RENOVATING ROMANIA

A STRATEGY FOR THE ENERGY RENOVATION OF ROMANIA’S BUILDING STOCK
BPIE would like to express its gratitude towards the stakeholders who contributed to improving this study by actively participating in our consultation meeting in November 2013. We look forward to further discussions with all stakeholders.

Cover photos © courtesy of Acoperis Magazin, Property Buyer, Primaria Bacau, Municipiul Moreni, Ministry of Regional Development and Public Administration, Arena Constructiilor.

Published in April 2014 by the Buildings Performance Institute Europe (BPIE)

Copyright 2014, Buildings Performance Institute Europe (BPIE). Any reproduction in full or in part of this publication must mention the full title and author and credit BPIE as the copyright owner. All rights reserved.

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
# CONTENTS

## PART I - A STRATEGY FOR THE ENERGY RENOVATION OF ROMANIA’S BUILDING STOCK

I  **INTRODUCTION**  
II  **AIM OF THIS STRATEGY**  
III  **EUROPEAN POLICY CONTEXT**  
   European Directives Affecting the Building Sector  

IV  **BENEFITS**  

V  **PHASE 1 - IDENTIFYING STAKEHOLDERS AND INFORMATION SOURCES**

VI  **PHASE 2 - APPRAISAL OF TECHNICAL AND ECONOMIC POTENTIAL**  
   Overview of the Renovation Model  
   Initial Data and Modelling Assumptions  
   Renovation Variables  
   Scenarios  

VII  **RESULTS**  
   Model Results  
   Economic Comparison of Renovation Scenarios  
   Cost Effectiveness Calculation  
   Cost Effectiveness Calculations by Building Type  

VIII  **FINANCING THE MEASURES**  
   Investment Profile  

IX  **PHASE 3 - POLICY APPRAISAL**  
   Existing Policies  
   Financial Support Schemes  
   Policy Options  
   Barriers  
   Developing Policy Solutions  

X  **CONCLUSION**
1. Setting the Stage

The building stock is responsible for a large share of greenhouse gas emissions (GHG) in the European Union. Major emission reductions can be achieved through changes in this sector, and the building sector is crucial to achieving EU reduction targets. With more than one quarter of the 2050 building stock still to be built, a large amount of GHG emissions are not yet accounted for. To meet the EU’s ambitious reduction targets, the energy consumption of these future buildings needs to be close to zero, which makes finding and agreeing on an EU-wide definition or guidelines for “nearly Zero-energy Buildings” (nZeB) essential in the effort to reduce domestic greenhouse gases to 80% of 1990 levels by 2050.

The recast of the Energy Performance of Buildings Directive (EPBD) introduced, in Article 9, “nearly Zero-energy Buildings” (nZeBs) as a future requirement to be implemented from 2019 onwards for public buildings and from 2021 onwards for all new buildings. The EPBD defines a nearly Zero-energy Building as follows: 

*“nearly Zero-energy Building is a* [a nearly Zero-energy Building is a] “building that has a very high energy performance…”

The nearly zero or very low amount of energy required should to a very significant extent be covered by energy from renewable sources, including renewable energy produced on-site or nearby.

Acknowledging the variety in building culture, climate, and methodological approaches throughout the EU, the EPBD does not prescribe a uniform approach for implementing nearly Zero-energy Buildings (nZeBs) and each EU member State has to elaborate its own nZeB definition. The EPBD also requires EU member States to draw up specifically designed national plans for implementing nZeBs which reflect national, regional, or local conditions. The national plans will have to translate the concept of nearly Zero-energy Building into practical and applicable measures and definitions to steadily increase the number of nearly Zero-energy Buildings. EU member States are required to present their nZeB definition and roadmaps to the European Commission by 2013.

So far the nZeB criteria as defined in the EPBD are of a very qualitative nature with much room left for interpretation and way of execution. Indeed, there is little guidance for member States on how to concretely implement the directive and on how to define and realise nearly Zero-energy Buildings. Therefore, a more concrete and clear definition of nZeB needs to be formulated which includes common principles and methods that can be taken into account by EU member States for elaborating effective, practical and well-thought-out nearly Zero-energy Buildings.

The aim of this study is to actively support this elaboration process in Romania by providing a technical and economic analysis for developing an ambitious yet affordable nZeB definition and implementation plan. Starting from country data on current construction practices, economic situation conditions and existing policies, different technological options are simulated for improving the energy performance of offices and single- and multi-family buildings. We have evaluated the economic implications of the various options and offer recommendations for an implementation plan.
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 - ODYSSEE')

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.

---

II AIMS 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 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.
Figure 2: Distribution of residential floor area by building type and urbanisation

Figure 3: Distribution of non-residential floor area by building type

New construction rates are generally higher in the non-residential sector. Data about new construction per building type category is hard to find. In the residential sector, the average new construction rate is about 0.64%. It is not possible to give precise new construction rates per sub-types of buildings. Therefore, we can only indicate trends and refer to the average construction rate within the building sector (below or above average). This indication might be misleading, since the rate depends on the denominator, e.g., there might be many houses built in the rural area, but the rate may appear below average because the building stock of this type is huge. However, we consider this being the best approximation possible at this stage and acceptable in the context of this study.

