URBACT II

BUILDING ENERGY EFFICIENCY

IN EUROPEAN CITIES

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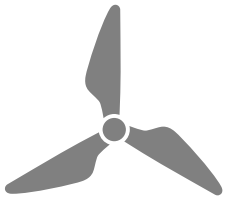

BUILDING ENERGY EFFICIENCY IN EUROPEAN CITIES

J Owen Lewis, Sadhbh Ní Hógáin, Antonio Borghi

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Foreword

The 'Cities of Tomorrow' reflection process, which I initiated in 2010, culminated in a report which provided inspiration for urban development policy-makers and practitioners alike, whether at local, regional, national or European level. It is good to see URBACT now taking on the challenges it outlined, and through its broad network of urban experts and city partners, trying to find possible solutions. URBACT is building on the lessons learnt during these years of work, including last year's conference in Copenhagen, while working closely with other EU-funded programme partners in ESPON, INTERACT, INTERREG IVC, European cities associations such as EUROCITIES and Energy Cities, and the OECD.

In this way, URBACT is actively seeking concrete solutions to the six interlinked challenges that rank high on the agenda of European cities: shrinking cities, more jobs for better cities, supporting young people through social innovation, divided cities, motivating mobility mind-sets, building energy efficiency.

I am pleased to present this series of six reports that provide evidence of sustainable urban development strategies pulling together the environmental, social and economic pillars of the Europe2020, while also adopting an integrated and participative approach, essential in these times of scarce public resources.

More than ever, cities need an 'agenda for change' to focus on decisive action that will boost growth, to tap into their existing potential, and to rethink their priorities. Better governance, intelligence and changing of the collective consciousness are all part of it. Cities of tomorrow need action today. URBACT is all supporting cities to make this happen so... don't be left behind!

Johannes Hahn
Member of the European Commission in charge of Regional Policy

Abstract

Cities can lead in the reduction of CO_2 emissions and the fight against climate change. Buildings are the largest energy-consuming sector in the EU, and offer the largest cost-effective opportunity for savings. Relative to almost all other investments, energy efficiency retrofit – installing newer energy efficiency technologies in older buildings – cost-effectively creates more distributed jobs and enhances economic activity, reduces costs for businesses and households of all income levels, reduces emissions and improves energy security. However, considerable intensification in the delivery of ambitious whole-building energy efficiency upgrade programmes is needed.

The gaps between consumers' actual investments in energy efficiency and those that appear to be in the consumer's own interest demand new approaches to finance which incentivise energy efficiency upgrading. Far too many European households are living in fuel poverty; tackling this is not solely about saving money or reducing the impact of climate change, but has implications for health, child poverty, and educational achievement. As the European building stock is highly diverse, particularly in historic and traditional buildings, there are no 'one-size-fits-all' solutions.

Integrated urban strategies provide the means to tackle the various challenges faced by cities. These strategies must link together the social, environmental and economic policy dimensions, connect the various levels of responsible governance, and involve the key stakeholders in the implementation of an energy efficiency policy for each municipal building stock. The scale and extent of the radical changes required are not yet generally appreciated.

Keywords

Energy efficiency, European city, built environment, architecture, EU 2020 Strategy, urban dimension of EU cohesion policies, integrated strategies, urban policies, urban regeneration, fuel poverty, energy bill, employment, local economy, local supply chain, innovation, carbon footprint, CO_2 emissions, climate change, neighbourhood, life-cycle assessment, embedded energy, local supply chain, eco-restoration, eco-materials, historic centres, renewable energies, retrofitting, heritage, district heating, financial mechanisms

Cascina Cuccagna, an old farmhouse in the city of Milan.
Photo: Courtesy of Cascina Cuccagna

Executive summary

Cities have a central role to play in the reduction of CO_2 emissions and the fight against **climate change, the historic challenge now facing our society**. Buildings are the largest energy-consuming sector in the EU, and offer the largest cost-effective opportunity for savings. Cities can mitigate climate change by reducing energy consumption in the construction, maintenance and refurbishment of buildings. **Retrofitting existing buildings** with energy efficiency technologies can at the same time offer important economic and employment opportunities, improve energy security, and save more than it costs. For this to happen, Europe needs to ensure the implementation of **stable, long-term policies and legislation**, which will provide certainty to the market and transform the buildings sector, at European, national and municipal levels.

Cities are ideally placed to drive action on sustainability through **local action plans**. Policies of municipal authorities should comprise integrated packages of measures, including technical, institutional, policy and financial measures. Clear energy saving and emission reduction **targets for European cities** can be helpful in further stimulating the demand for retrofit. Real potential for reducing emissions and energy use lies in master planning sustainable zones within cities: by integrating mass retrofit in local area master plans and regeneration programmes, areas can be transformed into energy efficient low-carbon zones.

Refurbishing the built environment can have **additional positive effects on communities** such as improving cultural landscapes, facilitating a more balanced demographic distribution of population, and providing a solid base for local economic activities. Many energy efficiency interventions are not visible and do not lend themselves readily to political launches and profiling. However, **best practice examples** of completed retrofit projects such as we have seen within the URBACT programme and others can be very useful in generating interest, confidence, and demand. Homeowners like to see before they invest, and public access to show homes has been successful in many cities in raising awareness and confidence.

