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

VII RESULTS

MODEL RESULTS

The results of the modelling of renovation activities, presented in this section, are based on different renovation scenarios of the Romanian building stock up to 2050. The main variables are the renovation rate and depth, while for the required investment decisions and the expected returns, the discount rates used provide a picture of the most attractive pathways. The model derives renovation scenarios taking into account the above mentioned variables and calculates the resulting costs, savings and other benefits, as presented in Table 7.

TABLE 6 –Results of scenario analysis

SCENARIO		Baseline	Modest	Intermedi- ate	Ambitious
Energy Savings					
Energy saving in 2050	TWh/a	8.5	31.1	44.8	63.2
Energy saving in 2050 compared to 2010	%	8.3	30.4	43.8	61.8
Lifetime Costs and Benefits					
Investment costs up to 2050	€ million (NPV)	2,084	5,486	9,224	16,540
Cumulative energy cost savings	€ million (NPV)	5,414	16,726	25,164	37,011
Net saving to consumers (@ 8% discount rate)	€ million (NPV)	3,333	11,248	15,954	20,496
Net saving to society (@ 4% discount rate)	€ million (NPV)	17,143	67,586	93,862	126,408
Internal Rate of Return	IRR	14.6	14.4	13.6	11.4
Carbon Emissions*					
Annual CO ₂ saving in 2050	MtCO ₂ /a	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

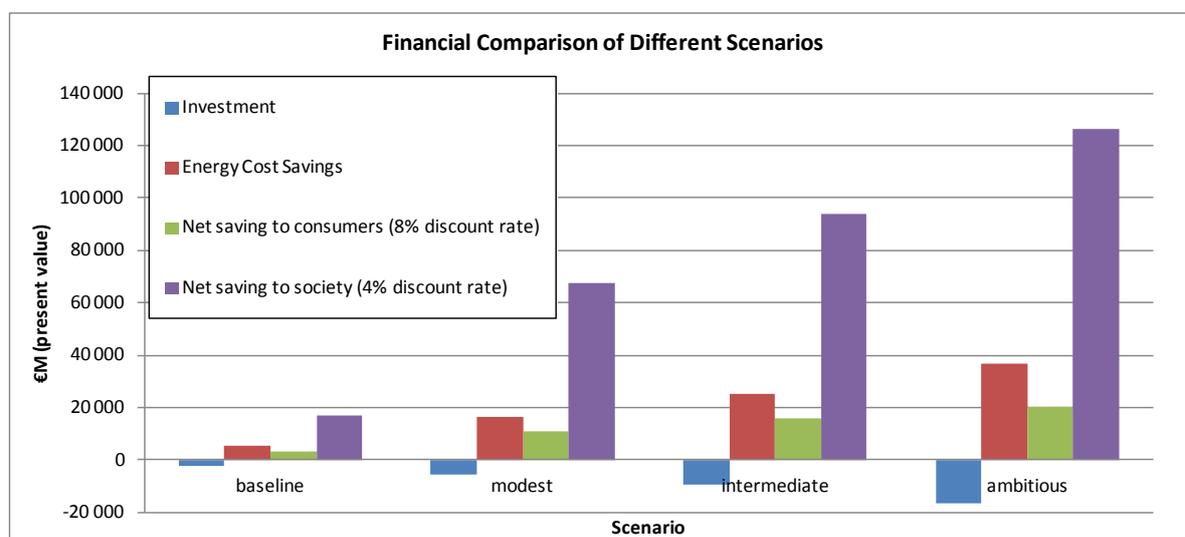
*decarbonisation rate for baseline is the average rate of decarbonisation in the EU since 1990. For other scenarios, it is the required rate to achieve the *EU 2050 Low Carbon Roadmap* objectives

ECONOMIC COMPARISON OF RENOVATION SCENARIOS

The following figures compare the renovation pathways' costs and savings. The results indicate that net consumer savings of €20 billion (present value, using a discount rate of 8%) are in reach provided that an ambitious renovation strategy is pursued.