For the non-residential sector, the situation is worse; there is no reliable data for each building category. The estimated construction rates for the non-residential sector were very high over the last decade and for certain sub-types even well above 10%/year. This construction rate seems credible if we consider the strong impetus in the service sector in Romania and the lack of existing office buildings. However, this high construction rate cannot last for too many years and will very likely not continue until 2019 when the nZeB requirement should be in place. Market research indicates that floor space of commercial offices

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Urban Area</th>
<th>Rural Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached Single Family House</td>
<td>17%</td>
<td>43%</td>
</tr>
<tr>
<td>Semi-detached and Terraced Sfh</td>
<td>34%</td>
<td>1%</td>
</tr>
<tr>
<td>Multi-Family Housing (mhf)</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

The construction rate depends on the specific type of building. For example:

- Office buildings - national authorities
  - Office buildings - local authorities
  - Office buildings - commercial low standard
  - Office buildings - commercial high standard
- Schools/education
- Health facilities
- Hotels/restaurants
- Retail in mixed-use buildings
- Retail detached (e.g., supermarkets or malls)
- Others (e.g., industry/logistics)

For the non-residential sector, the situation is worse; there is no reliable data for each building category. The estimated construction rates for the non-residential sector were very high over the last decade and for certain sub-types even well above 10%/year. This construction rate seems credible if we consider the strong impetus in the service sector in Romania and the lack of existing office buildings. However, this high construction rate cannot last for too many years and will very likely not continue until 2019 when the nZeB requirement should be in place. Market research indicates that floor space of commercial offices

* Low standard means low concern for internal comfort and simple HVAC systems (e.g., natural ventilation). High standard means high internal comfort (no overheating), typically achieved by central HVAC systems.


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 Rompuy:

“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 study 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 Ecofys. 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**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MULTIPLIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Cost Saving</td>
<td>1.0</td>
</tr>
<tr>
<td>Economic Stimulus</td>
<td>1.5</td>
</tr>
<tr>
<td>Societal (health) Benefits</td>
<td>1.0</td>
</tr>
<tr>
<td>Environmental Benefits</td>
<td>0.1</td>
</tr>
<tr>
<td>Energy System Benefits</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>4.6</strong></td>
</tr>
</tbody>
</table>

*Opening Address at Renovate Europe Day, Brussels, 9th October 2013
*Saving 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.
almost doubled from 2005 to 2011; however the new high construction rate has been slowing down since 2009 and reached 2.5% in 2011 (table 4).

Table 4: Development of floor area of commercial office buildings since 2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Useful Area (mill. m²)</th>
<th>New Built Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>2.5</td>
<td>-</td>
</tr>
<tr>
<td>2006</td>
<td>2.8</td>
<td>12</td>
</tr>
<tr>
<td>2007</td>
<td>3.2</td>
<td>14</td>
</tr>
<tr>
<td>2008</td>
<td>4.1</td>
<td>28</td>
</tr>
<tr>
<td>2009</td>
<td>4.4</td>
<td>7</td>
</tr>
<tr>
<td>2010</td>
<td>4.6</td>
<td>5</td>
</tr>
<tr>
<td>2011</td>
<td>4.7</td>
<td>2.5</td>
</tr>
</tbody>
</table>

therefore we can assume that the construction rates are similar to those of other central and eastern European countries (Poland and Hungary), i.e. a new construction rate between 1.5 – 2.5% for the overall non-residential sector and a rate of on average 5% from 2009 to 2011 for office buildings only. For the other categories there is no data available and we indicate the new construction rate to be above or below average as in the case of residential buildings (table 5).

Table 5: Number of buildings in Romania

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Region</th>
<th>Number of Buildings (1000)</th>
<th>Floor Area (million m²)</th>
<th>New Construction Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>detached single-family houses</td>
<td>urban</td>
<td>1,189.2</td>
<td>97</td>
<td>above average</td>
</tr>
<tr>
<td></td>
<td>rural</td>
<td>3,660.9</td>
<td>237</td>
<td>Below average</td>
</tr>
<tr>
<td>semi-detached and terraced single-family houses</td>
<td>urban</td>
<td>112.0</td>
<td>20</td>
<td>above average</td>
</tr>
<tr>
<td></td>
<td>rural</td>
<td>54.9</td>
<td>6.3</td>
<td>Below average</td>
</tr>
<tr>
<td>multi-family buildings</td>
<td>urban</td>
<td>80.9</td>
<td>191</td>
<td>Below average</td>
</tr>
<tr>
<td></td>
<td>rural</td>
<td>5.1</td>
<td>5.3</td>
<td>Below average</td>
</tr>
<tr>
<td>other buildings that cannot be assigned to above categories</td>
<td>urban</td>
<td>6.3</td>
<td>1.1</td>
<td>Below average</td>
</tr>
<tr>
<td></td>
<td>rural</td>
<td>8.6</td>
<td>0.5</td>
<td>Below average</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>5,118</td>
<td>559</td>
<td>0.6</td>
</tr>
<tr>
<td>Non-residential buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>commercial and public office</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>19.1</td>
<td>7.8</td>
<td>much above average</td>
</tr>
<tr>
<td>retail</td>
<td></td>
<td>133.5</td>
<td>18.3</td>
<td>above average</td>
</tr>
<tr>
<td>hotels &amp; restaurants</td>
<td></td>
<td>5.0</td>
<td>5.2</td>
<td>above average</td>
</tr>
<tr>
<td>health facilities</td>
<td></td>
<td>51.3</td>
<td>9.3</td>
<td>Below average</td>
</tr>
<tr>
<td>educational facilities</td>
<td></td>
<td>8.1</td>
<td>17.4</td>
<td>Below average</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>217.1</td>
<td>59.4</td>
<td>1.5-2.5*</td>
</tr>
</tbody>
</table>

* assumption based on the Romanian national institute of Statistics and authors’ best estimation.

