



# FAIR ENERGY TRANSITION TOWARDS NEARLY ZERO ENERGY BUILDINGS

**European Public, Cooperative and Social Housing Providers  
Working for a Fair Energy Transition**

Progress Report, March 2013



**POWER HOUSE  
NEARLY  
ZERO  
ENERGY  
CHALLENGE**

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**Written on the basis of Nearly Zero Challenge taskforce reports from:**



**NEARLY  
ZERO  
ENERGY**  
HOUSING FOR  
WARM/MEDITERRANEAN  
CLIMATE ZONES

Led by Federcasa



**NEARLY  
ZERO  
ENERGY**  
HOUSING FOR  
FOR COLD/CONTINENTAL  
CLIMATE ZONES

Led by GbV



**NEARLY  
ZERO  
ENERGY**  
HOUSING IN  
DIVIDED OWNERSHIP

Led by Finabita



**FINANCING  
NEARLY  
ZERO  
ENERGY**  
HOUSING PROJECTS

Led by NHF & CECODHAS Housing Europe

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# FOREWORD

*“The social housing sector is facing a set of diverse challenges provided by a dynamically changing environment. Demographic shifts in an aging European society, social hardships due to a multi-year economic crisis in many Member States, and regulatory requirements related to the building stock and new construction are creating conditions which at first glance may seem to place an unacceptable burden on housing companies and associations. Yet, with these challenges come opportunities which allow the sector to develop and implement strategies to “future-proof” its business for the coming decades.*

*One such strategy concerns the energy performance of buildings which is of increasing relevance for the social housing sector. European legislation requires that all new buildings are adhering to nearly-zero energy principles within a few years. Such buildings will have to be much better insulated than is current building practice, will have to use much more efficient heating and potentially cooling systems and will have to integrate renewable energy systems. This may be perceived by many in the industry as requiring investments which are unaffordable. Adding to this, experience with and knowledge about nearly-zero energy buildings (nZEBs) may simply not be common. It is therefore not surprising that scepticism about the feasibility of nZEBs in the social housing sector still prevails.*

*By providing many excellent examples of buildings which apply nZEB principles this report makes that case that such buildings can become the future standard for social housing. We know that there are many barriers still to overcome, but they are not insurmountable. The political framework implemented by national governments will have to provide full support for high efficiency buildings, including financial incentives and supporting taxation systems. Mechanisms which create trust and confidence in new technologies and practices will be important to make nZEBs a mainstream sector standard. And this in turn requires better qualification and training for those designing, building and managing high efficiency buildings. At the same time, tenants living in such buildings will have to be made aware and educated about how to use the building to its advantages.*

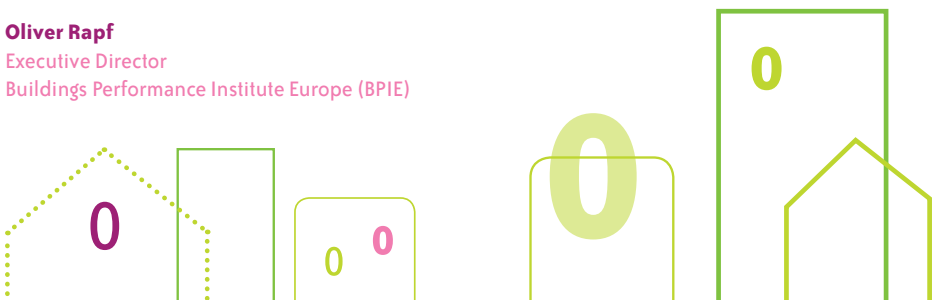
*No doubt, the complexities of the nZEB challenge cannot be ignored. The country initiatives and individual projects described in this report give real-life examples how problems can be solved in innovative and constructive ways. Exchange of knowledge, documentation and publication of data and solutions that work are beneficial for all. And the advantages in terms of better buildings, reduced fuel poverty and higher living quality, reduced risk of exposure to fluctuating and increasing energy prices, and many other societal benefits justify the efforts to change building practices in the social housing sector.*

*Success often comes down to individual leadership, and the leading examples shown in this report are well suited to inspire many followers. BPIE will continue to support the market penetration of high efficiency buildings with its analysis and research, and is ready to support the social housing community in its efforts to make nearly-Zero Energy Buildings the standard building practice in the sector.”*

## **Oliver Rapf**

Executive Director

Buildings Performance Institute Europe (BPIE)



*“The Power House Europe Initiative allows cooperative, social and public housing providers around the EU to create a community, share knowledge and get inspired. They compare experiences and data to get advice and ideas on how they can meet energy saving and renewable targets with optimal outcomes for residents, housing providers and the planet.”*

**Kurt Eliasson**  
CECODHAS Housing Europe President

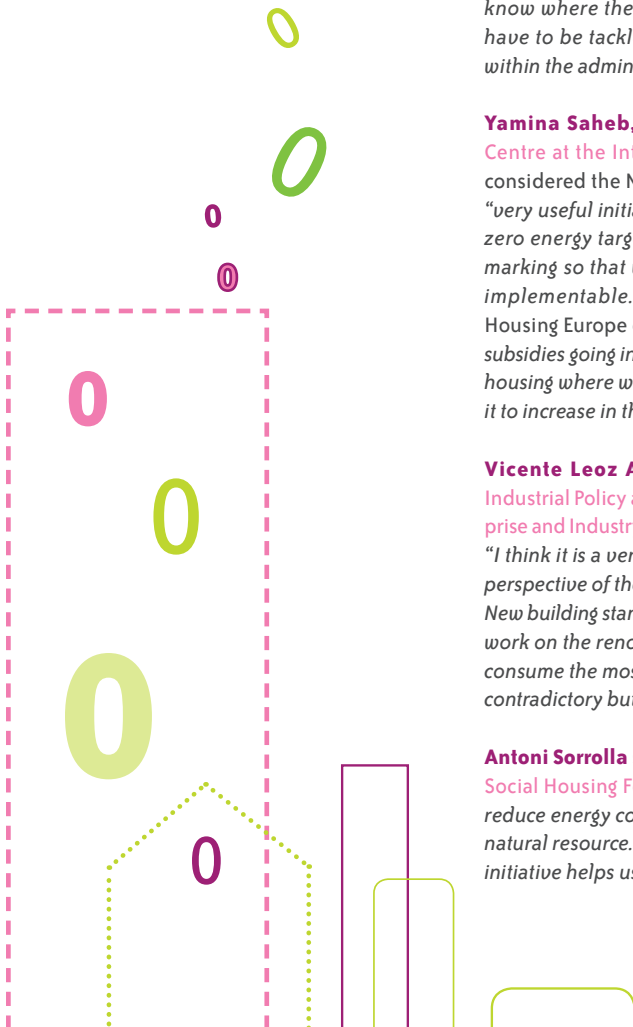
**Overheard at the Launch of the nearly Zero Energy Challenge official launch, September 2012 in Madrid, Spain:**

**Pilar Martinez**, Director of Architecture, Housing and Land for the Spanish Ministry of Public works said that she saw the Nearly Zero Energy Challenge as vital as *“in addition to improving the quality of life, it will generate employment and economic growth which is a social necessity in our country.”* She called on CECODHAS Housing Europe and the public housing companies in Spain to *“continue what they have done until now and done so well, to continue to be laboratories for new ideas because they are working on the ground and they know the reality in the cities better than anyone else. They know where the barriers and obstacles lie which have to be tackled and overcome at other levels within the administration.”*

**Yamina Saheb**, Head of Sustainable Buildings Centre at the International Energy Agency, (IEA) considered the Nearly Zero Energy Challenge as a *“very useful initiative for the EU because of nearly zero energy target for buildings. We need benchmarking so that we can design policies which are implementable.”* She stressed that CECODHAS Housing Europe can *“play a major role in avoiding subsidies going in the wrong way, especially in social housing where we have fuel poverty and we expect it to increase in the future.”*

**Vicente Leoz Argüelles**, Head of Sustainable Industrial Policy and Construction Unit of DG Enterprise and Industry at the European Commission said *“I think it is a very important project both from the perspective of the climate and energy dependency. New building standards are vital, but we also have to work on the renovation of existing buildings which consume the most energy. These objectives are not contradictory but complementary.”*


**Antoni Sorrolla** speaking on behalf of the Spanish Social Housing Federation (AVS) said *“We have to reduce energy consumption and control the use of natural resource. The Nearly Zero Energy Challenge initiative helps us go into that direction.”*





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# POWER HOUSE NEARLY-ZERO ENERGY CHALLENGE: EXECUTIVE SUMMARY


 Social, cooperative and public housing providers in Europe own and manage 12 per cent of the housing stock. The Power House Nearly-Zero Energy Challenge, funded by Intelligent Energy Europe and led by CECODHAS Housing Europe, seeks to build capacity and confidence amongst these providers ahead of the requirement that in 2020 all new buildings should be nearly-zero in terms of their energy consumption and any energy required sourced from renewable supplies.

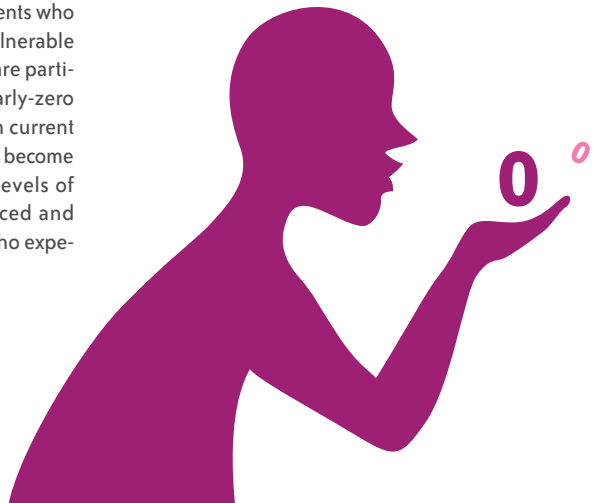
 These providers have a key role to play in ensuring the actual delivery of these requirements, not only in terms of their new construction, but also in the retrofitting of their existing stock to reduce its carbon emissions. Seventy per cent of the dwelling stock in 2050 is already built, and much of it is highly wasteful of energy.


 The Nearly-Zero Energy Challenge will work in four key areas identified earlier as of key importance – cold/continental climates, warm/Mediterranean climates, divided/cooperative ownership of dwellings and critically, the capacity to finance nearly-zero energy dwellings.

 Social housing providers typically provide a range of services and support to their residents who are often drawn from amongst the most vulnerable and marginalised groups in society. They are particularly concerned that the transition to nearly-zero energy is a fair and equitable one for both current and future residents – that rents should not become unaffordable after improvements, that levels of new home building should not be reduced and policies and funding should help those who experience fuel poverty.

 A review of the progress to date in the ten countries participating in the project has shown that experience varies widely between Member States. Only Austria and Germany have developed a significant number of nZEB dwellings, Sweden has a certain number of low-energy dwellings but most of the other countries have only a handful, most of which have been developed as demonstration projects.

 Individual Member States are required to establish their own definition of nearly-zero, as well as their strategy for approaching the 2020 target. To date, not all Member States involved in the project have established a formal definition of nearly-zero or the associated strategy or roadmap to reach it.





A survey of the social housing providers in the ten Member States identified five key types of barriers in delivering new construction to nZEB standards and retrofitting their stock to an appropriate standard.


**0 Economic and financial** – the lack of access to available and affordable finance to carry out new construction or retrofit existing stock to meeting nearly-zero standards is a major barrier.

**0 Technical** – there is still a major lack of skills and expertise throughout the construction sector, as well as uncertainty as to how new technologies perform.


**0 Credibility** – a lack of mainstream examples of good practice and robust data from nearly-zero homes has fostered an atmosphere of confusion and misinformation.

**0 Social and organisational** – there needs to be recognition that saving energy is not simply a technical issue, but it also depends on the lifestyle of residents and correct stock management.


**0 Legislative** – the lack of definition of nearly-zero energy buildings, a lack of policy coherence and legal structures to address energy retrofit where there is divided ownership are all key issues to be addressed.



A series of recommendations for EU and national governments have been established to address these issues and are set out on pages 23 to 26 of this report.



Progress is already being made to support the transition to nearly-zero energy buildings in the Member States and examples are identified in this report. These include financial incentives to ensure that improvements can be carried out without rent increases (Klima Bonus inn Bielefeld, Germany), subsidised passive housing developments in Austria and Belgium, the KredEx revolving fund for energy efficient refurbishment in Estonia, information and advice systems in Italy and France and a competition to deliver highly energy efficient housing at an affordable price in Sweden (SABO's Kombohus).



The Solar Decathlon Europe has identified innovative designs for new forms of nearly-zero housing that could be developed in the future by social housing providers, most notably the Canopea Nano Towers by Team Rhône-Alpes.