From a societal perspective, using a discount rate of 4%, the value of the energy cost savings alone amount to €126 billion, not counting the significant value of the associated co-benefits.

Figure 16 – Financial appraisal of different scenarios



COST EFFECTIVENESS CALCULATION

An important consideration in determining how rapidly to shift towards progressively deeper renovation standards is the cost effectiveness of different renovation depths. This section examines how the “cost optimal” building performance standard varies over time, given the assumptions listed above.

Cost calculations have been undertaken at three discount rates (4%, 6% and 8%) for each of four renovation depths in the table below. All calculations have been undertaken for a fictitious “statistically average” building, which is derived by dividing the total regulated²³ energy consumption by the gross floor area of the Romanian building stock. This gives a figure of 211 kWh/m²/a.

TABLE 7 – Energy saving and resulting energy performance by renovation depth for nominal average Romanian building consuming 211 kWh/m²/a

Renovation Type	Energy saving (%)	Saving (kWh/m ² /a)	Resulting energy performance (kWh/m ² /a)
Minor	15	32	179
Moderate	45	95	116
Deep	75	158	53
nZEB	95	200	11

The calculations are undertaken for 2014 and 2-yearly intervals thereafter, up to 2030, as presented in the table below. The cost optimal level is taken as the point at which the net present value (NPV) exceeds zero. Results with negative NPV are shown in red.

²³Regulated energy = those uses covered by EPBD: heating, cooling, ventilation, hot water and fixed lighting

In undertaking NPV calculations, an average lifetime of 40 years for the installed measures has been assumed. This is a conservative estimate, at the bottom of the 40-120 year range for building life as published by the International Energy Agency in "Beyond Kyoto - Energy Dynamics and Climate Stabilisation"²⁴. For the most part, building fabric measures, once installed, will be in place for the remaining lifetime of the building. Other technical measures such as HVAC plant or solar installations may need replacement after 20-30 years, though the assumption is that the new equipment will be at least as efficient as that it replaces. In other words, investing in more efficient equipment locks in future savings.

The results are also plotted graphically in figure 17 overleaf, showing the break-even date when the lines cross the x-axis.

TABLE 8 – NPV²⁵ calculations (€NPV saving per m² floor area)

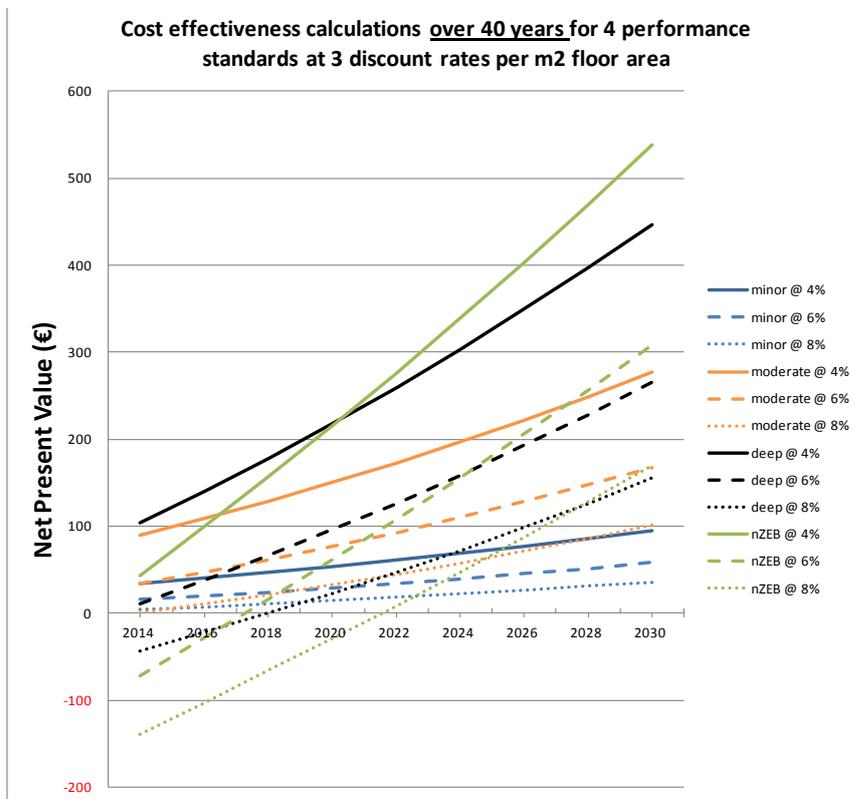
Depth	2014	2016	2018	2020	2022	2024	2026	2028	2030
4% Discount Rate									
minor	35	41	47	54	61	69	77	86	95
moderate	90	109	129	150	173	197	222	249	277
deep	104	140	178	218	260	303	349	397	447
<u>nZEB</u>	44	100	157	216	276	339	403	470	539
6% Discount Rate									
minor	16	20	24	29	34	40	45	52	58
moderate	34	47	61	77	93	110	128	147	168
deep	11	38	66	96	126	159	193	228	265
<u>nZEB</u>	-72	-28	16	62	108	156	206	256	309
8% Discount Rate									
minor	5	8	11	14	18	22	27	31	36
moderate	1	11	21	33	45	58	72	86	102
deep	-43	-22	0	23	47	72	99	126	155
<u>nZEB</u>	-139	-102	-66	-29	9	48	87	128	170