URBACT projects focus on key urban issues: they enable cities and other public authorities to exchange experiences, identify good practices, build new local policies, and draw conclusions which they can then disseminate to urban policy-makers and practitioners. While focused on particular themes, projects can frequently offer **insights and practical knowledge** relevant to other themes and issues. During the **2012 URBACT Annual Conference**, the energy efficiency workstream organised a series of workshops on the theme 'Retrofitting our way out of recession!' which considered how best to stimulate the market, how to finance retrofit, the challenge of fuel poverty, and historic buildings issues (see Annex 1).

Enhancing energy efficiency represents one of the most important opportunities for Europe to **expand economic growth and job creation**. Relative to almost all other investments, retrofitting cost-effectively creates more distributed jobs and enhances economic activity, reduces energy costs for businesses and households of all income levels, reduces emissions and improves energy security. But to date, progress on the ground in improving building energy efficiency is very disappointing.

There are substantial gaps between consumers' actual investments in energy efficiency and those that appear to be in the consumer's own interest. New strategies to secure **sufficient financing for the thorough renovation** of the European building stock are needed, drawing on private and public investment. More innovative ideas and initiatives will be necessary because

whole-building renovations are costly, even if cost-effective. The considerable up-front capital required is normally the single greatest barrier. A **variety of financial mechanisms** have been employed and more are being designed to incentivise energy efficiency upgrading.

A common definition of **fuel poverty** is where a household spends more than 10% of its disposable income on fuel. There are indications that in Western Europe 12% of all households are living in fuel poverty. In Mediterranean climates fuel poverty will relate more to thermal stress; heatwaves are causing increasing numbers of deaths during the summer months. Tackling fuel poverty is not solely about saving money, reducing running costs or reducing the impact of climate change – it affects the efficiency of the health service, child poverty, educational ability and productivity.

Historic and traditional buildings play crucial roles in the identity of cities. The best way to keep these buildings alive is to ensure their continuous and proper use, adapting them to current needs. But historic and traditional buildings have different technical characteristics when compared to modern construction, and there are no 'one-size-fits-all' solutions.

Integrated strategies are the only way in which European cities can effectively tackle the different economic, environmental, climatic and social challenges they face. These strategies must link the social, environmental and economic policy dimensions, connecting the various levels of responsible governance, and involve key stakeholders in the implementation of an energy efficiency policy for each municipal building stock.

The scale and extent of the **radical changes** required of our urban citizens and systems are still not generally appreciated. Realising the potential will require enhanced efforts both from the EU and from Member State governments to create the incentive frameworks to overcome market inertia, to secure end-user demand, to facilitate the provision of private capital, and to enable cities seize opportunities to transform urban energy efficiency.

1. Challenges and opportunities

1.1 Why urban energy efficiency matters

Cities are key players in the reduction of CO_2 emissions and the fight against climate change. Energy consumption in urban areas – mostly in transport and housing – is responsible for the largest share of CO_2 emissions. The urban way of life is both part of the problem and part of the solution. In Europe, CO_2 emission per person is much lower in towns than outside them (IEA 2008). The density of urban areas allows for more energy-efficient forms of housing, transport and service provision. Consequently, measures to address climate change may be more efficient and cost-effective in big and compact cities than in less densely built space (European Commission 2011b). The built environment has a critical role to play in the long-term sustainability of European cities. The European building sector accounts for 40% of total energy use and 36% of Europe's CO_2 emissions. European cities face an enormous challenge in raising their buildings and the built environment to low energy standards while encouraging citizens to adapt to a more sustainable lifestyle by radically reducing energy and water consumption and waste.

Currently 80% of the European population live in urban areas; this figure was less than 10% in 1700 (Bakker, 2000). And in European cities, three-quarters of the building stock that will exist in 2050 already exists today.

In its *Roadmap for moving to a competitive low-carbon economy in 2050* (European Commission 2011a) the European Commission established a long-term objective of decreasing emission levels from the building sector by between 88% and 91% in 2050, compared to 1990 levels. The Sectoral Emission Reduction Potentials and Economic Costs for Climate Change (SERPEC-CC) project identified that by 2020 there will be a potential emissions abatement of 19% in the built environment, rising to 29% in 2030. Savings on heat demand combined with efficient and low-carbon heat supply systems could strongly reduce the use of fossil fuels and associated CO_2 emissions from buildings.

For European cities to deliver successful, low-carbon futures, diverse stakeholders including politicians, policy-makers and local authorities need to recognise the role cities can play in mitigating climate change. Ambitious targets to lower energy use and reduce greenhouse gas emissions need to be put in place.

Cities can mitigate climate change by reducing energy consumption in the construction, maintenance and refurbishment of buildings.

"Energy efficiency is not a cost weighing on national budgets but a huge investment opportunity returning money to state coffers"
– Marie Donnelly, Director, EC Directorate General for Energy

1.2 The urban opportunity

Buildings represent the economic sector with the largest cost-effective opportunity for savings. But measures to increase energy efficiency in buildings support several other important societal and individual goals, such as increased employment and boosting economic activity, improved quality of life, reduced CO_2 emissions, reduction of fuel poverty, and better security of supply with lower dependence on imported fuels.