The European Union (EU) has set itself the challenging target of achieving large reductions in greenhouse gas emissions. In terms of domestic buildings, its aim is to achieve a 20 per cent reduction on the 1990 levels by 2020 and an 80 per cent reduction on the 1990 levels by 2050. It anticipates that this will be achieved by increasing the energy efficiency of both new and existing housing stock and increasing the proportion of energy that comes from renewable sources. Home energy use accounts for 25 per cent of total energy consumption in the European Union<sup>1</sup>. This is likely to continue to grow due to the increase in the number of buildings.

There have been two Energy Performance of Buildings Directives (EPBDs) adopted by the European Parliament and Council. The original EPBD was adopted in 2002 and has now been 'recast', or revised, to clarify the original document and extend its scope in line with current European Union policy goals, whilst reducing the variations in its implementation. The recast EPBD came into force on 9 July 2010. Both directives aim to reduce energy consumption in the residential and non-domestic sectors by raising awareness of energy use, mandating minimum standards, and requiring inspections to ensure compliance.

## 1.1 What is Nearly Zero Energy Building (nZEB)?

Nearly zero energy building (nZEB) is a new low energy housing standard introduced in the recast EPBD in 2010. The Directive follows the broad shift in focus of EU policy and regulation towards a specific emphasis on energy performance. In particular, it addresses the energy efficiency of buildings, both new and existing, recognising the pressing need to renovate the existing stock, since delayed refurbishment can lock in poor energy performance for many years. The Directive has still to find its way

into all Member States' regulations and then down to refurbishment and construction practices, as well as eventually to housing managers and households who will have to learn how to manage and live in nearly zero energy buildings.

According to Article 9 of the recast Directive<sup>2</sup>, Member States shall ensure that by 31 December 2020, all new buildings are nearly zero energy buildings (nZEB). It defines a nearly zero energy building as a construction that has a 'very high energy performance' and that any energy required in the building should come 'to a very significant extent' from renewable energy sources. Neither of these two terms is defined specifically in the Directive.

Acknowledging the variety in climate and building culture throughout the EU, the EPBD does not prescribe a uniform approach for implementing nearly zero buildings, leaving room for individual Member States to establish different definitions of nZEB, as well as their own strategy for approaching the 2020 target. It requires Member States to draw up specifically designed national plans or roadmaps for increasing the number of nearly zero-energy buildings. These national plans will have to translate the nZEB concept into practical and relevant measures for increasing the number of such buildings. As at December 2012, only France and Estonia of the ten national taskforce members in the project (Austria, Belgium, Bulgaria, Estonia, France, Germany, Italy, Spain, Sweden and the UK) had completed this process of developing their roadmaps.

The Directive also requires that the cost efficiency over the lifecycle of buildings is taken into account when requirements for the energy performance of buildings are established. National minimum standards should be set by the Member States based on the cost optimum for construction costs and operational costs. Therefore, the European Commission

<sup>1</sup> Reallocation of emissions from energy industries to end users 2005–2009, European Environment Agency, 2011 <http://www.eea.europa.eu/publications/end-use-energy-emissions>

<sup>2</sup> Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings [http://ec.europa.eu/energy/efficiency/buildings/buildings\\_en.htm](http://ec.europa.eu/energy/efficiency/buildings/buildings_en.htm)



has submitted the regulation No. 244/2012 which determines the methodological approach for the analysis of cost optimality of requirement levels<sup>3</sup>. The cost optimality principle acts as a bridge between the standard energy performance and the intended goal of reaching nearly zero energy buildings by 2020. In this sense the period between now and 2020 can be interpreted as a transition period during which the markets are forced to adapt and to apply a life-cycle cost perspective instead of the usual construction cost perspective<sup>4</sup>.

The principle as defined in the EPBD offers high degrees of freedom when it comes to applying it in the building regulations. Although the EU regulation on cost optimality provides uniform regulations in some respects, for example concerning included cost elements, calculation algorithms and analysis period, it also allows room for national definitions in many key areas, such as:

- Definition of the reference building related to important assumptions such as size, form, compactness, share of window areas, etc.
- Selection of the variants (packages of measures) which are assessed
- Construction costs (and most important construction cost differences for different qualities)
- Maintenance costs of relevant building elements and related inflation rates
- The assumed life-time of building elements
- Discount rates
- Starting level of energy prices
- Energy price trends (although the regulation includes a recommendation to use the “official EU forecast”, Member States are allowed to use other forecasts for their assessments)

According to a survey done in the frame of the EPBD concerted action in 2011, most of the Member States intended to follow a microeconomic approach instead of, or together with, a macroeconomic approach which would mainly include GHG emissions as externalities<sup>5</sup>. To date, the number of available cost-optimal calculations for different reference buildings according to EU regulations is quite limited, although considerable work has been done during the last years in developing the application of life-cost-analysis in building practice. In terms of the nearly Zero Energy Challenge project, cost-optimal calculations for multi-family-residential buildings have already been done for Estonia and Austria<sup>6</sup>.

A recent study of actual nearly zero energy buildings in Austria has proved to be very valuable in helping to provide an overview of all the various costs involved in developing and maintaining nearly zero energy housing stock<sup>7</sup>. Data was drawn from a broad sample of 55 multi-family residential buildings with a calculated heating demand of less than 50kWh/m<sup>2</sup>/year over a period of two to three years. Data related only to the costs involved and the study did not seek to address other important parameters such as living comfort and practical usability.



<sup>3</sup> Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements.

<sup>4</sup> Leutgöb, Pagliano, Zahgheri (2013): Cost optimality – Brake or accelerator on the way towards nearly zero energy buildings. Paper submitted for the eceee 2013.

<sup>5</sup> Cost-optimal levels for energy performance requirements - The Concerted Action's input to the Framework Methodology. April 2011.

<sup>6</sup> Kurnitski et al. (2011): Cost optimal and nZEB energy performance levels for buildings (study for Estonia). Bednar et al. (TU Vienna / 2012) and Leutgöb et al. (e7 / 2012) (studies for Austria).

<sup>7</sup> W. Hüttler (2013) nZE buildings in Practice – the Case of Austria

## The preliminary key results from the study are as follows<sup>8</sup>:

- There is some evidence that the measured energy consumption for heating in nearly zero energy buildings (i.e. less than 30kWh/m<sup>2</sup>/year) is significantly lower than for low-energy buildings (i.e. 30-50 kWh/m<sup>2</sup>/year).
- There is a broad range, with a factor of three, in the actual energy consumption data (i.e. 15-50 kWh/m<sup>2</sup>/year for passive-house buildings, 20-70 kWh/m<sup>2</sup>/year for lowest-energy buildings and 30-90 kWh/m<sup>2</sup>/year for low-energy buildings). It would be misleading to draw conclusions from studying only small numbers of buildings.
- Maintenance costs vary widely and those buildings with ventilation systems tend to have higher maintenance costs. The lower energy costs of passive house and lowest-energy building types therefore tend to be partly compensated for by higher maintenance costs.
- Smaller and less compact buildings have significantly higher capital costs per dwelling unit than large and very compact buildings.
- In general, the lower costs for heating energy do not compensate for the higher investment costs for the passive-house standard of building. It is the lowest-energy standard building (i.e. an energy heating demand of 25-30 kWh/m<sup>2</sup>/year) that is the cost-optimal standard.

It is important that nZEB is not simply seen as an additional burden or restriction, but rather as an opportunity for housing providers to develop new and better ways of building and retrofitting their housing stock, helping create employment, addressing fuel poverty and a range of other benefits, as well as the reduction in greenhouse gas emissions.

Whilst no specific guidance is given, the immediate activities likely to be needed in all Member States to a greater or lesser degree to achieve the 2020 target for nearly zero buildings were identified by the European Council for an Energy Efficient Economy<sup>9</sup> as:

- Long term policy commitment at national level
- Removal of legal, regulatory or administrative barriers
- Clear definitions and guidance
- Mobilisation of all major players
- Benefiting from best practice
- Creating awareness of the challenges ahead
- Creating awareness of the benefits of NZEB

## 1.2 What is the Powerhouse Nearly Zero Energy Challenge?

The Powerhouse Project led by CECODHAS Housing Europe was part of the EU-funded Intelligent Energy Europe (IEE) Programme and ran from 2008 to 2011. It sought to mainstream existing knowledge on refurbishing and building housing with optimal energy consumption levels. The Powerhouse Nearly Zero Energy Challenge continues this work and looks to build capacity and confidence among Europe's social, cooperative and public housing providers ahead of the introduction of nZEB obligations.

The project has a crucial role in turning policy into action by carrying out a reality check. It recognises that having new norms on paper, regardless of their levels of ambition, will be ineffective unless stakeholders are convinced and ready and able to implement them. New laws and norms are also irrelevant if they do not take into account the reality on the ground, including high levels of poverty, low levels of skills and the lack of funding, either subsidies or affordable loans, to ensure that social housing providers are able to implement them. Very high standards for renovation could actually result in

<sup>8</sup> Final results will be available in April 2013

<sup>9</sup> Janssen, R. (2011) Nearly Zero Energy Buildings: Achieving the EU2020 Target [http://www.epbd-ca.org/Medias/Pdf/8400SE16\\_21\\_11h15-11h30\\_Janssen.pdf](http://www.epbd-ca.org/Medias/Pdf/8400SE16_21_11h15-11h30_Janssen.pdf)

a drop in renovation rates, while high standards for new construction if not properly checked and monitored can also be useless. More evidence is also needed that low energy standards will result in lower energy costs for residents. This project seeks to provide key information across a range of climatic conditions and organisational structures to inform the relevant EU policy in this area.

The project commenced in June 2012 and will continue for three years. Its work programme includes consolidating existing analysis and the compilation of cost and consumption data in selected pilots. Work is organised on four key themes identified in the earlier Powerhouse work. The taskforce working on cold, continental climates will address, in particular, concerns on hidden cost implications of increased air tightness linked to ventilation and air quality through monitoring and reporting of costs for works carried out, maintenance and consumption during the use-phase in ten exemplary developments. Members of this task force include representatives from Belgium, Estonia, France, Italy, Sweden, Germany, Austria and the UK. This data, coupled with field studies, are a key component for confidence building.

In parallel, in warm, Mediterranean climates, where meeting nZEB requirements requires a different approach, the taskforce with representatives from Italy and Spain use the same methodology, to mainstream effective solutions.

The third joint taskforce with representatives from Bulgaria, Estonia and Italy will showcase exemplary financing and organisational solutions used to reach nearly zero standards in existing housing in divided ownership.

The fourth taskforce, drawing on all members of the project, will address the need to make the business case for nearly-zero energy housing and for maximum mobilisation of public and private finance.

Thirty test cases of low and nearly zero energy building in different European social and cooperative housing are being monitored. They show the real energy performance of buildings, rather than

the values estimated by designers. Monitoring covers heating and cooling, the production of hot water and technical services such as ventilation and lighting. The production of in-situ renewable energy systems will also be monitored. All data will be publicly accessible and the first results will be available online in early 2013.

### 1.3 What is a Fair Energy Transition?

Social housing providers typically provide a range of services and support to the residents in their homes, who often are drawn from amongst the more vulnerable and marginalised groups in society. There are a variety of competing pressures on the providers to ensure the best outcomes for their residents, and whilst recognising the crucial importance of the energy saving agenda being driven by the recast EPBD, they are also particularly concerned to ensure that the transition to nearly zero energy is a fair and equitable one for their current and future residents. **By a fair transition, it is meant that:**

- Energy efficient refurbishment should not result in increasing rents to levels that residents can no longer afford, forcing them to leave their homes.
- New construction is not restricted, since with the higher costs of building to nearly zero energy standards fewer homes can be built from a limited budget, thus impacting on the lives of those waiting for a decent home to live in.
- Policies and funding schemes should also embrace those hardest to reach, who are most likely to be victims of fuel poverty.
- In respect of the production of renewable energy, that there is diversification of ownership of the energy produced and monopolies do not use their positions to control these new markets.

## 1.4 The role of CECODHAS Housing Europe in delivering a fair energy transition to nZEB

CECODHAS Housing Europe is the European Federation of Public, Cooperative and Social Housing providers - a network of 45 national and regional federations which together represent 41,400 public, voluntary and cooperative housing providers in 19 countries. Together they manage over 27 million homes, about 12 per cent of the existing dwellings in the EU. In this document the term 'social housing providers' is used as a generic term to cover the various types of organisation.

As organisations with huge amounts of housing stock, the ability to work across neighbourhoods and a commitment to the welfare of their residents as well as to cutting carbon, social housing providers are well placed to drive the requirements of the EPBD process forward. They thus have a key role to play in ensuring the actual delivery on the ground of the recast EPBD. In many Member States social housing providers have been the pioneers of low energy housing provision. They must provide housing that is affordable in terms of construction, maintenance and running costs. Given that they retain a long-term responsibility for managing and maintaining the stock, as well as having a commitment and responsibility for their tenants, there is a strong incentive to ensure that the energy efficiency of the stock is optimised. This has been particularly the case in colder climates, where fuel poverty is a major issue for those residents on low income. Between 50 million and 125 million people in Europe are estimated to be fuel poor and will inevitably increase in the future in line with rising energy prices and increased fuel bills<sup>10</sup>.