NOTE - Negative NPVs in red are not cost effective

²⁴page 68 of <http://www.oecd.org/greengrowth/greening-energy/49157219.pdf>

²⁵NPV is calculated by taking the investment costs and resulting savings over the lifetime of the measures, discounted using the rate indicated

Figure 17 – NPV calculations over 40 years using various discount rates and renovation depths



It can be seen that:

- At a **4% discount rate**, all levels of renovation are cost effective today,
- At **6% discount rate**, all levels except nZEB renovation are cost effective today. nZEB becomes cost effective in 2018.
- At **the highest discount rate of 8%**, deep renovation only becomes cost effective after 2018, while nZEB renovation is cost effective from 2022 onwards.

At first glance, these performance levels might seem surprisingly demanding. However, in calculating the cost effectiveness, it should be noted that two key factors are instrumental in making the deeper renovations cost effective within a matter of years:

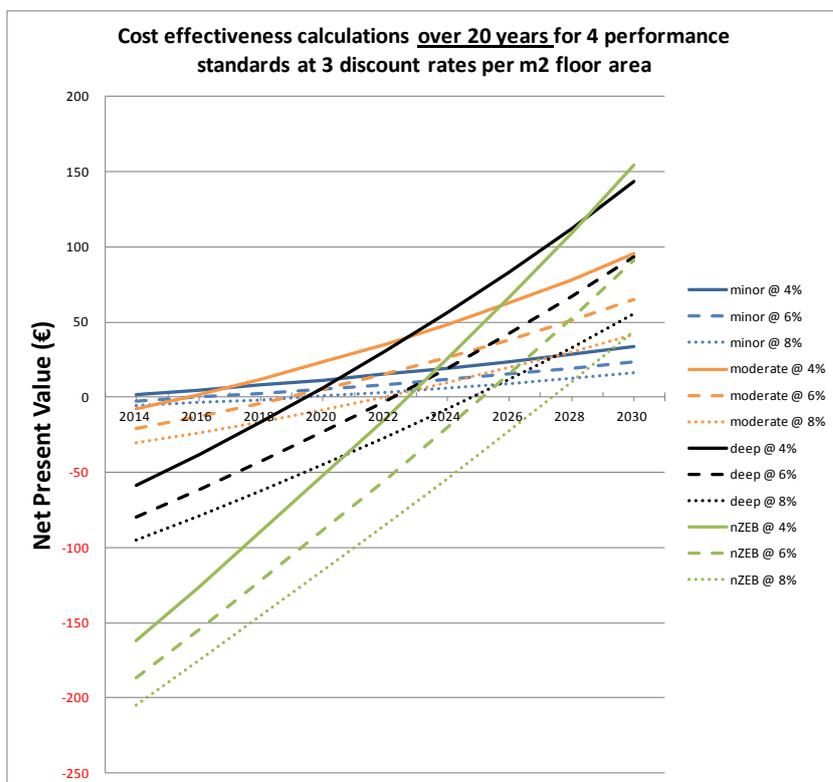
- Energy price inflation is increasing the value of future savings,
- The learning curve is reducing the cost of renovation in future years.