V PHASE 1 - IDENTIFYING STAKEHOLDERS AND INFORMATION SOURCES
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:

- Asociatia Producatorilor Materialelor de Constructii din Romania (APMCR) – Association of Romanian Construction Materials Manufacturers;
- Asociatia Romana a Antreprenorilor din Constructii (ARACO) – Romanian Association of Construction Entrepreneurs;
- Patronatul Societatilor din Constructii (PSC) – Construction Companies Employer’s Organization
- Camera de Comert si Industrie a Romaniei (CCIR);
- Romania Green Building Council (RoGBC);
- Asociatia Inginerilor de Instalatii din Romania (AIIR) – Association of Romanian Installation Engineers;
- Asociatia Auditorilor Energetici din Constructii (AAEC) – Association of Energy Auditors in Constructions;
- Liga Asociatiilor de Proprietari Habitat – League of Habitat Owners Associations;
- Federatia Asociatiilor de Proprietari din Romania – Federation of Property Owners Associations in Romania;
- Asociatia Producatorilor de Surse Regenerabile (SUNE) – Association of Renewable Sources Producers;
- Asociatia Româna Pentru Promovarea Eficientei Energetice (Arpee) – Romanian Association For Promoting Energy Efficiency;
- Asociatia Municipiilor din Romania – Association of Romanian Municipalities;
- Asociatia Oraselor din Romania – Association of Romanian towns;
- Confederatia Producatorilor Industriali din Romania (CONPIROM) – Confederation of Industrial Producers from Romania;
- Societatea Romana 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);
- Romania’s 2nd National Action Plan for Energy Efficiency;
- Statistical Yearbook of Romania;
- Census data.

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 building renovation can be taken based on agreement of two thirds of owners.
4.2.2. Renewable energy share in new buildings

The building code in Romania doesn’t specify any requirements for using renewable energy and DHW in buildings.

4.2.3. Actual practice in construction

4.2.3.1. Enforcement

Building requirements (including minimum thermal performance of building components and global indicator g12) are controlled at the stage of construction authorisation (building permit). In principle, the requirements are respected in the design documentation. Otherwise the construction project does not pass the authorisation process. However, in practice, the execution of the work is not always undertaken according to the design and can depend on the budget reduction by the investor. In addition, the poor execution of details/joints (thermal bridges) can lead to a reduction of the global thermal resistance of the building envelope and usually result in values which do not respect the minimum thermal requirement.

4.2.3.2. Penalties for non-compliance

If a construction is built without a permit or infringes its permit, the control authorities may order the demolition of those elements which are not compliant with the permit or were built without a permit. In such cases, the construction works can be suspended. In this case, the administrative fine to be paid by the investor is up to approximately €2 300 euro in addition to indemnities for the damage caused.

4.2.3.3. Body responsible for compliance in construction

The main responsible body for compliance control in construction is the State Inspectorate in Construction (SIC), a public institution with a legal personality, subordinated to the Ministry of Regional Development and Tourism (MTR). SIC has a control function over the execution of works. The actual inspection for compliance, after issuing the building permit and authorisation of works, is done by either:

- Construction inspectors employed by SIC;
- Site inspectors/project supervisors (subject to authorisation by SIC) employed by the beneficiary/building owner;
- Technical inspectors (subject to authorisation by MTR) employed by the contractor.

Compliance with the energy performance regulation is required during the authorisation phase of construction works. During the final commissioning phase, the realisation of an energy performance certificate (EPC) is required. With the exception of apartments in a block of flats, the EPC also displays the energy performance indicator for a reference (national) building (the same geometry as the actual building, but with the minimum thermal requirements fulfilled). This would be equivalent to the energy performance of the same building respecting the minimum energy performance requirements at
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)**

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices</td>
<td>16.3%</td>
</tr>
<tr>
<td>Educational buildings</td>
<td>16.9%</td>
</tr>
<tr>
<td>Hospitals</td>
<td>13.8%</td>
</tr>
<tr>
<td>Hotels &amp; Restaurants</td>
<td>7.7%</td>
</tr>
<tr>
<td>Sport facilities</td>
<td>7.0%</td>
</tr>
<tr>
<td>Wholesale and retail trade</td>
<td>27.2%</td>
</tr>
<tr>
<td>Other non-residential buildings</td>
<td>11.1%</td>
</tr>
</tbody>
</table>

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

**Breakdown of the building stock by building types**

- Single family houses: 273,313,582 m²
- Multi family houses: 151,307,054 m²
- Other residential buildings: 1,613,464 m²
- Offices: 10,990,000 m²
- Educational buildings: 11,349,000 m²
- Hospitals: 9,250,000 m²
- Hotels & Restaurants: 5,420,000 m²
- Sport facilities: 4,700,000 m²
- Wholesale and retail trade: 18,300,000 m²
- Other non-residential buildings: 7,456,000 m²
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 dwelling.\(^{(10)}\)

\(^{(10)}\)BPIe estimation based on survey carried out for BPIe report “European Buildings under the Microscope”, 2011.