The CECODHAS Housing Europe members provide housing in a range of different climatic situations and with different ownership models. This includes both warm Mediterranean-type climates such as those found in Italy and Spain, where cooling and ventilation are key users of energy in people's homes and the cold and/or continental climates,

such as those found in Estonia and Sweden, where space heating in the cold months is a major consumer of energy. Citizens have different lifestyles and house types reflect these climatic differences. In Spain and Portugal effective low energy homes can be built without the need for active ventilation systems and highly insulated shells and the well-established criteria developed for the Passive -house standard in the colder countries of Europe are inappropriate. In some cases, there is a diversity of climatic conditions within the country itself, for example, the six climatic zones in Italy with cold conditions in its northern alpine areas and hot Mediterranean conditions in its more southern areas.

There are also different ownership forms in the housing sectors in these Member States, with social rental housing, a range of cooperative housing models with differing tenure systems and the former state-owned housing in the former East European countries, which was transferred into the ownership of the former tenants at very little cost, but which now presents significant problems in terms of energy efficient renovation. In these latter instances the residents play a major role in the decision making processes, especially when it comes to the renovation of existing apartment blocks with multiple ownerships.

Whilst approximately 2.3 million new homes are being built per year<sup>11</sup> in the 27 countries of the EU, the existing housing stock will still account for nearly 70 per cent of the building stock in 2050. Whilst the development of highly energy efficient new stock is important, the ability to retrofit the existing stock to an appropriate standard will be the key determinant of whether the 2050 targets for energy reduction can be achieved. For social housing providers throughout Europe with very large numbers of inefficient dwelling units in management and maintenance, this is seen as more important than developing the appropriate standards for new construction.

<sup>10</sup> Tackling Fuel Poverty in Europe: Recommendations Guide for Policy Makers. European Fuel Poverty and Energy Efficiency (EPEE) 2009. [http://www.fuel-poverty.org/files/WP5\\_D15\\_EN.pdf](http://www.fuel-poverty.org/files/WP5_D15_EN.pdf)

<sup>11</sup> Euroconstruct Annual Report 2012

A key role for social housing providers is that of being able to look in the longer term at its housing stock and understand how it should be 'future-proofed'. Improving the energy efficiency of people's homes is but one aspect of future housing provision, others relate to demographics (an aging population), social inclusion (increasing immigration levels), and social trends (an increased demand for single person accommodation), health and employment creation. This integrated view is to be welcomed.

Improving energy efficiency has also been shown as an effective way to stimulate economic growth, thus improving job opportunities for those on lower incomes. A recent study in The UK showed that an energy efficiency programme is a more effective way to stimulate the British economy compared to likely alternatives such as cutting VAT rates, reducing fuel duty or investing in capital infrastructure projects such as building roads<sup>12</sup>.

The housing providers represented by CECODHAS Housing Europe work everyday in partnership with the construction sector and are in a good position to understand the possible ways in which the construction sector could be improved to deliver affordable and energy efficient homes. It is estimated that approximately 40 million new homes are needed across the EU and the cost of delivery is high<sup>13</sup>. For example, in Sweden social housing providers face unsustainable construction prices, with costs more than 30 per cent higher than in the neighbouring country of Finland. This is due to a variety of factors, a major one of which is the lack of competition in the construction sector, with only a small number of suppliers. Possible ways in which this could be addressed include developing more efficiencies along the building chain, simplifying procurement procedures, increasing the capacity of small and medium sized firms and increasing the skills and attractiveness of the construction sector.

## 1.5 Solar Decathlon Europe meets social housing

Social housing providers are working to balance both social and environmental challenges for a fair energy transition and have long recognised the need to innovate and identify ways to save money during the construction or rebuilding process and to look for innovative approaches, concepts and building techniques that make the realisation of nearly-Zero Energy Buildings both simpler and cheaper.

For this reason CECODHAS Housing Europe teamed up with the Solar Decathlon Europe to tap into the inspiration and motivation of the world's best architectural schools in their quest to shape the innovative path of the sector. A team of jurors, expert practitioners from the housing organisations evaluated 10 Solar Decathlon entries and selected three teams to present their work at the 'Fair Energy Transition' Symposium on September 26<sup>th</sup> in Madrid.

The Nearly Zero Energy Challenge Project was officially launched at the Symposium and aimed at facilitating the process of fair energy transition by providing an opportunity for discussions and concrete examples from the 2012 Solar Decathlon Europe entries. Comments from the event include:

Pilar Martinez , Director of Architecture, Housing and Land for the Spanish Ministry of Public works said that she saw the Nearly Zero Energy Challenge as vital as *"in addition to improving the quality of life, it will generate employment and economic growth which is a social necessity in our country."* She called on CECODHAS Housing Europe and the public housing companies in Spain to *"continue what they have done until now and done so well, to continue to be laboratories for new ideas because they are working on the ground and they know the reality in the cities better than anyone else. They know where the barriers and obstacles lie which have to be tackled and overcome at other levels within the administration."*

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<sup>12</sup> Cambridge Econometrics and Verco (2012): Jobs, growth and warmer homes, Consumer Focus

<sup>13</sup> Source Speech by Kurt Eliasson, Symposium 26/9/12.... Original source of data

Yamina Saheb, Head of Sustainable Buildings Centre at the International Energy Agency, (IEA) considered the Nearly Zero Energy Challenge as a *“very useful initiative for the EU because of nearly zero energy target for buildings. We need bench marking so that we can design policies which are implementable.”* She stressed that CECODHAS Housing Europe can *“play a major role in avoiding subsidies going in the wrong way, especially in social housing where we have fuel poverty and we expect it to increase in the future.”*

Vicente Leoz Argüelles, Head of Sustainable Industrial Policy and Construction Unit of DG Enterprise and Industry at the European Commission said *“I think it is a very important project both from the perspective of the climate and energy dependency. New building standards are vital, but we also have to work on the renovation of existing buildings which consume the most energy. These objectives are not contradictory but complementary.”*

Antoni Sorrolla speaking on behalf of the Spanish Social Housing Federation (AVS) said *“We have to reduce energy consumption and control the use of natural resource. The Nearly Zero Energy Challenge initiative helps us go into that direction.”*

Angelo Consoli, Director of the Brussels office of Jeremy Rifkin and the Foundation on Economic Trends called for more ambition and to aim for zero energy challenge since *“By now the technology and the business are far ahead than even the bureaucracy. Zero emission buildings and even positive energy buildings are already going up everywhere in Europe.”* Consoli also stressed that *“This new democratic distributed interactive energy model, the third industrial revolution starts with human capital so you have to engage in a massive retraining programme and you have to push for the European Union to engage in that.”*

The launch of the Project was also an opportunity to present the first Solar Decathlon Meets Social Housing ‘Fair Energy Transition’ Award. The Jury, made up of social housing practitioners as well as representatives from the United Nations Economic Committee for Europe and Building Performance Institute Europe were asked to review the Solar Decathlon Europe entries from the perspective of social housing providers. The criteria were affor-

ability, user and management friendliness and replicability in multi-family blocks in an urban environment.



**Top floor of the nanotower with communal space beneath the solar canopy roof**

Photo Credits: Solar Decathlon Europe

The winning team selected by the jury was **Canopéa Nano Towers in the City** and was based in the Rhone-Alpes region of France. The winning team aspired to provide a solution to the problems of densification of the cities through Canopea, a habitat which combines qualities of the individual house and availability of urban services. Canopea is a collective of small buildings, called “nanotowers”, which is situated within a neighbourhood. Each nanotower is equipped with a system of mutualized external passageways, which offers space qualities similar to those of a detached house:

- 360° of freedom,
- possibility of going around the house,
- tolerable proximity of the neighbourhood,
- pleasure of shared common spaces which increase the individual space of life,
- presence of plantations integrated in the construction taking the form of vertical farms,
- access to public transportation and services of the area,
- centralised management of the technical systems.



### Overview of the solar canopy of the nanotower

Photo Credits: Solar Decathlon Europe

Canopea Nano Towers was selected on the basis of its holistic urban approach, with grids for heat and energy, waste removal and treatment systems and its emphasis on social connectivity and common space. The winning team also pointed out affordability, mobility and adaptability to hot and cold climate as the reasons why their project had been selected.



### Design showing a cluster of nanotowers in a neighbourhood

Photo Credits: Solar Decathlon Europe

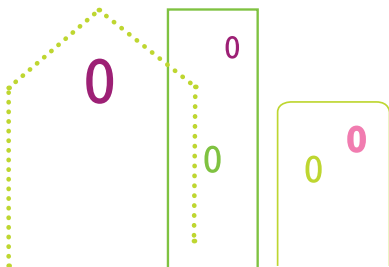
The designers describe it as taking inspiration from tree canopies that absorb 95 per cent of the forest's overall solar energy and capture 30 per cent of the rainfall. The nanotowers are less than 10 stories high and each floor is its own home. The space beneath the photovoltaic canopy is shared and provides laundry and cooking facilities, as well as a small recreation area for residents. Clusters of nanotowers are linked with passageways filled with gardens, storage areas and recycling facilities. In order to optimize energy conservation, each of the nanotowers that make up the Canopea are connected to smart grids that manage all of the heating and cooling systems, in addition to a variety of other services that can be monitored with touch pads.



### Inside the communal space

Photo Credits: Solar Decathlon Europe

The 75 square metre dwelling unit comprises the bottom two floors of one nanotower. It features a master bedroom, bathroom and additional room with a lot of flexible open space along with large bay windows in the living room that open to an outdoor garden. Earthen walls create a pleasant internal environment while operable louvers permit natural ventilation and daylighting. The roof is composed of silk-screened bi-glass photovoltaic panels<sup>19</sup>.



<sup>19</sup> Canopea Home is a Solar-Powered Urban Habitat with a Vertical Farm by Rhône-Alpes for the European Solar Decathlon Canopea by Team Rhône-Alpes – Inhabitat - Sustainable Design Innovation, Eco Architecture, Green Building

It is important to gain an understanding of the extent to which nearly zero energy buildings already exist in Europe. The taskforce leaders for the three areas of housing in warm/Mediterranean climates, cold/continental climates and divided ownership and cooperative housing carried out surveys of the social housing providers in their particular area of interest and also took advice from external experts. Given that the building regulations are different in all Member States, it is not possible to compare against a single measure of energy performance. The surveys do however enable a general impression to be obtained of the current position, which is summarised below.

## 2.1 Austria

According to voluntary reporting schemes from the Federal programme “klima:aktiv” and IG Passivhaus, there are approximately 120 multi-family residential buildings in passive house or lowest energy standard (< 25 kWh/m<sup>2</sup> a energy heating demand) and about 100 in “klima:aktiv” standard, according to the criteria of the voluntary federal programme<sup>15</sup>. About five per cent of the annual new construction of cooperative housing associations are built to the passive house standard (i.e. 600 of 12,000), the remainder in low energy standard according to regional building codes. Beneficial factors for this development have been so far:

The research and development programme “Building of Tomorrow” launched in 1999 which has resulted in more than 50 demonstration projects to date, nearly half of them new or refurbished large residential buildings. Demonstration projects are documented and monitored (usually for two years). Through the programme a network of innovative researchers, planners and building experts was initiated, which serves as know-how pool and platform for formal as well as informal exchange of experiences.

The energy standards in the housing promotion schemes of the nine federal provinces are higher than those of the building regulations. Since 80 per cent of housing construction in Austria is built with public support, this has proven to be a very strong instrument to induce innovative energy standards. The definition and promotion of voluntary standards such as klima:aktiv and passive-house has had positive effects on the market development of nZE buildings in Austria.

## 2.2 Flanders-Belgium

The number of existing nearly zero energy buildings in Belgium-Flanders was described as “a handful”. Nevertheless, the steady process of tightening the building requirements since 2006 in two-year steps gives a good example of a successful step-by-step policy. It could be observed that the average thickness of insulation on facades and roofs improved significantly over the last years. A crucial element within this step-by-step policy is the periodical evaluation of calculation methods, procedures, current building standards and the administrative burden of the energy regulation. This happens every two years, and is carried out by the Flemish Energy Agency, after consulting the relevant stakeholders, among them the housing sector represented by the Flemish Social Housing Society.

## 2.3 Bulgaria

No nZEB definition has been proposed in Bulgaria. There are no nearly zero energy examples reported to date, but Bulgaria has a relatively well-structured general implementation plan for the introduction of nearly zero energy buildings, setting national intermediate targets and following a stepwise approach for the periods 2011-2013, 2013-2016 and 2016-2020. Part of the action plan is implementing pilot projects for nearly zero energy buildings in the public sector within the first period from 2011-2013.