Furthermore, it is expected that renewable technologies will progressively play a much more important role as costs come down and they become more affordable.

Clearly, the discount rate has a key bearing on cost effectiveness. Shifting from a calculation at 8% to one at 4% brings the point at which nZEB renovation becomes cost effective forward by 8 years, from 2022 to today. The graph above also illustrates that the more ambitious performance standards have a steeper curve, showing that the net present value benefits become progressively greater with time when compared with the less ambitious standards.

One other important factor is the lifetime over which measures are valued. If the cost optimal calculation is undertaken over just 20 years, instead of 40 years, a very different picture emerges, as illustrated in the figure below. Only the minor renovations at 4% discount rate are cost effective today, while it is not until 2028 that nZEB renovations at 8% discount rate become cost effective.

Figure 18 – NPV calculations over 20 years using various discount rates and renovation depths



COST EFFECTIVENESS CALCULATIONS BY BUILDING TYPE

Three example properties are considered to illustrate the financial aspects of a deep renovation, using discount rates of 4% and 8%. The chosen properties are:

- Single family house with a floor area of 73 m²
- Multi-family house with a floor area of 48 m²
- A nominal non-residential building with a floor area of 1000 m²

The results are summarised in the table below. It can be seen that in all cases, a deep renovation is cost effective when a 4% discount rate is applied, but not at 8%. Due to the impact of the learning curve and energy price reduction, deep renovations become cost effective at 8% discount rate in 2019 for non-residential properties, and 2023 for residential.

TABLE 9 - Cost effectiveness calculation for three building types

ITEM	UNITS	SINGLE FAMILY HOUSE	MULTI-FAMILY HOUSE	NON-RESIDENTIAL
Area	m2	73	48	1000
Energy use/m2	kWh/m2/a	201	201	255
Energy use	kWh/a	14673	9648	255000
Annual energy spend	€/a	604	397	10505
Investment cost-deep renovation	€	14308	9408	196000
Annual saving in 2014	€	453	298	7879
Annual saving in 2020	€	605	398	10522
Annual saving in 2030	€	980	644	17030
NPV at 4%	€	6649	4372	166186
NPV at 8%	€	-3560	-2341	-13114
Year in which deep renovation becomes cost effective at 8%		2023	2023	2019

VIII FINANCING 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 energy cost savings 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 most of the population and among business, coupled with low levels of motivation and awareness.

INVESTMENT PROFILE

The table and graph below present the investment profile in 5-yearly bands, commencing in 2015. Please note that these figures are undiscounted.