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

**Breakdown of the building stock by age bands**
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) systems13. Just over half of the energy supplied to district heating systems is natural gas, with the remainder provided by oil (26%) and coal (20%).

13 Euroheat 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)

<table>
<thead>
<tr>
<th>Energy supply composition for District Heat generated</th>
<th>Recycled heat incl. indirect use of Renewables</th>
<th>91%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Renewables</td>
<td>0.31%</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>8.3%</td>
<td></td>
</tr>
<tr>
<td>Total District Heat sales</td>
<td>49,095 TJ</td>
<td></td>
</tr>
<tr>
<td>(Total District Heat sales in 2007)</td>
<td>56,110 TJ</td>
<td></td>
</tr>
<tr>
<td>Annual District Heat sales turnover</td>
<td>713.84 M €</td>
<td></td>
</tr>
<tr>
<td>Share of citizens served by District Heating</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>Trench length of District Heating pipeline system</td>
<td>6,055km</td>
<td></td>
</tr>
<tr>
<td>(Trench length of District Heating pipeline system in 2007)</td>
<td>7,611 km</td>
<td></td>
</tr>
<tr>
<td>Average District Heating price</td>
<td>14.54 €/GJ</td>
<td></td>
</tr>
<tr>
<td>Number of District Heating utilities</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>Total installed District Heating capacity</td>
<td>13,619 MWth</td>
<td></td>
</tr>
<tr>
<td>Total investment in District Heating</td>
<td>168 ME</td>
<td></td>
</tr>
<tr>
<td>Estimated employment figures in District Heating sector</td>
<td>19,360</td>
<td></td>
</tr>
<tr>
<td>District heated floor space</td>
<td>55,590,000 m²</td>
<td></td>
</tr>
<tr>
<td>New connections to District Heating</td>
<td>166,000</td>
<td></td>
</tr>
<tr>
<td>CO₂ emissions per TJ of District Heat generated</td>
<td>81.7 Ton CO₂/TJ</td>
<td></td>
</tr>
<tr>
<td>Total heat demand</td>
<td>243,367 TJ</td>
<td></td>
</tr>
<tr>
<td>Total share of CHP of national electricity production</td>
<td>10.9%</td>
<td></td>
</tr>
<tr>
<td>CHP heat autoproduction</td>
<td>89 TJ</td>
<td></td>
</tr>
<tr>
<td>Average energy use of buildings per m²</td>
<td>0.883 GJ/m²</td>
<td></td>
</tr>
</tbody>
</table>

^12 See TABULA project website: http://www.building-typology.eu/
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 programme. According to EuroObserver renewable energy barometer, 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 homes. 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 buildings, 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.

---

15UN ECE 2001; Trainrebuild 2012
16Publicly owned housing is almost non-existent in Romania
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.

---

24%  26%
14%   14%
8%    7%
21%   24%

*Education*    *Health*
*Tourism*     *Commerce*
*Postal services/telecomm.* *Public administration*

---

1 This value is to be understood as a maximum value.
2 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]

![Energy Performance Chart](image)

Average CO₂ emission index [kgCO₂/m² yr]

![CO₂ Emission Chart](image)

---

---

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

13 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)

<table>
<thead>
<tr>
<th>Building type</th>
<th>Thermal performance U-value [W/(m²K)]</th>
<th>Final energy use (kWh/m²yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vertical</td>
<td>Horizontal</td>
</tr>
<tr>
<td>Offices</td>
<td>0.70 - 1.50</td>
<td>0.35 - 1.30</td>
</tr>
<tr>
<td>Education, culture Health</td>
<td>0.70 - 1.50</td>
<td>0.35 - 1.30</td>
</tr>
<tr>
<td></td>
<td>0.70 - 1.50</td>
<td>0.35 - 1.30</td>
</tr>
<tr>
<td>Tourism</td>
<td>0.70 - 1.50</td>
<td>0.35 - 1.30</td>
</tr>
<tr>
<td>Wholesale and retail trade services</td>
<td>0.70 - 1.50</td>
<td>0.35 - 1.30</td>
</tr>
</tbody>
</table>

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 respectively.

Figure 11 – Electricity 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.

ANRE\(^{19}\) 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”\(^2\). 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 CO\(_2\) emissions of different rates (i.e. percentage of buildings renovated each year) and depths of renovation (i.e. level of energy achieved) in the residential and non-residential building sectors up to 2050. The model allows a number of scenarios to be tested to illustrate the financial, economic, environmental, employment and energy use impacts of different rates of uptake and depth of building renovation. In particular, the scenarios assess the following outcomes, both annually and in total:

- Energy saved;
- CO\(_2\) emission reductions;
- Total investment required to install renovation measures;
- 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 CO\(_2\) 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 buildings\(^\text{21}\).)
- Commercial and industrial buildings.

There are around 1 million abandoned houses in Romania\(^\text{22}\), 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.