<sup>15</sup> <http://www.klimaaktiv-gebaut.at/> and <http://www.passivhausdatenbank.at/statistics.php>



## 2.4 Estonia

The vast majority of housing in Estonia was built between 1950 and 1990 and is highly energy inefficient and in urgent need of renovation. The present rate of renovation is one per cent of existing stock per annum, with less than one per cent being added due to new construction. Only one very low-energy building has been built in Estonia, although this case serves as a successful example. The kindergarten Kaseke, situated in the municipality of Valga in Southern Estonia, is being reconstructed using the principles of energy efficiency criteria and best possible indoor climate. All the solutions are economically feasible and they correspond to the passive-house standard. The energy consumption of the building has dropped from 250 kWh/m<sup>2</sup>/year to 15 to 17 kWh/m<sup>2</sup>/year. The project has received a grant of €1,080,000 from KOIT (Investment Donations Programme for Local Municipalities), a programme of the Estonian government, while the total cost of the project is estimated to reach €1,450,000.

This pilot project has received a great deal of attention and many different actors have shown interest and asked for information about it. Some other developers already have started to plan their own low-energy project inspired by this pilot. The intention is to have at least ten nearly zero energy buildings constructed by 2015, one in each of the regional centres.

## 2.5 France

The progress of France towards nZE buildings is illustrated by the number of energy plus buildings which are already listed on the 'Batiment à energie positive' ADEME website. According to this database, the number of plus-energy buildings in France is 192, most of them already in use and about 20 of them multi-family residential buildings.

France has followed a quite ambitious way with the new thermal regulation (RT 2012) which was established on 1st January 2013 and requires that new buildings limit consumption of primary energy to 50 kWh/m<sup>2</sup>/year. The French label for low-energy housing (BBC label), which is the standard for the new French thermal regulation (RT 2012), is used as a

baseline by social housing organisations. The aim is to reduce energy consumption and greenhouse gas emissions, and to act on the reduction of tenants' total costs, limiting the impact of the increase of energy prices on the costs, while ensuring the same level of comfort.

The Union Sociale pour l'Habitat together with the Caisse des Dépôts et Consignations have financed evaluation studies of existing new buildings and refurbishment projects. The conclusions of these studies are interesting with respect to the level of energy efficiency reached, which is lower than expected, but also the high level of investments involved. In addition, apart from the fact that the energy goals are not reached, the increase of the other expenses seems significant and needs to be studied. Different reasons can explain these conclusions: inappropriate use by the tenants, incorrect instructions from the builders, the absence of an energy-efficiency guarantee agreement, technical equipment which is unadapted or the wrong size, and the fact that maintenance costs are not taken into account in the calculations.

In order to improve future operations, it is urgent to optimize the funds invested, learning from previous experience wherever possible. This is the aim of the forthcoming observatory of energy efficiency launched by the Union Sociale pour l'Habitat, which focuses on the question of tenants' total costs.

## 2.6 Germany

According to the National Housing and Real Estate Federation (GdW), about 20 to 30 per cent of new construction in social housing can be regarded as nearly zero energy buildings. Furthermore, the international database on passive houses identifies 84 multi-family residential passive houses in Germany. About 40 per cent of new constructions are built to a higher standard than that stipulated by the actual building regulations. Some of the key drivers in Germany have been:

- The **KfW programme**, which promotes the construction of new energy-efficient homes and the energy-efficient refurbishment of older residential buildings in particular, with grants or loans at favourable rates. KfW also supports

measures to improve the quality of life through the creation of barrier-free housing. The energy standards are laid out in the Energy Conservation Ordinance (Energiesparverordnung/EnEV). These standards apply to new buildings. KfW promotes new buildings if better than EnEV (40/55/70) and the refurbishment of houses if after refurbishment they do not exceed a specific energy requirement for a comparable new house EnEV(55/70/85/100/115). Simply put, the figures indicate in percentage terms how much of the maximum primary energy requirement specified by the EnEV the house consumes. The best standard receives the highest support. The KfW promotion scheme can be regarded as good example since it is uniform for the whole country and easy to communicate<sup>16</sup>.

■ **Research programmes** also play an important role as trigger for innovative buildings, namely “Zukunft Bau” and “EnOB – Research for Energy Optimized Building” with sub-programmes “EnBau” for new buildings and “EnSan” for refurbishment. A considerable number of demonstration projects have been launched within these programmes, including documentation and evaluation of the buildings<sup>17</sup>.

■ Last, but not least, the clear definition of the **passive-house concept** as a building standard together with a calculation tool, certification of buildings and certified planners, a network of passive-house interest groups and hundreds of training courses, workshops and conferences, have had a considerable impact on the market development of nearly zero energy buildings in Germany.

## 2.7 Italy

In terms of new construction, there are eight certified passive houses in Italy in total, five of them built in Südtirol, one in Lombardia (Lonato), one in Veneto and one in Sicily. No subsidies were provided, they were all carried out as private initiatives, and only the one in Lombardia is owned by a social housing cooperative. There are also examples of

nearly zero energy buildings from refurbishment of existing property, but they are pilot projects, such as the “Casa Kyoto” of ANIT association, which is located in Gavirate in Lombardia.

The survey with experts carried out by FINABITA confirms that in Italy the nZEB concept is assimilated within the CasaClima approach. Another example is the analysis of the existing publications about nZEB: all of these are presenting buildings designed with the CasaClima approach<sup>18</sup>. In total, more than 3,700 buildings have been certified according to CasaClima standards in Italy to date (minimum standard of less than 50 kWh/m<sup>2</sup>/year energy heating demand). CasaClima defines quality standards which can be met on a voluntary basis, provides certification and training of professionals and is constantly developing a professional network of planners, consultants, auditors and craftsman<sup>19</sup>.

The main driving forces for innovative construction are the positive and strict local legislation framework that is stimulating all the building stakeholders to innovate and a strong voluntary effort to provide innovative and competitive solutions to the actual building. The proponents of these advanced projects are often well informed and courageous and invest their own resources to go beyond the actual building market. There is no relevant public financing assistance for nearly zero energy buildings available, the main national incentive is a tax credit programme to promote energy efficiency in Italy.

## 2.8 Spain

Although there is no official database available, there are some newly constructed nearly zero energy buildings all around Spain, most of them as demonstration projects, although some others are official public buildings. No information about any examples of nZEB renovation is reported in the survey. Due to the economic crisis, budget cuts have seriously impacted the energy efficiency sector. There is no kind of funding for nearly zero energy buildings; moreover the grants for energy saving at national, regional and local level have been eliminated.

<sup>16</sup> [http://www.kfw.de/kfw/en/Domestic\\_Promotion/Our\\_offers/Housing.jsp#Energy-efficientConstruction](http://www.kfw.de/kfw/en/Domestic_Promotion/Our_offers/Housing.jsp#Energy-efficientConstruction)

<sup>17</sup> <http://www.forschungsinitiative.de/> and <http://www.enob.info/en/>

<sup>18</sup> TF paper warm/Med based on data from ZEPHİR <http://www.zephir.ph/>

<sup>19</sup> [www.klimahaushaus.it/en/](http://www.klimahaushaus.it/en/)

However, on the regional level, the I.D.A.E. (Institute for the Diversification and Saving of Energy) of the Spanish Finance Ministry provides direct aid as repayable grant through the Autonomous Communities (ACs) for investments in certain types of projects that promote energy efficiency or renewable energy. These supports include those actions that are part of the Renewable Energy Plan 2005-2010 (PER) and the 2008-2012 Action Plan of the Strategy of Energy Saving and Efficiency in Spain (E4). The respective Autonomous Communities are responsible for the development of public aid programmes, but to date no programme has been developed for the construction or retrofitting of nearly zero energy buildings.

## 2.9 Sweden

A certain number of nearly zero energy buildings already exist in Sweden: 43 new-build multi-family buildings with about 3.200 dwellings were built to a low energy standard and one building was renovated to nearly zero energy standard. The main drivers behind these projects are innovative housing associations which want to strengthen their brand and public funding from EU funds. In the case of EU funding, project reports are available in English.

Financial support for demonstration projects and local/regional collaboration initiatives is provided by the LÅGAN programme focusing on buildings with very low energy use. It also encourages new thinking by evaluating and disseminating information from demonstration projects and supporting development projects. LÅGAN is a collaborative programme between the Swedish Construction Federation, the Swedish Energy Agency, Region Västra Götaland, Formas and others<sup>20</sup>. An important feature of this programme is the sustainability and credibility of the action based on a five-year programme (2010-2014) and a total budget of SEK60 Million. LÅGAN offers not only support for demonstration projects, but also for co-operation and networking initiatives at the regional and local level. Furthermore, the LÅGAN programme website also provides a best practice database, with completed projects throughout Sweden, including 78 multi-family residential buildings.

## 2.10 UK

Currently, there is no database of nZEB projects and although various collections of case studies for new build and retrofitting of existing homes exist, the exact number of projects already completed or planned is not known. The main drivers behind nZEB projects currently vary, depending on the developer. However, at the current time they generally fall into the categories of fuel poverty, improved quality of assets, planning requirements, funding and (increasingly) legislation.

Affordable Housing providers are one of the main sector groups leading on nZEB housing projects, in part due to already being required to build to increased levels (although not nZEB currently) due to funding, and also due to their commitment generally to have a positive impact in the neighbourhoods in which they work. The Government has committed to zero carbon for new build by 2016, although the regulations and legislature to underpin this has not yet been finalised.

The implementation of the Green Deal in October 2012 has inspired some pilot projects, allowing comparison of predicted energy savings to actual achieved savings. Use of the current financial incentives of Community Energy Saving Programme (CESP) and Carbon Emissions Reduction Target (CERT) supplier obligations, Feed in Tariffs and the Renewable Heat Incentive has had an impact in terms of driving projects (although not necessarily in terms of reaching nZEB); but the Green Deal and Energy Company Obligation – which is paid for through a levy on all electricity bills – should see higher numbers of refurbishment projects taking place if they work in the way they are intended to.

In summary, very few countries among the taskforce members have an exact definition of nZEB, plus a roadmap of how to achieve it and there is only a limited understanding or awareness of where current energy performance is in relation to nZEB requirements. In other Member States the process of defining what it is and how it should be reached is still ongoing. The purpose of the Nearly Zero Energy Challenge is not to define nZEB, but rather to identify its cost effectiveness and usability in practice. Findings will be used to feed the nZEB roadmap preparation process at national level.

<sup>20</sup> [www.laganbygg.se](http://www.laganbygg.se)

The obstacles to delivering nearly zero energy building were identified through surveys of social housing providers and through discussions with external experts in the field. The feedback received indicated a variety of barriers and challenges exist, which can be broadly categorised into the following five key areas. It was recognised that the two key areas of work to be carried out, i.e. new construction of nearly zero energy buildings and refurbishment of the existing stock, present different barriers and challenges to delivery. Each of the barriers listed below applies to a greater or lesser degree, and in different ways, to both areas of work.

- Economic and financial barriers
- Technical barriers
- Credibility barriers
- Social and organisational barriers
- Legislative barriers

### 3.1 Economic and financial barriers

are shown in the surveys of social housing providers to be the major problem faced by social housing providers in delivering nZEB homes. Having the correct funding in place for social housing, multi-tenure and private ownership for both new construction and retrofitting is crucial to delivery of EPBD.

It is very difficult to compare what is happening in different Member States, since the fiscal and subsidy systems are so different. For example, in Belgium there is limited general funding for new housing construction, while in Sweden there is none at all. Whilst there are grant schemes available in both Austria and Germany, there are significant differences between them. **There are however some clearly agreed financial barriers, including:**

**0** A lack of available finance to carry out new construction or refurbishment, either through the provision of subsidy or access to affordable capital. This is seen by all Member States involved to be the main obstacle to going beyond the existing building code and taking up the nZEB. The lack of subsidies was mentioned by many of the respondents to the surveys of social housing providers. One of the rea-

sons for higher levels of development of low energy housing in Germany and Austria may be the more generous subsidy systems for low energy housing that are available there. In Austria, for example, nearly all passive housing is developed in the subsidised housing sector, where not only the 'normal' level of subsidies is available, but also additional grants for the low energy or passive house components of any development.

**0** The lack of subsidies is a particularly acute barrier in those Member States experiencing severe economic crisis at the moment, such as Italy and Spain. There is no relevant or specific public financing assistance for nearly zero energy buildings in Italy. As a result of the recast EPBD, the national government has introduced some small initiatives to promote low energy building but these limited funds are now exhausted. There are some additional funds made available on a regional basis. In Spain, budgets cuts have been severe in the energy sector and there are no funds for nZEB buildings. The national government has introduced an Action Plan and Energy Efficiency Savings 2011-2020 setting out the required reductions in energy used in heating and cooling.