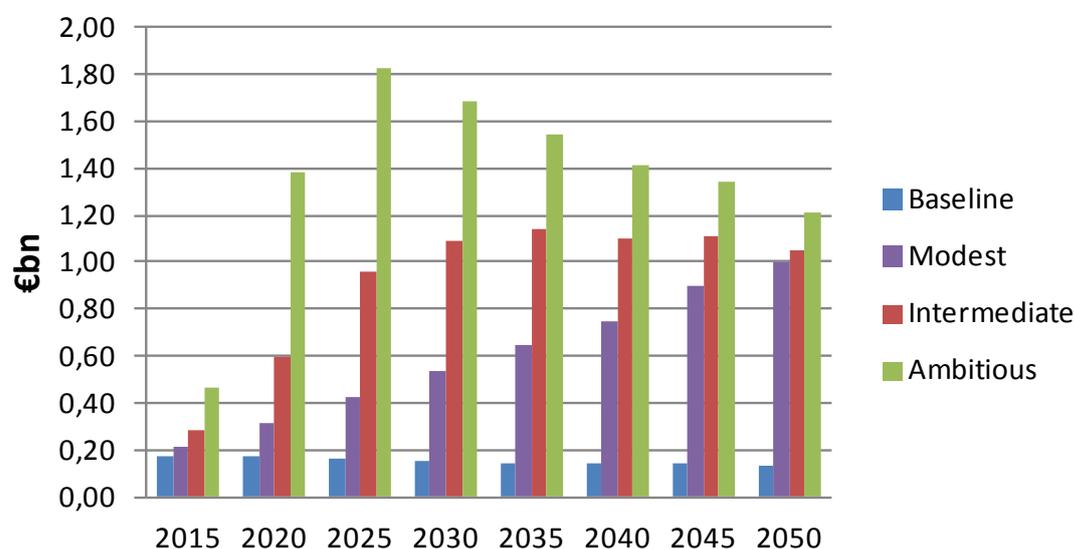
TABLE 10 – Investment profile

Scenario	2015	2020	2025	2030	2035	2040	2045	2050
€bn								
Baseline	0.18	0.17	0.16	0.15	0.15	0.14	0.14	0.13
Modest	0.22	0.32	0.42	0.53	0.64	0.75	0.90	1.00
Intermediate	0.28	0.60	0.96	1.09	1.14	1.10	1.11	1.05
Ambitious	0.46	1.38	1.83	1.69	1.54	1.41	1.34	1.21

The baseline illustrates the current estimate investment in building renovation, at around €0.18 bn/a. While the level of activity remains the same, costs decrease over time due to the learning curve. As expected, the investment required increases from the modest to the ambitious scenarios in 2015, and also increases for all three scenarios at least until 2025.

The acceleration is particularly rapid for the ambitious scenario, which represents a rapid shift towards deep renovation, reaching a peak investment rate of €1.8bn in 2025. After 2025, the total investment on the ambitious scenario reduces as the cost of measures decreases, while investment in the intermediate scenario more or less reaches a plateau around 2030 of around €1.1bn. Investment in the modest scenario continues to grow throughout the period, reaching €1bn/a in 2050.

Figure 19 – Investment profile



EU FUNDS FOR ENERGY EFFICIENT RENOVATION OF BUILDINGS²⁶

Buildings are at the heart of the EU's strategy to achieving smart, sustainable and inclusive growth by 2020. The EU has consistently recognised that investing in energy efficient renovation of the EU building stock is a win-win-win solution for businesses, for households, and the planet. 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. Indeed, funding for Romania is expected to more than double, to around €1.5bn over the seven year funding period. 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.

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).

The quantity of money allocated for energy efficiency in the European Structural and Investment Funds is expected to more than double from the last funding period. Indeed, the 4% maximum limit for investment in energy efficiency in residential buildings from the last ERDF funding period has been replaced by an obligatory minimum percentage to be invested in sustainable energy, including energy efficiency, in the upcoming funding period (from a minimum of 12% for most of the newer Member States to at least 20% for older Members). The funding opportunities for energy efficient building renovations have been further increased in the next funding period by opening the Cohesion Fund to both public and private housing (a sector previously excluded for this fund), and the European Social Fund will continue to encourage the training of Energy Efficiency Experts.

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"²⁷. The European Commission's webpage "Financing Energy Efficiency"²⁸ provides additional information on sources of finance.

One particular source of funding is the EU EBRD Energy Efficiency Finance Facility (EEFF) – see box

EU EBRD Energy Efficiency Finance Facility (EEFF)

EEFF is a grant-supported credit line that has been established by the European Commission and the European Bank for Reconstruction and Development to help private sector energy efficiency investments. Private sector industrial companies may borrow up to 2.5 million euros from a participating bank for energy efficiency investments, with free technical consultancy; and receive a 15% EU grant (up to 375,000 Euro) direct from EBRD when the investment is complete and operational.

Funding is available for a range of different energy saving investments, including building renovation.