---

\(^{2}\)http://bpie.eu/eu_buildings_under_microscope.html

\(^{21}\)Romania cost optimality study

\(^{22}\)2nd 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.
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**

<table>
<thead>
<tr>
<th>Renovation Depth</th>
<th>Initial Cost (€/m²) at today’s prices</th>
<th>Learning curve</th>
<th>Costs in 2050 (€/m²) at today’s prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor renovation - 15%</td>
<td>25</td>
<td>0.5%</td>
<td>21</td>
</tr>
<tr>
<td>Moderate renovation - 45%</td>
<td>90</td>
<td>1%</td>
<td>63</td>
</tr>
<tr>
<td>Deep renovation - 75%</td>
<td>200</td>
<td>2%</td>
<td>97</td>
</tr>
<tr>
<td>nZEB renovation - 95%</td>
<td>350</td>
<td>3%</td>
<td>117</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>Baseline</th>
<th>Modest</th>
<th>Intermediate</th>
<th>Ambitious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Savings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy saving in 2050 TWh/a</td>
<td>8.5</td>
<td>31.1</td>
<td>44.8</td>
<td>63.2</td>
</tr>
<tr>
<td>Energy saving in 2050 compared to 2010 %</td>
<td>8.3</td>
<td>30.4</td>
<td>43.8</td>
<td>61.8</td>
</tr>
<tr>
<td>Lifetime Costs and Benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment costs up to 2050 € million (NPV)</td>
<td>2,084</td>
<td>5,486</td>
<td>9,224</td>
<td>16,540</td>
</tr>
<tr>
<td>Cumulative energy cost savings € million (NPV)</td>
<td>5,414</td>
<td>16,726</td>
<td>25,164</td>
<td>37,011</td>
</tr>
<tr>
<td>Net saving to consumers (€ million (NPV)</td>
<td>3,333</td>
<td>11,248</td>
<td>15,954</td>
<td>20,496</td>
</tr>
<tr>
<td>Net saving to society (€ million (NPV)</td>
<td>17,143</td>
<td>67,586</td>
<td>93,862</td>
<td>126,408</td>
</tr>
<tr>
<td>Internal Rate of Return IRR</td>
<td>14.6</td>
<td>14.4</td>
<td>13.6</td>
<td>11.4</td>
</tr>
<tr>
<td>Carbon Emissions*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual CO₂ saving in 2050 MtCO₂/a</td>
<td>3</td>
<td>22</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>2050 CO₂ saved (% of 2010) %</td>
<td>12</td>
<td>79</td>
<td>83</td>
<td>89</td>
</tr>
<tr>
<td>CO₂ abatement cost €/tCO₂</td>
<td>-138</td>
<td>-40</td>
<td>-54</td>
<td>-70</td>
</tr>
<tr>
<td>Societal Benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment generated Average Jobs/year</td>
<td>4,403</td>
<td>15,854</td>
<td>24,888</td>
<td>39,736</td>
</tr>
</tbody>
</table>

*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.
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 regulated 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**

<table>
<thead>
<tr>
<th>Renovation Type</th>
<th>Energy saving (%)</th>
<th>Saving (kWh/m²/a)</th>
<th>Resulting energy performance (kWh/m²/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>15</td>
<td>32</td>
<td>179</td>
</tr>
<tr>
<td>Moderate</td>
<td>45</td>
<td>95</td>
<td>116</td>
</tr>
<tr>
<td>Deep</td>
<td>75</td>
<td>158</td>
<td>53</td>
</tr>
<tr>
<td>nZEB</td>
<td>95</td>
<td>200</td>
<td>11</td>
</tr>
</tbody>
</table>

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”. 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 – NPV\(^2\) calculations (€NPV saving per m\(^2\) floor area)**

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

NOTE - Negative NPVs in red are not cost effective

\(^2\)NPV is calculated by taking the investment costs and resulting savings over the lifetime of the measures, discounted using the rate indicated.

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.
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>
<thead>
<tr>
<th>ITEM</th>
<th>UNITS</th>
<th>SINGLE FAMILY HOUSE</th>
<th>MULTI-FAMILY HOUSE</th>
<th>NON-RESIDENTIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>m²</td>
<td>73</td>
<td>48</td>
<td>1000</td>
</tr>
<tr>
<td>Energy use/m²</td>
<td>kWh/m²</td>
<td>201</td>
<td>201</td>
<td>255</td>
</tr>
<tr>
<td>Energy use</td>
<td>kWh/a</td>
<td>14673</td>
<td>9648</td>
<td>255000</td>
</tr>
<tr>
<td>Annual energy spend</td>
<td>€/a</td>
<td>604</td>
<td>397</td>
<td>10525</td>
</tr>
<tr>
<td>Investment cost-deep renovation</td>
<td></td>
<td>14308</td>
<td>9408</td>
<td>196000</td>
</tr>
<tr>
<td>Annual saving in 2014</td>
<td>€</td>
<td>453</td>
<td>298</td>
<td>7879</td>
</tr>
<tr>
<td>Annual saving in 2020</td>
<td>€</td>
<td>605</td>
<td>398</td>
<td>10522</td>
</tr>
<tr>
<td>Annual saving in 2030</td>
<td>€</td>
<td>980</td>
<td>644</td>
<td>17030</td>
</tr>
<tr>
<td>Npv at 4%</td>
<td></td>
<td>6649</td>
<td>4372</td>
<td>166186</td>
</tr>
<tr>
<td>Npv at 8%</td>
<td></td>
<td>-3560</td>
<td>-2341</td>
<td>-13114</td>
</tr>
<tr>
<td>Year in which deep renovation becomes cost</td>
<td></td>
<td>2023</td>
<td>2023</td>
<td>2019</td>
</tr>
<tr>
<td>effective at 8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. financial analysis of the solutions

The financial impacts for single-family, multi-family and office buildings have been calculated by assuming the extra investment costs and related cost savings (mainly reflecting energy savings) of nZeB solutions as compared to the reference buildings according to the current standard.