The capital cost of building nZEB homes is higher than that of current construction standards. There are extra costs associated with improved insulation of all building components. As most construction professionals are not used to the new technologies, much time and resources are invested in planning, education and quality assurance which also bring up costs. A 2009 study, which detailed the extra costs of constructing new passive houses, indicated that up to 10 per cent extra upfront investment costs are reported, with clearly declining trend<sup>21</sup>. In Germany, Austria, Sweden and Switzerland extra costs could be in the range of two to six per cent while in the UK, France, Portugal, Spain and Italy are said to be in the range of three to ten per cent for newly constructed buildings respecting passive house standards.



For retrofitting of the existing stock, estimates of additional costs also vary massively, but for much of the dwelling stock significant energy efficiency refurbishment is required if the appropriate standards are to be met. Although it is often stated that these additional capital costs can be recouped through savings in the cost of energy, there is as yet, little reliable data to prove this point or an agreed method of calculation. In Flanders, for example, an evaluation of the 19 passive housing units that have been built, show that the maximum cost limits for social housing are exceeded by between 50 and 80 per cent. Monitoring of the houses is currently being carried out to assess the real (rather than design) energy consumption levels and to understand the tenants' views on living in such homes. Not only are the capital costs of construction higher, it is also anticipated that the costs of maintenance will also be higher, as more complex systems are being used in the dwellings.



Financing from banks / Energy Service Companies (ESCOs) is often not forthcoming, especially when the cost of retrofitting a whole building, rather than a single apartment is sought. Banks and ESCOs are reluctant to engage in long-term energy efficiency financing contracts and tend to prefer shorter term investments and paybacks. The use of new

materials and technical equipment also causes problems in obtaining mortgage finance since lenders are lending housing finance on a long-term basis and want empirical evidence of the longevity of the new products. With little understanding of the technologies involved or of whole-life costing or knowledge of pay-back rates through energy saving there is a reluctance to take what are perceived to be financial risks.



In many European countries, there has been a large scale privatisation of the state housing stock, and it is now becoming apparent that a significant number of owners of the apartments do not have the wealth or income to carry out the substantial works required to improve them. Whilst this problem is especially pronounced in many of the former East European Member States, it occurs widely throughout Europe where multi-family apartment blocks have been partly privatised following the introduction of right to buy schemes. Not only does this prevent work being carried out on individual apartments, it also inhibits collective action by a group of apartment owners in a multi-family block, where some may have the financial resources to carry out energy efficiency improvements, but not all.




Not only is it difficult to finance the construction of nZEB, there is also low profitability involved for any firm choosing to develop it. There are also additional costs for building professionals as the intensive time required for and spent on the design stage is often not reflected in the fee level that can be charged.




For social housing providers, there is always a tension between the capital cost of constructing a dwelling unit and the number of units that can be provided for a limited amount of capital. Given that there is always more demand for social housing than can be provided; there is a strong political imperative to ensure that the maximum number of units is delivered for any government subsidy available. The higher capital costs of constructing nZEB homes inevitably puts pressure on levels of total

<sup>21</sup> Low Energy Buildings in Europe: Current State of Play, Definitions and Best Practice. European Commission, 2009. [http://ec.europa.eu/energy/efficiency/doc/buildings/info\\_note.pdf](http://ec.europa.eu/energy/efficiency/doc/buildings/info_note.pdf)

delivery. In Belgium (Flanders), for example, the passive social housing project 9 + 5 + 5 dwellings built in 2011-2012 exceed by 50 to 80 per cent the maximum cost limit for social housing<sup>22</sup>.


 Energy efficient retrofitting is different to other forms of investment in that it does not generate any additional income, but rather avoids future costs and thus requires specific models of long-term funding. One of the problems for social housing landlords in relation to this is the split incentive – whilst the retrofitting work may have a positive impact for residents in terms of reduced energy bills and the eradication of fuel poverty, there is a major problem for the landlords in that the capital funding required to carry out the necessary works often cannot be recouped from tenants through higher rent, due to regulation of rent levels.


 Although EU funding initiatives such as ELENA offer opportunities for funding large scale projects, these are currently not available to be accessed by smaller projects


 Although retrofitting may technically increase the asset value of a social housing provider's stock, there is unlikely to be any significant change in terms of the balance sheet valuation of assets against which to secure future lending, since the assets are valued on the basis of rent attainable from stock rather than the actual stock value.


**3.2 Technical barriers** are inevitable with the introduction of new technologies and can include both problems associated with low energy housing design, technological systems and construction materials, as well as the lack of knowledge and skills in the building chain. The current levels of knowledge and experience vary widely between social housing providers and Member States. Competencies in large-scale refurbishment are now highly concentrated within the social housing sector in virtually all Member States, since this work is scarcely carried out in the private sector.

**The following key obstacles were identified by taskforce members:**

 A lack of specific knowledge on the part of the built environment professionals, including planners, building managers and architects had led to problems with poor design and the unsuccessful introduction of new technologies. It was particularly felt that there was inadequate knowledge on how to identify the best technology mix to deliver nZEB and also an understanding of how to assess the cost-effectiveness of the products


 The skills and knowledge of the construction workforce and their supervisors who actually carry out the construction was also found to be lacking in some Member States due to the very low levels of training in these systems. Similarly, skills and experience were lacking in those required to service and maintain the new heating and ventilation systems which require regular cleaning, service and repair to ensure their proper functioning. In Estonia, it was noted, the construction sector has been very slow to engage with the environmental agenda.


 Weak technical performance of some of the equipment and systems specified, particularly in earlier projects. For example, in some of the early passive housing projects that were designed to be heated without a conventional heating system, additional heating had to be installed to ensure an adequate comfort level for residents; ventilation systems had to be changed and external sunshades did not work, causing problems of overheating. In some cases there are still ongoing debates as to the properties of individual products, for example regarding the fire resistance of polysterol as an insulating material. In some Member States there was inadequate availability of the appropriate products and high prices for those that were available, although this was more of a problem in some Member States than others.


 An anticipated additional area of inadequate capacity is likely to be found in the public officials who will be called upon to manage the forthcoming nZEB requirements.


**3.3 Credibility barriers** are inevitably part of the development of new building systems and technologies. These barriers have arisen primarily due to the lack of examples of good practice and robust data from completed projects, as well as natural inertia and resistance to change. Both the general public and most professionals are simply not aware of what nZEB is, or have been misinformed through inaccurate hearsay. In the absence of reliable data on the performance of nZEB dwellings it is difficult to spread a reliable and clear message. The levels of interest and information vary between Member States. In Italy, for example, there is low awareness amongst the general public and little interest or demand for nZEB and considerable scepticism about the nZEB concept resulting from inadequate communication to the general public, whereas in Germany and Austria there is a greater awareness of the concept.

**The key issues that have emerged from the surveys of social housing providers and discussions carried out with experts show that:**

 There are too few examples of nearly zero energy housing being developed as part of mainstream housing provision in many Member States, with the majority of working examples being demonstration projects. In some cases these are badly presented or seem very remote from typical living patterns. In many Member States there is real uncertainty about the energy and cost savings that can be achieved, and with few working examples to visit or reliable data, there is very little opportunity to help improve understanding.


 Negative and incorrect debate or information in the media can prejudice not only residents against living in such buildings, but also builders and other organisations involved in the construction sector from wishing to participate in the sector. Typical misinformation circulating relates to a variety of aspects of the use of nZEB, including the much higher construction costs involved, health issues arising for those living in low energy housing and the durability of the various building parts.

 The lack of a common definition of nZEB and an understanding of the terminology relating to high energy performance buildings continues to exacerbate the problem of poor visibility and credibility of the product. The regionalisation of the European Central Bank (ECB) system in Italy for example has only added to the confusion, since there are 21 separate regions and autonomous provinces.

 A further factor is the general inertia in the building sector, which in many Member States is dominated by traditional skills and materials, with little or any incentive to change well known and culturally acceptable designs and construction practices.

**3.4 Social and organisational barriers** also need to be addressed if nearly zero homes are to be widely developed and lived in. The amount of energy used in a building depends not only on the design specification and materials used, but also on the lifestyle of the residents and the housing management services provided.

**The key issues that have emerged from the surveys of social housing providers and discussions carried out with experts show that:**

 The acceptance of what is considered an adequate level of thermal comfort varies widely with differing personal and cultural standards. Some persons are willing to wear layers of clothing indoors, whilst others prefer to wear sleeveless shirts, even when snow lies thickly on the ground. Some households prefer to have windows open to ensure a supply of fresh air, others are happy to rely on ventilation systems. This human dimension is rarely considered by engineers: "I sometimes have the impression that low energy housing engineers feel that people should stay outside, so that they do not interfere with the perfect energy-efficient house they have created"<sup>23</sup>.

<sup>23</sup> Ralph Protz, Kompetenz Zentrum, Berlin

**0** In terms of savings in the amount of energy used, allowance also has to be made for the 'rebound effect' i.e. an actual increase in energy consumption once the energy saving measures have been introduced. This is especially common in low-income households where a choice can be made between having lower energy bills or paying the same amount of money but having higher comfort levels with increased heating.

**0** Saving energy and improved energy efficiency are not usually a priority for property owners or tenants, who typically prefer improved kitchen or bathroom facilities or improvements to the structural safety of the building or access within it, such as the installation or upgrading of lift facilities.

**0** There is a cost involved in community outreach to ensure that residents have a good understanding of how they can live in their home to optimise their use of energy. It is estimated that this is 15 per cent of the total cost of refurbishment<sup>24</sup>. These costs include advising and informing residents and where necessary, decanting residents into temporary housing to allow work to be carried out.

**0** Adequate training and support of residents will be needed to maximise the functioning of low energy housing but also to enable informed decision making by residents. This was felt to be particularly important where there is divided or cooperative ownership and every decision concerning the building has to be agreed with all the owners, otherwise only partial retrofit measures can be undertaken. It is slightly easier with cooperatives where the cooperative owns the building and can invest the resources, but even so the residents will need to be consulted and in practice it may be difficult to achieve approval from a large majority of residents. Estonia noted that where members of residents associations would need assistance with understanding the energy refurbishment and their role in ensuring that energy consumption was kept to a minimum.

**3.5 Legislative and regulatory barriers** arise for a number of reasons. The key issues that have emerged from the surveys of social housing providers and discussions carried out with experts show that:


**0** In many Member States a major regulatory impediment is felt to be the unclear or non-existent definition of nZEB and what is required of social housing providers in terms of standards or specifications. In some Member States there are no intermediate targets or adequate targets for retrofitting. Whilst some Member States are ahead of where they need to be to achieve energy efficient targets, other Member States have no energy efficiency strategy in place at all. In Italy, for example, the delayed government action to deliver the technical guidelines for the delivery of EPBD1 at national level have meant that several regions have proposed their own interpretations, which has caused significant confusion in the building sector and will be an impediment to the forthcoming Recast EPBD implementation.


**0** The Nearly Zero Energy Building Obligations set by the EPBD also require the production of renewable energy either on site or nearby all new buildings. However, there is widespread uncertainty as to the extent and method by which renewable energy should be incorporated into the building design. There are still many bureaucratic obstacles to local production and consumption of renewable energy. In Germany, housing cooperatives are limited to producing energy for the consumption of their members. If there is a surplus, they face the issue of not being able to sell it to the grid as this would mean becoming an energy producer which is taxed accordingly, thereby losing the normal tax free status that housing cooperatives enjoy. In Austria, there is already installation of solar panels on a large scale in social housing, but this would not be economically viable without subsidies. USH, the French social housing body, fears that any changes in energy cogeneration price of gas and wood may affect the profitability of renewable energy systems which would represent


<sup>24</sup> National Housing Federation, London information, 2012.





a risk for households in France. In Spain, until there is auto-consumption of renewable energy there can be no such thing as nearly zero energy housing as being able to feed locally produced energy to the grid is currently a complex procedure. Technical difficulties related to grids and storage are also a major issue. These must be addressed to ensure that buildings become part of the energy infrastructure, encourage local energy production and to mainstream nZEBs.


 In many Member States there is a mismatch between the requirement to deliver improved energy building standards and the existence of financial incentives to help bring about those standards. The EPBD (Article 4) requires Member States to set minimum standards for the energy performance of both new construction and refurbished dwellings and Article 10 highlights the importance of appropriate financing and other instruments for the transition to nZEB. Although the requirement in Article 4 is in place, the financial instruments to enable the work to be carried out are not yet in place in all Member States.

 Legislative and taxation barriers arise in national contexts - in Italy, for example, the existing legislation is more oriented to promoting single homes rather than multi-family blocks, as well as a national law relating to the Stability and Growth Pact for public bodies that blocks the creation of public debt through public investments, including investments relating to energy efficiency.