²⁶Adapted from the Renovate Europe Campaign leaflet on Structural Funds: <http://www.renovate-europe.eu/uploads/Renovate%20Europe%20Structural%20Funds%20Leaflet.pdf>

²⁷http://ec.europa.eu/energy/efficiency/studies/doc/2014_guidance_energy_renovation_buildings.pdf

²⁸http://ec.europa.eu/energy/efficiency/financing/financing_en.htm



IX PHASE 3 - POLICY APPRAISAL

EXISTING POLICIES

Romania has several policies affecting energy use:

- The energy roadmap for Romania (GD 890/2003) aiming at a final electricity consumption of 57,59TWh 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 program "Heating 2006 - 2015 heat and comfort" (GD 462/2006) for rehabilitation of the DH 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 (GD 1069/20071) 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" program;
- Continuing the Program for the thermal retrofitting of blocks of flats;
- Expanding the national program for energy efficiency (retrofitting the heating system, retrofitting public buildings and increasing the efficiency of public lighting) 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 GO no. 22/2008 on energy efficiency and the promotion of the final consumer use of energy from renewable sources.

For upgrading/major renovations of existing buildings, no minimum requirements are imposed. However, if public money is utilised (e.g. national program for rehabilitation), then a maximum value of 100kWh/m²a is specified for space heating final consumption.

PERMIT REQUIREMENTS FOR RENOVATION

For undertaking major renovation measures that may have an impact on the building structure, it is necessary to have a permit attesting that the renovation project fulfils all the legal requirements. If the building is listed or is located in a historical area, an additional permit confirming that the renovation of the façade does not change the main characteristics of the building and/or area is required.

ORGANISATION OF OWNERS IN MULTI-FAMILY BUILDINGS AND THE RENOVATION DECISION PROCESS

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. The owners association will be represented by a committee formed of several representatives.

According to the Government Emergency Ordinance no. 69/June 2010 the decision for the building renovation can be taken based on the agreement of two thirds of the owners.

FINANCIAL SUPPORT SCHEMES

There are several financial support schemes already in place by and/or with the support of the Romanian Government. They promote uptake of energy efficiency and renewable energy in buildings and build the capacity of local organisations. The following programmes especially target the older building stock with most potential for improvements usually located in low income regions.

TABLE 11 –Government Support Schemes in Romania

Name of Financial Support Scheme	Short Description
Heating 2006-2015 – warmth and comfort «Termoficare 2006 - 2015 - căldură și confort»	This programme has two components: - the National Programme on Thermal Rehabilitation of block of flats - Programme for improving the DH systems.
Thermal rehabilitation of housing stock financed by bank loans with Government guarantee complementary to the Multianual National Programme for increasing the energy performance of dwellings	In 2010, the Romanian government adopted a support scheme for increasing the energy efficiency of the housing stock. The scheme offers government guarantees and subsidised interest for loans contracted for the thermal rehabilitation of housing stock. Homeowners' associations and owners of single-family housing can thus benefit from favourable credit conditions for the thermal rehabilitation of living space built and acquired by the end of 2000.
Casa Verde Program	The Casa Verde Program operated in 2010-11, providing funding from the Environmental Fund for the installation of heating systems that use renewable energy.
LGGE Improving Energy Efficiency in Low-Income Households and Regions of Romania²⁹	This project focuses on reducing energy consumption in low-income public housing to address fuel poverty in Romania. The project aims to improve capacity among local builders and suppliers to reduce fuel consumption in low-income communities and promote community based retrofits of schools, municipal buildings, and households. It also supports improved policies aiming at energy efficiency in low-income communities and improved databases and methodologies for tracking buildings' energy needs.

²⁹<http://www.thegef.org/gef/node/4412>

POLICY OPTIONS

Phase 3 of the renovation strategy is the development of an appropriate policy landscape – an essential component for the successful delivery of a renovation strategy. The historic underinvestment in building renovation cannot be properly addressed by a single policy or support programme. Rather, 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.