6.1. Basic assumptions

The following tables present the assumed energy prices as the basis for estimating the financial impact for private households and offices. These prices are averages, considering a period of 30 years with an anticipated high increase in energy prices over the period 2011-2020 (when a price liberalisation is foreseen) and an average annual price increase rate of 1.5% afterwards (2021-2040).

All calculations for Romania were based on an interest rate of 8% as it is currently the case in Romania.

Table 16: Assumed energy prices for private households and offices/industry (average 2011-2040)

<table>
<thead>
<tr>
<th>Energy Price</th>
<th>Average Price</th>
<th>Yearly Price Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas [€/kWh]</td>
<td>0.044</td>
<td>6.0%</td>
</tr>
<tr>
<td>Conventional Electricity [€/kWh]</td>
<td>0.154</td>
<td>5.5%</td>
</tr>
<tr>
<td>Feed-in Electricity [€/kWh]</td>
<td>0.154</td>
<td>5.5%</td>
</tr>
<tr>
<td>District Heat (50% ReS) [€/kWh]</td>
<td>0.023</td>
<td>6.0%</td>
</tr>
<tr>
<td>Wood Pellets [€/kWh]</td>
<td>0.054</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

The assumed investment costs as identified on the Romanian market today are described in the following tables. Obviously, investment costs are dependent on specific market circumstances, contract negotiations, sales volumes etc. and might differ substantially at the level of individual projects. This study doesn’t take into account the potential price decrease for new technologies. However, this is very probably going to happen after a certain level of market upscale.

Consequently, additional costs for 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

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

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 BUILDINGS  

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
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 57,59 TWh in 2015;
- 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;

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 acquisition 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

<table>
<thead>
<tr>
<th>Name of Financial Support Scheme</th>
<th>Short Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating 2006-2015 – warmth and comfort «Termoficare 2006 - 2015 - căldură și confort»</td>
<td>This programme has two components: - the National Programme on Thermal Rehabilitation of block of flats - Programme for improving the DH systems.</td>
</tr>
<tr>
<td>Thermal rehabilitation of housing stock financed by bank loans with Government guarantee complementary to the Multian-nual National Programme for increasing the energy performance of dwellings</td>
<td>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.</td>
</tr>
<tr>
<td>Casa Verde Program</td>
<td>The Casa Verde Program operated in 2010-11, providing funding from the Environmental Fund for the installation of heating systems that use renewable energy.</td>
</tr>
<tr>
<td>LGGE Improving Energy Efficiency in Low-Income Households and Regions of Romania29</td>
<td>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.</td>
</tr>
</tbody>
</table>

29http://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 Romania:
• 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)

<table>
<thead>
<tr>
<th>BARRIER TYPE: Legal/Strategic</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
</tr>
<tr>
<td>There is no common national strategy on deployment of sustainable energy technologies and solutions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BARRIER TYPE: Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial crisis, lack of or insufficient funds to support building renovation</td>
</tr>
<tr>
<td>Lack of private investment in the rehabilitation of residential and non-residential buildings</td>
</tr>
<tr>
<td>High costs of ESCOs</td>
</tr>
<tr>
<td>Low demand for low energy building technologies, leading to higher prices</td>
</tr>
<tr>
<td>National tendency to “maximise profit with minimal effort” instead of optimal use of the cost method, resulting in sub-optimal investments</td>
</tr>
<tr>
<td>The high rate of unemployment and the duration of time until re-employment</td>
</tr>
<tr>
<td>Energy prices (gas, fuel, electricity etc.) vs. real prices (i.e. energy subsidies)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BARRIER TYPE: Skills, employment &amp; education system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of skilled workers or low levels of training in the use of new technologies designed for EE and RES</td>
</tr>
</tbody>
</table>

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 prices. Nevertheless, there is much experience within the EU as well as globally with EEOs 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://euroconferinte.ro/prezentari/Tema1-17.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