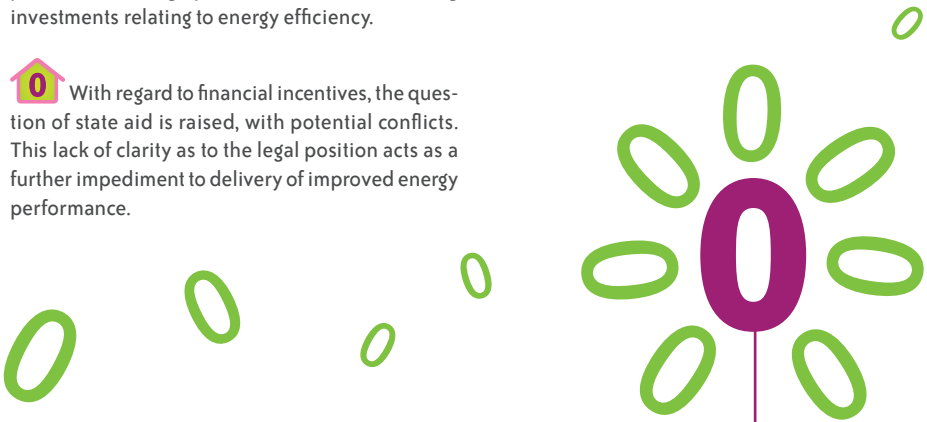
 With regard to financial incentives, the question of state aid is raised, with potential conflicts. This lack of clarity as to the legal position acts as a further impediment to delivery of improved energy performance.

 While the EU clearly describes energy efficiency as a win-win investment option, there are examples of a lack of coherence between the various interacting policies. Examples were identified by CECODHAS Housing Europe in their response to the DG Energy Consultation on financial support for energy efficiency in buildings<sup>25</sup>. These include EU fiscal consolidation guidelines which block spending on energy efficiency at municipality level and the EU state aid rules that can lead to confusion on the criteria on what qualifies for co-funding of EU financing, sometimes due to an inaccurate interpretation at national level.

 A particular legal problem arises in connection with those dwellings in divided ownership. Privatisation of the dwelling stock in multi-family houses is not the easiest legal structure when seeking to carry out large-scale refurbishment works. Problems arise in not having an appropriate legal body to take out a joint mortgage and issues relating to those residents who either cannot or do not wish to contribute towards paying for the improvements.

 Even when legislative requirements are clearly in place, compliance and enforcement can be minimal. In Bulgaria for example, the requirement to provide energy certificates for new tenants or owners of every dwelling unit is rarely complied with.

<sup>25</sup> National Housing Federation, London information, 2012.





# OVERCOMING BARRIERS

## 4.1 Recommendations for action

Whilst it is recognised that there are differing challenges faced in the 27 Member States in respect of the delivery of nZEB buildings, there are nevertheless broad areas of action that could be implemented to ease the transition to nearly-zero energy housing for social housing.

### ECONOMIC

**0** The provision of loan guarantee funds would help provide assurance for commercial lenders and investors and reduce the risk profile associated with energy efficiency investment. The European Investment Bank could play a role in pioneering such loan guarantee funds. With long-term low-interest funding difficult to come by in the current economic climate, the introduction of such facilities would massively boost potential for work to improve energy efficiency. This would also help promote the use of ESCO funding.

**0** In general there is a severe lack of knowledge and trust of the potential of market-based financing instruments. In the UK, the pioneering Green Deal offers one such model, but it has yet to become fully operational. In its basic form the up-front cost of energy efficiency improvements will be met by an approved Green Deal provider, who will recover the money over time via the electricity charges. These Green Deal charges must meet the 'golden rule' of being less than the cost of the energy saved. The detail around repayments, approved costs of refurbishment and interest rate to be charged on the loan have yet to be determined and will be crucial in determining its success.


**0** The introduction of national or regional promotion schemes for energy efficient new buildings or refurbishment projects should be encouraged as they have been shown to have a beneficial impact on market development, either as part of an integrated subsidy system for social housing, as for example in Austria or as stand-alone promotion


schemes for improved energy-efficiency-standards, as for example the KfW program in Germany. They play an important role in bridging the innovation gap between single demonstration projects resulting from R&D programs and broader application in daily practice and can enable social housing providers provide higher energy and comfort standards at same rent levels.

**0** A system of funding and financial opportunities is required which matches the long-term stock planning by housing managers, especially in the case of refurbishment. Stop-start or short-term incentive schemes only serve to increase the perception of risk associated with a particular project, not only on the part of the social housing provider looking to undertake the work, but also by any commercial or government co-financiers of the project.


**0** At the EU level, it would be possible to improve the usability of existing funding streams such as ELENA AND MLEI by ensuring that their scale and timing are appropriate for the organisations that will be going to use them. Lengthy delays between writing an application and waiting for decisions on its outcome further add to the complexities of putting projects together.


**0** Action that needs to be taken at national level includes the development of VAT policies which promote refurbishment, addressing regulatory policies to local energy provision, continuity of national incentives and fair solutions to the split incentive problem.

 Encouragement of a green economy around the delivery of energy efficient housing, either through new construction or retrofit would serve to improve availability and affordability of the materials and skills needed to deliver nZEB homes. The EU has recognised this potential and has made it possible for up to 20 per cent of European Regional Development Funds to be used for energy-efficient refurbishment of housing stock. Were this to be implemented, it is calculated that €60 billion could be invested in energy efficiency, generating 300 billion of investment and 3,500,000 jobs, as well as reducing energy consumption in 14 million households and reducing fuel poverty<sup>26</sup>.


 Housing organisations and tenants should be permitted to become producers as well as users of renewable energy, avoiding the development of monopoly providers of these resources. There are frequently obstacles in national tax systems which operate as a disincentive to local production and consumption. Boosting local energy production on-site or near to housing owned and managed by social housing providers could also result in greater opportunities to finance energy efficiency measures in the housing stock.


## TECHNICAL


 Technical support of the kind offered by initiatives such as ELENA is able to meet a real need at local level. It would be helpful if these initiatives could be made available for use on smaller projects. Capacity building to assist in the application process for funding from the European Regional Development Fund and the European Social Fund would be welcomed by those Member States that have not been proactive in the field of applying for these funds and who find that, in some cases, this can involve excessive bureaucracy.

 Equipping building professionals with the necessary skills, expertise and information to design and construct nZEB is essential if such buildings are to be delivered on any scale other than that of demonstration or pilot projects. Training and subsequent certification would reassure social hou-

sing providers that the professionals they employ have the appropriate skills. Likewise, certification of products and clear guidance of the capacities of different materials and systems would assist in the delivery of technically appropriate buildings. Demonstration centres, one-stop advice shops, innovation networks bringing together researchers, planners and real estate experts and mentoring systems would all help to provide support and grow confidence in the comparatively unknown nZEB sector.


 Facilitating the exchange of know-how and experience on a wide range of issues- technical, financial and social would enable a more rapid uptake of the good practices. It is important that this should take place locally and nationally as well as between countries. Initiatives and projects launched within the Intelligent Energy Europe programme, such as the BUILDUP portal or the Powerhouse Europe project coordinated by CECODHAS Housing Europe, have proven to serve as effective platforms for information exchange and building confidence among housing providers. At the national level, it is also particularly helpful if there is an informal opportunity to discuss difficulties and failures, as well as the success stories.

 Skills in carrying out accurate energy audits of the existing housing stock are much needed, in order to deliver a reliable estimate of measures to be carried out to achieve energy savings. Once this knowledge is available it can be used to inform local heating, cooling and energy planning, as well as providing reassurance for financiers with an accurate assessment of risk.


 A social rental housing sector has to be established as a way of helping solve the problems faced by low-income home owners who cannot afford to maintain their property, and which are now falling into disrepair. This is particularly the case in many of the Member States who have joined the EU more recently, and where there was large scale privatisation of the housing stock.


<sup>26</sup> Speech by Kurt Eliasson, Fair Energy Transition Symposium, Madrid, 25 september 2012


## CREDIBILITY


 There is an urgent need for the development of detailed and accurate monitoring systems of nZEB construction and retrofitting of existing homes in order to provide reliable and accurate evidence of performance and thus help raise awareness of what can be achieved, inspiring and giving confidence to the various stakeholders to engage more actively with the Directive. This monitoring should provide quality evidence of real consumption, costs and usability for residents, using standardised measures wherever possible to enable easier comparison and it would also enable the comparison of theoretical calculations and actual consumption especially around the cost-optimality calculation, which would need to be based on country specific data and reference buildings and pave the way for transition to energy efficient affordable housing. One such example of the value of monitoring is the study of nearly zero energy buildings in Austria carried out by GBV, the Austrian Federation of not-for-profit housing associations, together with E7, which combines theoretical calculation and an analysis of evidence based economic data and shows possible ways to define nZEB based on cost-optimal levels, as highlighted earlier in this report<sup>27</sup>.

 Other Research & development programmes which have proven effective are “Building of Tomorrow” in Austria, “Zukunft Bau” and “EnOB – Research for Energy Optimized Building” in Germany or the “LÅGAN programme” in Sweden. They include the construction of a considerable number of demonstration projects with high visibility, decent documentation and evaluation of real energy consumption, costs and usability. R&D programmes can foster the development of innovation networks, bringing together researchers, planners and real estate experts not only on project level but also in continuous workshops series. Considering a minimum duration of 3 to 5 years a national R&D buildings programme can be a core element of creating an innovation friendly environment and thus bringing nZEBs into practice.

 As well as data on energy consumption and performance, it would be valuable for social housing landlords to have a solid evidence base relating to investment costs, maintenance requirements and associated costs and the life cycle costs in order for them to be able to make informed decisions regarding their development programme and how to establish cost-optimal building standards. Again, the study by GBV & E7 demonstrates how such evidence can be gathered and interpreted.

 The use of stepwise approaches in moving gradually towards nZEB would be valuable in ensuring the transition to nearly zero energy buildings. Although it would take time it would allow learning on a small scale, which can be developed for much larger scale delivery. This would require a structured plan with interim targets, regular evaluation, for example every two years, consultation with the relevant stakeholders and a gradual tightening of requirements based on evidence from demonstration projects, voluntary standards and promotion schemes.

 The development of voluntary standards, such as CasaClima, Passivhaus, klima:active which are highlighted in the examples below, is important in building confidence and have shown significant impact in encouraging the market development towards nZEB standards. They allow for the development of appropriate definitions and adequate calculation tools, as well as developing certified products and professional standards through continuous training and workshops for professionals.

 Facilitating legal access to data on energy consumption may be necessary in some Member States, where it is considered to belong to the energy companies and not available to external organisations, such as social housing landlords.

<sup>27</sup> W. Hüttler (2013) nZE buildings in Practice – the Case of Austria

## SOCIAL AND ORGANISATIONAL

**0** In parallel to roadmaps to deliver the physical works and improvements, there also needs to be a better understanding of the importance of household lifestyles and behaviour on the energy performance of the homes that people live in and roadmaps developed to ensure that this element of energy performance can also be delivered.

**0** Training and awareness raising schemes to help residents optimise their living patterns would be invaluable in ensuring that the changes to their homes are understood and well embedded. There are a variety of ways in which this can be facilitated, including the appointment of community champions, providing a range of information in accessible formats, as well as hands on training and support for any ongoing maintenance tasks that need to be carried out by the residents.

**0** Training for the staff members in social housing organisations is important, since housing management and maintenance staff do not always have the knowledge necessary to advise or support residents in how to make the most out of living in low energy homes. In a study carried out by the Metropolitan Housing Partnership in the UK, this was found to be one of the barriers to building capacity and engagement amongst tenants and was rectified with improved training<sup>28</sup>.

## LEGISLATIVE

**0** With the current wide range of EU policies which could impact on the achievement of energy efficiency goals, a review of policy coherence would enable greater ease of access and uptake. For example, it would serve to identify any legislative or regulatory barriers relating to economic governance state aid, construction market regulation which could have an impact on social housing providers and others achieving their energy efficiency and renewable energy goals. It would also be helpful if the current complexity around funding streams could be reduced. There are currently a range of different funds, with different criteria for access. Bringing these various streams together would help to join up the various aspects of assistance needed into a one-stop space, for example support with technical assistance, low interest loans for refurbishment, awareness raising packages, etc.

**0** Integration of national policies relating to energy efficiency would also be helpful in some Member States. In Italy, for example, it was felt that it would be helpful to merge the regulations for renewable energy with the existing building regulations or to broaden the scope of the existing building regulations by introducing renewable energy requirements. Also helpful would be an integrated approach between policies of building providers and the local utilities, facilitating a faster and cheaper implementation of nZEBs.



<sup>28</sup> Homes of Our Times (2012), Metropolitan Housing Partnership, UK

## 4.2 Fair energy transition towards nZEB: Best policy and practice examples

A variety of good practices are emerging throughout Europe, dealing with different aspects of delivering a fair energy transition. Some of these provide financial incentives; others are technical solutions or methods of monitoring energy performance. It should be noted that many of these initiatives are being threatened by generalised austerity measures in the EU.

### 4.2.1. BIELEFELD KLIMABONUS (GERMANY)



Bielefeld is a city of 320,000 people located in the north-west of Germany. The City Council has been

actively engaged in addressing the need to increase energy efficiency in all aspects of the city's life, including running public campaigns to engage the citizens in the actions. In 2007, the Social and Health Committee of the City Council decided to introduce a 'Climate Bonus' (Klima Bonus) to further support this work. The idea of the climate bonus was developed in cooperation between the municipality and a local housing association.