One of the difficulties that all countries face is that the policies that can influence building renovation – whether positively or negatively – rarely sit within a single government department, or even a single tier of government. At the national level, relevant policies are typically split across numerous departments or agencies. Clearly, the composition of different government ministries varies from country to country, and is also frequently subject to change as a result of changing governments following elections. Consequently, the policy areas described below may be within separate ministries, or equally part of the same ministry:

- **Finance/Treasury:** 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:** With the economic crisis still having a significant impact on many European and global economies, many actors have mistakenly taken the view that measures to improve the environment are somehow detrimental to economic growth. Considerable evidence exists that investing in highly energy performing buildings is good for the economy and creates jobs.
- **Environment/Climate Change:** While much of the focus remains on international negotiations, the fact remains that buildings are the largest contributor to CO₂ emissions and must therefore be a priority area for action domestically.
- **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. Regional authorities manage the operational programmes for EU funds and can therefore have a significant influence on prioritising expenditure.
- **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.

The starting point for the policy appraisal section of the renovation strategy is a review of the existing barriers. Solutions then need to be developed to address these barriers. Solutions need to act in a concerted manner to support and reinforce each other and create a framework conducive to investment in building renovation.

BARRIERS

Three main types of barriers have been identified as being of most relevance to the building sector in Romania³⁰:

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

The table below lists selected barriers under each of the three headings. The following section discusses a range of policy options that aim to address the barriers and provide a policy landscape that is conducive to improving the energy performance of buildings.

TABLE 12 – Appraisal of barriers (simplified)

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
Lack of private investment in the rehabilitation of residential and non-residential buildings
High costs of 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 investments
The high rate of unemployment and the duration of time until re-employment
Energy prices (gas, fuel, electricity etc..) vs. real prices (i.e. energy subsidies)
BARRIER TYPE: Skills, employment & education system
Lack of skilled workers or low levels of training in the use of new technologies designed for EE and RES

DEVELOPING POLICY SOLUTIONS

In its report to the Commission on EED article 7 pertaining to Energy Efficiency Obligations (EEOs), the Romanian Government argued that it would be inappropriate to consider an EEO in the period 2014-2016 due to the impact on energy prices³¹. Nevertheless, there is much experience within the EU as well as globally with EEOs³² that shows the significant benefits that can be achieved, and the net benefits to consumers far outweighs the modest increase in energy bills.

³⁰The above list has been adapted from this presentation at Euro Constructii in 2012: <http://euroconferinta.ro/prezentari/Tema1-17.pdf>

³¹http://ec.europa.eu/energy/efficiency/eed/doc/article7/2013_ro_eed_article7_en.pdf

³²The Regulatory Assistance Project has produced numerous documents on EEOs, e.g. on global best practice <http://www.raponline.org/document/>

Rather than progressing an EEO at this stage, the Romanian Government has opted for an alternative approach comprising the following range of policy measures:

- Establishment of an energy efficiency investment fund to tap into private funds, structural funds, auctioning revenues under EU ETS provisions and possibly the state budget.
- Conducting 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
- Regulations or voluntary agreements
- Supporting the development of ESCOs, including developing the regulatory framework for the effective operation of the ESCO and energy performance contracts markets by 2016.

These measures go some way towards improving the landscape for building renovation, and it is important that they be implemented in an effective way. In addition to these measures, BPIE believes there are many more actions that should be given serious consideration. These are discussed in BPIE's *Guide to renovation strategy development*, under six headings:

- Strategic
- Legislative/Regulatory
- Technical
- Fiscal/Financial
- Communication/Capacity Building
- R&D

Figure 20 – Schematic of Main Categories of Policy Measures



The full policy option list is presented overleaf, along with a proposed indication as to the relevance to the situation in Romania.