<table>
<thead>
<tr>
<th>STRATEGIC</th>
<th>BPIE INDICATIVE LIST OF POLICY INITIATIVES (non-exhaustive)</th>
<th>APPLICABILITY IN THIS RENOVATION STRATEGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Establish support across the political spectrum for deep renovation of the building stock</td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>Establish an independent committee to monitor and report progress on the strategy on an ongoing basis, including making recommendations for improvements and periodic updates</td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>Undertake systematic appraisal of barriers to renovation in each segment of the market and develop policy responses to address each barrier</td>
<td>High – this strategy identifies some of the key barriers and possible solutions</td>
</tr>
<tr>
<td></td>
<td>Establish objective to eradicate fuel poverty through enhancing energy performance of the housing stock</td>
<td>High - Addressing the poor energy performance of housing of the many disadvantaged Romanian citizens would be a major boost to their quality of life</td>
</tr>
<tr>
<td></td>
<td>Develop holistic cross-policy targets that integrate with and deliver on goals in related fields, e.g. sustainable urbanisation, resource efficiency, sustainable construction etc.</td>
<td>To be considered in 2017 (2nd iteration of national renovation strategy)</td>
</tr>
<tr>
<td></td>
<td>Establish a wide stakeholder group as a forum for consultation, policy formulation and feedback on practical issues and barriers to renovation</td>
<td>The stakeholders identified in this document could form the basis of an ongoing stakeholder forum</td>
</tr>
<tr>
<td></td>
<td>Demonstrate leadership through accelerated deep renovation of public buildings, thereby developing supply chain capacity and providing a knowledge base for private/commercial renovation activity</td>
<td>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</td>
</tr>
</tbody>
</table>

---

**SOURCE** - BPIE Guide to Renovation Strategy Development
<table>
<thead>
<tr>
<th>LEGISLATIVE &amp; REGULATORY</th>
<th>BPIE INDICATIVE LIST OF POLICY INITIATIVES (non-exhaustive)</th>
<th>APPLICABILITY IN THIS RENOVATION STRATEGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify trigger points and develop respective regulation that could be used to encourage, or require, building energy performance improvement(^{14})</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Design Energy Efficiency Obligations (EEO) that encourage the delivery of deep renovation</td>
<td>This should be considered a <strong>top priority</strong> action for the period from 2017 onwards.</td>
<td></td>
</tr>
<tr>
<td>Facilitate the upgrade of all social housing to high energy performance levels</td>
<td>Not a priority given the limited amount of social housing in Romania</td>
<td></td>
</tr>
<tr>
<td>Address restrictive practices concerning local deployment of low/zero carbon technologies to ensure that a positive environment for buildings integrated renewables is established</td>
<td><strong>High</strong> – buildings integrated renewables should be actively supported, within the bounds of EU state aid rules</td>
<td></td>
</tr>
<tr>
<td>Remove restrictive tenancy laws which disincentivise or otherwise inhibit energy performance improvement</td>
<td><strong>High</strong> – willing investors should not be prevented from undertaking renovation by inappropriate legislation</td>
<td></td>
</tr>
<tr>
<td>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</td>
<td>For consideration in 2017</td>
<td></td>
</tr>
<tr>
<td>TECHNICAL</td>
<td>Develop renovation standards that are progressively and regularly strengthened in response to experience and new technological solutions</td>
<td>As required by EPBD</td>
</tr>
<tr>
<td>Analyse potential for district heating systems to provide efficient, low carbon energy</td>
<td><strong>High</strong> – 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</td>
<td></td>
</tr>
<tr>
<td>Ensure proper monitoring &amp; enforcement of compliance with building codes</td>
<td>As required by EPBD</td>
<td></td>
</tr>
<tr>
<td>Develop packaged solutions that can be readily replicated in similar building types</td>
<td>Establish database of technical solutions that serves as a learning point for future projects/investments</td>
<td></td>
</tr>
<tr>
<td>Introduce quality certification for installers &amp; products</td>
<td>As required by EPBD</td>
<td></td>
</tr>
</tbody>
</table>