The bonus was introduced, not only to save energy but also to reduce social hardship by ensuring that tenants were not obliged to move to more affordable accommodation after an energy retrofit of their apartment had led to an increase in rent. Rent increases of €3.00/m<sup>2</sup>/month following an energy retrofit were not uncommon and very difficult for many tenants to cope with. Since in Germany, cities and counties bear the reasonable costs of accommodation and heating for those receiving unemployment benefits, they were not always able to pay the higher rents resulting from an energy retrofit, and low income tenants and especially those on unemployment benefits could be obliged to move elsewhere.

The climate bonus works on the principle that the lower the documented energy consumption, the higher the rent that can be charged. The energy consumption level has to be validated with an energy performance certificate. The bonus operates as a graduated surcharge on the rent price per square metre; the lower the energy consumption, the higher can be the base rent. For example, if the energy consumption (including heating) is less

than 75kW/m<sup>2</sup>/annum then the base rent can be €5.29/m<sup>2</sup>/month, whereas if it is less than 175 kW/m<sup>2</sup>/annum, then the base rent can be €5.14/m<sup>2</sup>/month. Dwellings that have not been improved in energy efficiency typically have much higher consumption levels of 230 kW/m<sup>2</sup>/annum or more. The understanding is that the tenant should not be any worse off as the increased rent that can be charged is compensated for by the reduced energy bills.

The bonus encourages housing association and private landlords to renovate their properties and an advisory service is available to encourage uptake of the bonus. Approximately 16 per cent of the dwelling stock in Bielefeld has now been improved to optimise energy consumption. It is a cost-neutral exercise for the municipality, since the higher rental costs are balanced by the lower energy costs.

The Climate Bonus brings economic, environmental and social benefits to the city and its residents. In terms of the social benefits, tenants live in better quality homes, relocation due to unaffordable rental levels can be avoided, and there is reduced pressure on vulnerable neighbourhoods with the greater stability of households. Environmentally, the local climate protection efforts are supported and economically, there are advantages for landlords from the higher rental income and the city saves in the short, medium and long-term budgets for meeting heating costs of unemployed households.

### 4.2.2. LODENAREAL PASSIVHAUS (AUSTRIA)

In 2005, the city of Innsbruck and the Chamber of Architects held a competition for housing in the Lodenareal area. The architects Markus Prackwieser, Conrad Messner and Othmar Zobl won and consequently developed the urban renewal concept together with the municipal authority and Neue Heimat Tirol, a city and state-owned develop-

ment company dedicated to building low-income housing that is energy efficient and design oriented. With 354 rental dwellings constructed, Lodenareal is currently the largest passive house project in Europe and is certified by the Passivhaus Institut in Darmstadt, Germany.



The main aim of Neue Heimat Tirol (NHT) is to minimize long-term energy costs and rents for the tenants by applying modern architecture and an outstanding technical management, as well as raising public awareness of energy issues. With an energy consumption of less than 15 kWh/m<sup>2</sup> per annum, use of pellets and thermal solar as domestic renewable energy sources and high energy efficient features, the passive house development saves 680 tons of CO<sub>2</sub> per year.

The building costs of the project were about 4 per cent more than code minimum buildings which were covered by subsidies to keep rents affordable for the tenants. NHT has contributed €14 million from its own reserves to the construction costs, enabling a 50 m<sup>2</sup> apartment to have a rent of €370/month, including heating, hot water and underground garage.

NHT also played a leading role in facilitating and connecting know-how in a chain between all service deliverers and craftsmen throughout the whole process to align their understanding of the passive house concept and what the implications of this were for each of their roles in the construction of the building as well as to ensure appropriate

carrying out of the Passivhaus standard. During the construction phase, a show flat was arranged to enable the testing and implementation of all planned measures and to train involved craftsmen. Numerous visits and further training throughout the construction period enabled the team members to enhance their knowledge and skills.

#### 4.2.3 TENANTS ENERGY COOPERATIVES AND ENERGY COVENANT (THE NETHERLANDS)

AEDES, the Dutch association of social housing organisations, together with a large coalition of green NGOs, municipalities, the construction sector, tenants and home-owners, sent a letter to the Dutch Government with its vision of moving towards decentralized energy generation and thereby promoting the possibility for tenants to become members of energy cooperatives and directly reduce their own energy bills. Some of the proposed concrete measures proposed by the alliance to the Parliament are:

- a focus on decentralized renewable electricity (solar PV and possibly mini-wind)
- a limit to systems with a generating capacity of up to 3x80 Amps (enough to power 30 to 100 homes) which is politically feasible taking into account the loss of income for the state due to lower incomes from energy taxes
- To allow small end users within these system boundaries (collectives) to net (feedback) on a yearly basis.

In response, the new Dutch government is putting an emphasis on decentralized energy generation and local energy cooperatives. The government has also announced its intention to increase the renewable energy level from 14 to 16 per cent by 2020<sup>29</sup>. With the rising solar PV roll-outs in Netherlands, not only home owners but also tenants are already eligible to invest in solar PV installations and apply for subsidy schemes.

<sup>29</sup> Sebastien Garnier, AEDES, email correspondence.

#### 4.2.4 ESTABLISHMENT OF LOW ENERGY BUILDING OBSERVATORY (FRANCE)

The French “Grenelle de l’Environnement” aims to promote low energy building and reduce energy consumption in existing buildings by 38 per cent by 2020 imposing the refurbishment of the 800,000 most energy inefficient social housing units before 2020. For this effort, an initial group of loans at a special rate of 1.9 per cent was made available for 2009 and 2010 to renovate 100,000 units<sup>30</sup>. The social housing renovation programme has the goal of renovating 70,000 units per year between 2011 and 2020. As such, there is a need to identify and analyse low energy buildings and to disseminate good practices. To meet this challenge, the Ministry of Ecology, Sustainable Development and Energy (MEDDE), the Agency for Environment and Energy Management (ADEME) and Effnergie Association have partnered to create the Low Energy Building Observatory (Observatoire Bâtiment Basse Consommation), a tool for gathering neutral data on existing low energy housing and for sharing experiences on the operations of low energy buildings.

The Low Energy Building Observatory (BBC), with its information publicly available on the internet ([www.observatoirebbc.org](http://www.observatoirebbc.org)), hosts a database of BBC label (French label for low-energy consumption) building projects and good practices of low energy buildings in France. The BBC label is used as a baseline for building professionals and social housing organisations and is also the standard for the new French thermal regulation (RT 2012) which sets an annual requirement for new buildings a maximum consumption of primary energy to 50 kWh/m<sup>2</sup>.

Primarily aimed at governments and construction professionals, the Low Energy Building Observatory will inform and provide tangible evidence for the RT 2012 and assist building professionals in the knowledge exchange and analysis of BBC label buildings in both new build and retrofit.

#### 4.2.5 BRUSSELS L'ESPOIR (BELGIUM)



**L'Espoir passive housing**  
Photo Credit: Nathalie de Craecker

L'Espoir is a project of a group of residents who, in collaboration with the Bonnevie Community Centre, CIRE (Coordination and Initiatives for Refugees and Foreigners) and the housing fund of Brussels, decided to launch an ecological construction project in response to the housing crisis in Brussels<sup>31</sup>. The project allowed 14 low income families in the Molenbeek area of Brussels to buy housing at very moderate cost.

It is innovative in a number of aspects. After identifying energy performance as a requirement for wellbeing, the association organised an architecture competition and training sessions in energy or co-ownership. The families participated in the design of their own passive eco-built apartment building and the architect, Damien Carnoy, had to take account of the limited budget of the residents and the need for a building that was 100 per cent passive.

Inspired by organisations originating in the United States, it also signed a charter for the creation of a Community Land Trust that manages and develops property intended to be sold or rented to low-income households. The land was sold by Molenbeek council at a democratic price.

<sup>30</sup> le Grenelle Environnement: French Climate Plan, Ministry of Ecology, Energy, Sustainable Development and the Sea, November 2009 [http://ec.europa.eu/environment/networks/greenspider/doc/climate\\_change\\_campaigns/ccc\\_france.pdf](http://ec.europa.eu/environment/networks/greenspider/doc/climate_change_campaigns/ccc_france.pdf)

<sup>31</sup> L'Espoir, <http://espoirmolenbeek.blogspot.com>



The project shows that economic fragility is not a hindrance to energy efficiency. Two-storey blocks of houses have been built using wood and other ecological materials on a plot of land in one of Brussels' most disadvantaged municipalities. The choice of materials was influenced by environmental considerations: renewable origin, grey energy, health impact, cost, implementation, and maintenance. Thermal solar panels, an extensive green roof, and a rainwater cistern, as well as climbing plants, are part of the ecological arsenal of this exceptional building, with a consumption of 15kWh/m<sup>2</sup>/yr<sup>32</sup>.

Furthermore a considerable number of nZE buildings (new and refurbishment) are already listed on the website of Bruxelles Environment. New building regulations will come into force from 2015 in the Brussels Region, requiring the level of passive house standard for new buildings.

#### **KREDEX'S REVOLVING FUND FOR ENERGY EFFICIENT REFRUBISHMENT IN HOUSING (ESTONIA)**



**Refurbishment work using KredEx fund**  
Photo credit: Mirja Adler, KredEx

People wishing to modernise the energy system of their homes often lack the available finance to carry out the work. Low interest loans combined with direct grants, aligned to energy efficient refurbishment measures, help to reduce the investment costs and/or the payback period of energy efficient refurbishment. This mechanism has been used in

Estonia where a central revolving loan fund, consisting of grant funds from the ERDF and loans from the Council of Europe Development Bank (CEB) combined with funds from the Credit and Export Guarantee Fund KredEx is used to provide long-term low-interest loans (currently 4.5 per cent compared to 7 per cent minimum on the market) through local commercial banks for the renovation of multiple-unit residential buildings built before 1993<sup>33</sup>.

The renovation loan can be applied for by apartment associations, building associations (incl. previous housing associations) and communities of apartment owners in buildings with at least 3 apartments. A self-financing contribution of 15 per cent is required from the home owners. This lending scheme was set up by KredEx's reconstruction grant.

Credit and Export Guarantee Fund KredEx, with the help of technical assistance provided by KfW Bankengruppe, targets energy efficiency investments that have been defined as priority measures in an energy audit. A precondition for receiving the renovation loan is an energy audit which indicates priority renovation work and which allows to estimate energy savings that will be achieved by renovation works. Energy savings of at least 20 per cent to 30 per cent need to be achieved in apartment buildings of 2000 m<sup>2</sup> and over 2000 m<sup>2</sup> respectively. The loan period is up to 20 years and the interest is fixed for 10 years. The minimum loan amounts to €6,400 per one apartment building.

<sup>32</sup> Brussels, Sustainable City <http://www.sustainablecity.be/exemplary-buildings/lespoir>

<sup>33</sup> Financing Energy Efficiency: Forging the link between financing and project implementation, European Commission, May 2010 [http://ec.europa.eu/energy/efficiency/doc/financing\\_energy\\_efficiency.pdf](http://ec.europa.eu/energy/efficiency/doc/financing_energy_efficiency.pdf)

#### 4.2.7 EXTENDED ENERGY EFFICIENT RENOVATION OF CONDOMINIUM BUILDING IN SOFIA (BULGARIA)



**Tchataldja Street 54, Sofia**

Photo credit: National Housing Renovation Program

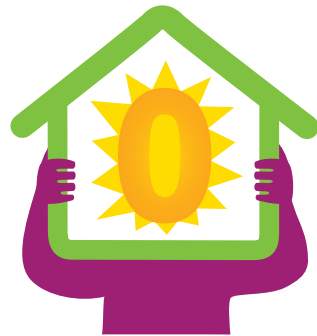
Energy efficient renovation with the use of renewable energy sources was accomplished in November 2011 in Sofia, Bulgaria. It was funded by a mixture of subsidies and own sources:

- 50% from the state budget under National Housing Renovation Program
- 25% from the EU sources for installing of RES (solar collectors) – 6FP project Staccato
- 25% own funding provided by apartment owners

The extended renovation project includes energy efficient renovation measures such as insulation of the building envelope, improvement of the common parts and installation of solar collectors. Building inspections and energy audits were carried out prior to the work. The technical design of the energy efficient renovation included installation of solar collectors supplied with water boilers, heat exchanger, expanding vessel, circulation pumps and hydro-module for automatic management of temperature sensors. The technical design of solar thermal installation was coordinated with the utility provider for heating and hot water at district level. The technology used is a Bivalent solar installation (solar energy plus district heating) for domestic hot water. The energy produced by the solar collectors will be at a level of 50 per cent.