TABLE 13 – Policy actions to underpin the renovation strategy

	BPIE INDICATIVE LIST OF POLICY INITIATIVES (non-exhaustive)³³	APPLICABILITY IN THIS RENOVATION STRATEGY
STRATEGIC	Establish support across the political spectrum 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
	Establish an independent committee to monitor and report progress on the strategy on an ongoing basis, including making recommendations for improvements and periodic updates	For consideration. An independent committee has the benefit of providing a politically neutral ground for considering progress and advising on steps to deliver the renovation ambition
	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 2017 (2nd iteration of national renovation strategy)
	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 (EED Art 5) from 2014, serious consideration should be given to implementing a similar objective in the remainder of the public sector, commencing in 2015

³³SOURCE - BPIE Guide to Renovation Strategy Development

	BPIE 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 ³⁴	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 (EEO) that encourage the delivery of deep renovation	This should be considered a top priority action for the period from 2017 onwards.
	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 disincentivise 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	For consideration in 2017
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 & 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 & products	As required by EPBD

³⁴Example trigger points include: Audits; Issue of Energy Performance Certificates; Boiler & air conditioning inspections; Change of ownership or tenancy; Change of building use; Other building work (e.g. extensions)

	BPIE INDICATIVE LIST OF POLICY INITIATIVES (non-exhaustive)	APPLICABILITY IN THIS RENOVATION STRATEGY
FISCAL/FINANCIAL	Secure sources of finance, including those identified in EED Article 20 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.
	Factor in 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 and energy performance contracts markets by 2016
	Strengthen energy/carbon pricing mechanisms to provide the right economic signals	For consideration in 2017, 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	For consideration in 2017

	BPiE 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 BuildUp Skills Romania, including establishing a cadre of suitably qualified energy auditors
	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	As above
	R&D	Support research, development and demonstration projects into new & improved technologies and techniques to deliver deep renovation, including how to scale up best practice to multiple buildings

X CONCLUSION

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 paper covers phases 1-3 of the BPIE strategy development and implementation process. Phase 4 (drafting and consulting on the strategy) was undertaken at a meeting in Bucharest in November 2013 with over 30 key stakeholders. This final draft strategy is the result of the consultation exercise.

The most important phase of the strategy, however, is its implementation. As a first step, it is key to maintain the interest and momentum generated by the publication of this strategy, and the network of stakeholders established during the development process. Government needs to allocate the resources and legislative timeslots in order for the policies and measures essential for delivering the strategy can be developed and implemented in a timely manner.

This strategy sets out a long term framework to 2050 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 manufacturers and installers to professional service providers, needs to be engaged in the process.

Net energy cost savings for consumers of €20bn (after deducting investment costs) could be achieved by adopting the most ambitious policy scenario. These are valued at a discount rate of 8%. Applying a societal discount rate of 4% gives a present value net benefit of €126bn. In addition, there are considerable associated impacts in terms of improved health, reduced import dependency, increased energy security, economic stimulus and environmental improvement that would provide further benefits to the Romanian economy.

Funding 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 all consumers to invest in building renovation.

Developing the full set of policies to raise the renovation rate from the current ~1% of floor area per annum to 2.5-3% will take time. Those policies which are considered the most important in the next three year period are identified in table 11, and summarised below.

- Aim for cross party and cross-society support for a national programme to renovate Romania's building stock;
- Establish a cross-ministerial group to appraise the co-benefits from energy performance improvement, and reflect the value in policy making in areas such as health and employment;
- Address the poor energy performance of housing of the many disadvantaged Romanian citizens thereby giving a major boost to their quality of life;
- Serious consideration should be given to implementing a 3% renovation rate for the entire public sector, commencing in 2015;
- Establish high performance requirements for replacement building elements and technical components such as HVAC plant;
- Provide support for buildings integrated renewables;
- Continue improvement in the efficiency and public acceptability of the large number of existing district heating systems, and also to stem the tide of disconnections;
- 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 the ESCO and energy performance contracts markets by 2016;
- Remove restrictive tenancy laws which disincentivise or otherwise inhibit energy performance improvement;
- Implement findings from BuildUp Skills Romania, including establishing a cadre of suitably qualified energy auditors;
- 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.

PART II of the study dealing with the evaluation of policy options for building stock renovation in Romania will be published in the summer of 2014



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