\(^{14}\)Example 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)
<table>
<thead>
<tr>
<th>FISCAL/FINANCIAL</th>
<th>BPIE INDICATIVE LIST OF POLICY INITIATIVES (non-exhaustive)</th>
<th>APPLICABILITY IN THIS RENOVATION STRATEGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure sources of finance, including those identified in EED Article 20 and EU/international funding sources, together with mechanisms that effectively leverage private capital</td>
<td>Top priority – maximise the application of EU Cohesion and Structural Funds under the 2014-2020 budget to deep renovation of buildings.</td>
<td></td>
</tr>
<tr>
<td>Factor in monetary value of co-benefits (e.g. health, employment) in public funding decisions</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Develop funding vehicles, tailored to specific market segments, that provide a simple (“one-stop-shop”) and commercially attractive source of finance for deep renovation</td>
<td>High – The proposed Energy Efficiency Investment Fund could be developed as the main funding vehicle for renovation</td>
<td></td>
</tr>
<tr>
<td>Develop mechanisms to encourage deep renovation via third party financing (TPF) e.g. ESCOs, EPCs</td>
<td>High - develop the regulatory framework for effective operation of the ESCO and energy performance contracts markets by 2016</td>
<td></td>
</tr>
<tr>
<td>Strengthen energy/carbon pricing mechanisms to provide the right economic signals</td>
<td>For consideration in 2017, once fossil subsidies have been largely removed</td>
<td></td>
</tr>
<tr>
<td>Remove fossil fuel subsidies to eliminate perverse incentives that discourage investment</td>
<td>In hand – existing subsidies for electricity, gas and district heating being progressively phased out</td>
<td></td>
</tr>
<tr>
<td>Consider “bonus-malus” mechanisms, e.g. property taxation systems (which reward high energy performing buildings while penalizing poorly performing ones) and energy pricing</td>
<td>For consideration in 2017</td>
<td></td>
</tr>
<tr>
<td><strong>COMMUNICATION / CAPACITY BUILDING</strong></td>
<td><strong>BPIE INDICATIVE LIST OF POLICY INITIATIVES (non-exhaustive)</strong></td>
<td><strong>APPLICABILITY IN THIS RENOVATION STRATEGY</strong></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Establish publicly accessible databases demonstrating energy performance of renovated buildings and information on how to undertake deep renovation</td>
<td>Medium – improved knowledge on renovation solutions will encourage replication</td>
</tr>
<tr>
<td></td>
<td>Gear up skills and training programmes covering the key professions and disciplines</td>
<td>High – implement findings from BuildUp Skills Romania, including establishing a cadre of suitably qualified energy auditors</td>
</tr>
<tr>
<td></td>
<td>Establish knowledge and experience-sharing networks across regions/Member States</td>
<td>Understanding how other Member States have addressed specific issues can help in their resolution within the Romanian context</td>
</tr>
<tr>
<td></td>
<td>Encourage development of local supply chain industry for maximising macro-economic benefits and to minimise embedded CO\textsubscript{2} emissions</td>
<td>High – maximise the economic potential for new employment in the manufacture and supply of low carbon solutions</td>
</tr>
<tr>
<td></td>
<td>Develop promotional and dissemination activities that sensitise building owners to opportunities for deep renovation and that provide stepwise support throughout the renovation process</td>
<td>High - The success of any policy is dependent on effective engagement with building owners in both residential and non-residential sectors</td>
</tr>
<tr>
<td></td>
<td>Communicate regularly and publicly on progress with the renovation strategy</td>
<td>As above</td>
</tr>
<tr>
<td><strong>R&amp;D</strong></td>
<td>Support research, development and demonstration projects into new &amp; improved technologies and techniques to deliver deep renovation, including how to scale up best practice to multiple buildings</td>
<td>Review existing EU R&amp;D initiatives and consider the scope for application of the results in Romania</td>
</tr>
</tbody>
</table>
about how to share the burden in context of the EU emission reduction targets. Another alternative would be for the Romanian government or the EU to provide higher financial support (e.g., in the form of subsidies) to allow for the implementation of the standards required to reach nZEb levels.

7.2. Direct and Indirect Benefits of Identified nZEb Solutions

Investing in more sustainable, energy efficient buildings contributes substantially to increased energy security, environmental protection, job creation and improved quality of life. It also contributes to the sustainable development of the construction sector and supply chain industry. While the upfront investment is relatively high and the return on investment usually longer than for other economic activities, there are multiple benefits that are shared among building users and owners, the construction industry, the public sector and society as a whole.

The benefits of implementing nZEbs are wider than simply energy and CO2 savings. They can be summarised as follows:

- The quality of life in a Nearly Zero-Energy Building is better than in a building constructed according to current practice. An adequate design of the building and a high quality construction include cost-saving possibilities that cover the additional costs of an energy-efficient building envelope almost entirely. There is a higher quality of life through better (thermal) comfort. The Nearly Zero-energy Building provides good indoor air quality. Fresh filtered air is continuously delivered by the ventilation system. It is more independent of outdoor conditions (climate, air pollution). Concerning the noise protection, the thick and well-insulated structures provide effective sound insulation.

- Ambient benefits arise through reduced energy demand that minimises wider environmental impacts of energy extraction, production and supply.

- There are environmental benefits from improving local air quality.

- Social benefits derive from the alleviation of fuel poverty.

- Health benefits are possible through improved indoor air quality and reducing risks of cold homes, particularly for those on low incomes or for elderly householders.

- Macro-economic benefits arise through the promotion of innovative technologies and creating market opportunities for new or more efficient technologies and through the provision of certain incentives for pilot projects and market transformation.

- Private economic benefits: Higher investment costs may be outweighed by the energy savings over the lifetime of the building (the building offers less sensitivity to energy prices and political disturbances. When a building is sold, the high standard can be rewarded through a resale price up to 30% higher in comparison to standard buildings.

- Job creation can result from the manufacturing and installation of energy efficiency measures and of renewable energy technologies.

- There will be decreased energy dependence on fossil fuels and therefore on the future energy prices.

In this study, the approach to quantifying some of the benefits is done in an approximate way, by extrapolating results from the reference buildings to a national level, e.g., (average energy and CO2 savings per m²) x (m² built new per year) x 30 years (2020-2050). In Table 25, we present the estimated macro-economic impact by 2050 in terms of additional investments, new jobs (only direct impact in the construction industry), CO2 and energy savings.

As an example, additional investments in a very well established construction sector already having all necessary job profiles and spread all over the considered country or region, then the job impact is determined with a fair approximation by using the job intensity of the sector. However, if the additional invested capital supposes to expand new qualifications as is the case for nZEb, it is necessary to create all over the given country or region a critical mass of specialists for these new qualifications able to provide the requested services. In this case, the job creation potential is much higher than in the first case (even few times higher).

This is the estimated job effect in the construction sector only and without considering the additional impact in the supply chain industry and other related sectors. It was considered that every €1 million invested will generate around 17 new jobs, as identified in several previous studies such as BPie (2011) 'Europe's Buildings under the microscope'.

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