The value of the integrated energy characteristic – total specific energy consumption for heating, hot water, lighting and others before renovation was 191.2kWh/m<sup>2</sup>/annum. The energy consumption of the building for heating after the execution of the renovation reduced up to 31.3kWh/m<sup>2</sup>/annum which means the annual energy consumption of the building for heating is smaller than the norm value of 32.8 kWh/m<sup>2</sup>/annum. The total annual energy consumption which includes all components of the energy balance of the building decreased up to 79.1 kWh/m<sup>2</sup>/annum which is smaller than the norm value of 80.6 kWh/m<sup>2</sup>/annum.

The advantage of installing solar collectors will be increased should the government introduce additional tax reliefs for solar energy systems.



#### 4.2.8 ERAP'S INFORMATION DESK FOR SUSTAINABLE BUILDING (ITALY)



ERAP (Ente Regionale per l'Abitazione Pubblica della Provincia di Ancona) is a local institution for public housing. Together with the Energy Department of the University of Ancona, ERAP

created an "Information Desk" - a consulting and information point for those in the real estate sector who are interested in sustainable building. It is relevant for operators in the urban planning and construction (public and private) sectors, in the environmental sector, as well as for citizens. The activities of the Information Desk, in accordance with the guidelines established by the Marche region are to:

- promote and develop information and knowledge on sustainable building
- provide information on the correct application of the Protocol Itaca-Marche
  - advise those who want an Energy and Environment certification, according to the protocol ITACA – Marche
- promote and improve energy efficiency in the residential, public and industrial sectors
  - reduce the consumption of oil and develop renewable energy sources (biomass, geothermal, solar thermal, small wind turbines)
- train operators and groups of users (entrepreneurs, professionals, public administration, citizens, etc.)
- collect case studies and best practice and disseminate the results
- create a database of projects concerning urban planning and sustainable buildings
- provide a forum for members to meet regularly to exchange ideas, suggestions and initiatives to contribute to the goals of the Information Desk

#### 4.2.9 SABO KOMBOHUS (SWEDEN)

Sweden is facing unsustainable construction prices which increased by 1,800 per cent between 1968 and 2010<sup>39</sup>. It is also 30 per cent more expensive to build in Sweden compared to the neighbouring country, Finland, which is why the majority of municipalities are suffering from a housing shortage, as indicated by the latest figures from the National Board of Housing. This is due to a number of factors: one of which is due to bureaucratic procedures and the other to a lack of competition in the construction sector, with only a small number of suppliers delivering most of the contracts.

SABO, the Swedish Association of Public Housing Companies, decided to tackle this obstacle head-on as a national federation by coordinating a competition in 2010/2011



among developers to come up with a high-quality affordable and energy efficient house. The SABO Kombohus competition challenged construction companies to build a two-story house with a construction cost of SEK12,000 (€1,350) per square metre excluding land costs and VAT.

SABO Kombohus aims to facilitate and simplify the procurement and construction of small apartment buildings for member companies. SABO therefore put together a package of tools that companies should use when using the framework agreements. The tools include templates for calculating the construction project's total costs and analysing the accounting of the project at different rental conditions as well as the draft contract between the housing company and the contractor. This procurement process serves to reduce investment costs for SABO's 300 housing members without reducing the quality of their housing and services. The houses are being constructed in small numbers all over Sweden as an illustration of what can be done at an affordable price showing the feasibility of building new houses when the construction sector works competitively and maintain their prices at affordable levels.

<sup>39</sup> Kurt Eliasson, SABO, [www.sabo.se](http://www.sabo.se)

To further challenge the construction industry to reduce prices, SABO invited organizations into a new competition, SABO Kombohus Plus, of building a new eight-storey building with about four apartments per floor, for less than SEK13,000 (€1,500) per square metre excluding land costs and VAT. The apartments are expected to have a balcony or patio and the building should have low energy consumption. Over 70 public municipal housing companies have so far expressed interest to build 5,000 apartments in SABO Kombohus Plus.

#### 4.2.10 USE OF ENERGY PERFORMANCE CONTRACTING (ITALY)



The pilot site in Italy in the framework of FRESH, a European cooperation project, shows a good practice example of using Energy Performance Contracting (EPC) in the refurbishment of a social housing on a large scale. FRESH aims to develop and promote EPC to finance low energy refurbishment operations in the social housing sector. Energy Performance Contracting refers to an Energy Service model type and includes the outsourcing of different forms of energy services from building owners to Energy Service Companies (ESCOs). One of the main purposes of EPC agreements is the implementation of building refurbishment projects to enable quantifiable and long-term guaranteed savings, which are typically realised by addressing thermal production systems and improvement of the operation and maintenance of the building.

The pilot in Italy was carried out by ACER, the Emilia Romagna social housing association and FRESH project partner, and consists of 13 public dwellings in Via Maramotti 25, built in 1981 in the town of

Reggio Emilia. A complete renovation is needed to improve both the comfort in the dwellings and energy consumption. ACER obtained official approvals from the municipality and from all the tenants in 2011 and acted as the leading authority in the refurbishment process on behalf of the tenants. The approvals were an essential precondition to sign an EPC which was awarded to an ESCO (Energy Services Company) through a competitive dialogue process based on open, performance-based specification.

As a result of the 12 year-limit posed on the EPC duration by Italian regulation, and considering the size of the pilot site, the intervention focuses on heating and hot water systems: changing the collective gas boiler and switching the hot water supply from electric boilers to a collective boiler<sup>35</sup>.

The 12-year contract includes a guarantee of 35 per cent energy savings per year which would be sufficient to repay the initial investment costs, cover winter fuel bills, and provide a fee for the ESCO, as well as provide an immediate seven per cent reduction in tenants' annual energy bills<sup>36</sup>. The ESCO is committed to pay a penalty in case of failure to reach the targeted level of savings. Any savings exceeding 35 per cent during the duration of the contract will be evenly shared between ESCO and the residents. At the end of the contract, all benefits will accrue to the tenants. To reduce the risk of default by tenants, ACER provides a guarantee to the ESCO. The use of the ESCO is also an effective solution for buildings where inefficient systems for heating and hot water need to be changed.



<sup>35</sup> FRESH Project, [www.fresh-project.eu](http://www.fresh-project.eu)

<sup>36</sup> EPC for Social Housing in Italy, SCI-NETWORK <http://www.sci-network.eu/snapshots/epc-for-social-housing-emilia-romagna-italy/>

#### 4.2.11 FLANDERS' NEARLY ZERO ENERGY BUILDING AT NO EXTRA COST (BELGIUM)

In Belgium, the additional cost of constructing and renovating schools, social housing, care homes and historic buildings is in some cases greater than half of the actual standard cost. As new legal energy efficiency requirements have a significant impact on the government budget, the Flemish government is working to develop solutions together with the experts in the field to make the construction of energy efficient buildings more efficient and to achieve this at no extra cost. The government is therefore looking for innovation on several fronts - concept, design, implementation, materials, techniques and procedures. This is done through Procurement of Innovation (POI), an open innovation platform and procurement process within which the government, businesses and research institutes jointly develop innovative solutions to specific challenges. The 'Nearly Zero Energy Building at no extra cost,' which aims to reconcile nearly zero energy building and affordability, is one of the projects in the framework of POI.



Princess Elisabeth Antarctica

In the social housing sector, two projects of three one-family houses will be carried out on building sites of two social housing companies: Denderstreek in Aalst and Ons Onderdak in Leper<sup>37</sup>. A competition to design and build the two projects will be launched. The five best entries will be provided with a financial incentive of €50,000. The social housing company will pay up to 100 per cent compared to NFS2 (the financial system for the maximum loans for social housing companies). The additional cost for the prototype houses will

be paid by IWT (Agency for Innovation through Science and Technology) with a maximum of 50 per cent compared to NFS2. The cost of monitoring and the cost of an energy project coordinator will also be paid by IWT. Other financial inputs such as ESCOs and sponsorship are an added value.

#### 4.2.12 ACCESSING CAPITAL VIA PAN-MEDITERRANEAN INITIATIVE (ITALY & SPAIN)



The ELIH-Med (Energy Efficiency of Low Income Housing in the Mediterranean) project focuses on energy efficiency in low income housing in the Mediterranean area. The target group includes tenants, owner occupiers with low income as well as households suffering fuel poverty, which represents about 40 per cent of the total building stock and is considered as “difficult to reach” through traditional public policies. The main objective of the project is to identify and test, through large scale actions, the feasibility of cost efficient innovative technical solutions and financial mechanisms backed with ERDF which could then be extended to all Mediterranean territories taking into account the differences of the region in comparison to the rest of Europe. 500 Low Income Housing representatives have been selected in six Mediterranean countries – Spain, Italy, France, Greece, Malta and Cyprus – for the implementation of demonstration projects.

The energy efficiency sector is heavily impacted in Mediterranean countries where the economic crisis is stronger than elsewhere in Europe with a greater rate of unemployment, drops in income and cuts in benefits resulting to rise in fuel poverty<sup>38</sup> among households. Energy savings are also more difficult to achieve due to climatic specificities, older building stock and a relatively higher poverty than in Northern Europe. In this context, ELIH-Med and MARIE (Mediterranean Building Rethinking for

<sup>37</sup> Kristien Van Hemelryck, VMSW, email correspondence

<sup>38</sup> According to the Observatory of Sustainability in Spain, 10 per cent of Spanish households could not afford to keep their homes in appropriate temperature conditions during the winter. In the case of the families served by the Spanish Red Cross, this figure soars to 43 per cent, and rises to 54 per cent among elderly people. See [http://www.telecinco.es/informativos/sociedad/Cruz-Roja-agravamiento-energetica-temperaturas\\_0\\_1546125187.html](http://www.telecinco.es/informativos/sociedad/Cruz-Roja-agravamiento-energetica-temperaturas_0_1546125187.html)

Energy Efficiency Improvement) projects collaborated together in developing a joint and common capitalization process for improving the energy efficiency of buildings in Mediterranean countries which can produce an important impact in terms of energy saving, jobs creation and market activation. A Policy Paper produced in November 2012 highlighted the main barriers to implement the 20/20/20 objectives in Mediterranean regions and cities and recommended common strategic lines to overcome these barriers and reinforce the linkages between territorial cooperation initiatives on energy efficiency, public policies and access to new sources of funding. The sets of strategic lines, currently being proposed to the European Commission, will serve as the general framework on which the development of a macro-regional approach in energy efficiency could rely on. Both strategic projects call for a greater cooperation on energy efficiency issues and specific efforts to test, innovate and fundraise ambitious projects and policies, to make the 20 per cent energy efficiency increase target more realistic.

#### 4.2.13 **RELISH: REFURBISHMENT AND RESIDENT EDUCATION PROGRAMME (UK)**



For most social landlords, most of the 'exemplar' and demonstration refurbishment projects are unaffordable and unrealistic as they are carried out in homes that are unoccupied.

The idea for Relish™ (Residents 4 Low Impact Sustainable Homes) came about after Worthing Homes, a registered provider in the Sussex coastal area, was exploring ways in which they could contribute towards the 80 per cent target reduction in CO<sub>2</sub> emissions and yet is affordable and makes a real difference to their families' well-being.

Relish™ is different from other current low carbon projects in the UK:

- **The budget:** set at £6500 (€7500 EUR) per home – matching the sum identified by government for investment in existing homes<sup>39</sup>. This sum is over and above the 'decent homes' works but set at a level which is affordable for registered providers.
- **Occupied homes:** Relish™ is a programme that works with residents who remain in their homes during refurbishment. This is the most 'typical' situation for landlords.
- **Education and advice:** households get involved in understanding how the improvements and their behaviour impact on reducing energy bills.
- **The Relish™ rating:** this will help households maintain their good energy saving habits and make wise energy efficient decisions in the future.
- **The pilot included two 'improved' homes -** with only one of the two receiving both works and tailored energy advice. A further two homes remained 'un-improved' and received only tailored energy advice and education. A remaining six properties were identified to form the 'control'. These properties did not receive any works or education but simply had their energy consumption monitored to assess the annual trends which may influence the pilot study.

The pilot demonstrated that works combined with education clearly delivers the best financial and environmental savings with the property that received both achieving a significant saving of £368 (€425 EUR) on their combined annual gas and electricity bill, as well as making huge carbon emissions savings<sup>40</sup>. visit [www.relish.org](http://www.relish.org)

<sup>39</sup> Identified in the government's recent 'Green Deal' initiative (Murray, 2009) as an affordable sum that could be rolled out to upgrade occupied homes on a nationwide basis.

<sup>40</sup> Relish, [www.relish.org](http://www.relish.org)

## PROJECT PARTNERS





## **CECODHAS Housing Europe**

### **The Federation of public, cooperative and social housing**

CECODHAS Housing Europe is a network of national and regional housing federations of housing organisations. Together the 43 members in 18 European members States manage 25 million dwellings which represent 12% of the total housing stock.

Its members work together for a Europe that provides access to decent and affordable housing for all in communities which are socially, economically and environmentally sustainable and where all are enabled to reach their full potential.

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