BUILD UP, a leading EC-backed built environment website, reports estimates that reducing the energy demand of the EU building stock by 80% by 2050 would boost economic activity in the

construction sector by up to €830 billion per year by 2020 and secure up to two million direct and indirect jobs in the EU. Such a programme would provide significantly increased net revenues to public administrations, owing to the creation of local jobs, resulting in lower unemployment payments and higher VAT and income tax receipts. This makes policies in the building sector a highly multi-purpose tool to achieve numerous important policy targets. A study commissioned by the Renovate Europe campaign on the benefits for public finances indicates that retrofitting Europe's buildings with energy efficiency technologies could boost GDP by €291 billion by 2017.

"The sustainable city is climate-conscious and energy-efficient, adaptable and socially just, economically efficient and, last but not least, creatively unique and beautiful"

– International Conference 'Urban Energies', Berlin, October 2012. German Federal Ministry of Transport, Building and Urban Development

The Building Performance Institute Europe (BPIE) data hub provides an open data portal presenting facts and figures on the EU building stock. It

Main front of the Cascina Cuccagna at the end of the 90s, Milan. Photo: Courtesy of Cascina Cuccagna

includes a wide variety of EU-wide technical data. In order to be able to reap the multiple benefits of investing in energy efficient renovation of the EU building stock and achieve the Renovate Europe targets, the scale of renovation within Europe should more than double, from the current 1.2% to 3% of the building stock per year.

Building users play a critical but poorly understood and often overlooked role in the built environment. Those seeking to advance urban energy efficiency need to work with users to deliver comprehensive energy reductions. Preparing the public for this interactive role is a job in itself; public education on building literacy is an area in which municipal authorities will have considerable analogous experience. Kathryn B. Janda (2011) in an article entitled *Buildings don't use energy: people do*, has argued that the field as a whole needs to develop professional expertise and seek ways of integrating user involvement in building performance to fully succeed in implementing energy efficiency programmes.

1.3 The efficiency challenge

According to Holmes and Mohanty (2012), of the €200 billion spent globally on clean energy in 2011, less than 7% went to energy efficiency. In addition, investment was focused on corporate research and development, venture capital and private equity, indicating that investment in retrofit projects in the real economy was limited. The abundance of the investment potential (estimated by DG Climate Action to be €4.25 trillion across the economy between 2011 and 2050) and the supposed modest costs of energy efficiency investments compared to power generation investments indicate that there are very significant barriers to realising the potential of energy efficiency. The barriers are well documented and include access to capital, split incentives and lack of information.

Realising the potential will require enhanced efforts both from Europe and from Member State governments to create the incentive frameworks to overcome market inertia, secure demand and facilitate private capital provision. There is currently a European debate about whether a top-down binding target-led approach or a bottom-up binding measures-based approach is preferable. A top-down binding target-led approach is preferable for securing investment for two reasons. First, binding targets have a track record of being more effective at creating the political will needed to drive environmental policy outcomes. Second, a focus at the European level on outcomes rather than prescription of method will enable greater freedom for Member State governments to select appropriate policy instruments. This is critical because such instruments must suit local conditions if they are to be effective at incentivising local investment (Holmes and Mohanty 2012).

Key messages

Cities can play a central role in tackling our greatest challenge, climate change. A major opportunity lies in the retrofitting of existing buildings with energy efficiency technologies: an activity which can at the same time offer important economic and employment opportunities, as well as improving energy security and saving more than it costs. Given the evidence of very significant challenges, for this to be realised, we need to adopt and implement stable, integrated policies and legislation, which will provide certainty to the market and transform the buildings sector, at European, national and municipal levels.

2. Building energy efficiency and policy integration

2.1 The multiple benefits of energy efficiency

Urban energy efficiency is one of the many responsibilities of municipal policy-makers. It cannot be considered in isolation – its economic, social and environmental implications are interwoven. While roles and patterns of decision-making vary, often choices are made about the neighbourhood, the apartment block or the individual dwelling without awareness of the impacts of these decisions. Orientation, built form, mix of uses, public transport access, parking, cycling provision, the viability of district heating and cooling, public and shared open spaces, refuse/recycling facilities, accessibility and adaptability – these and many other matters may influence the sustainability of the occupants' lifestyles and energy intensity.

A study by Cambridge Econometrics and Verco in 2012 modelled the macroeconomic effects of investing revenue from carbon taxes in the installation of energy efficiency measures in fuel-poor households. The results suggest investing in such a programme generates greater macroeconomic benefits – more jobs and greater growth – than the same injection of spending through other government spending programmes or cuts in VAT or fuel duty. The modelling outcomes suggest that investment in the housing stock is one of the best investments possible in terms of boosting short-term employment and economic activity, and it

Cascina Cuccagna, before renovation, Milan. Photo: Courtesy of Cascina Cuccagna

also improves medium to long-term economic efficiency by reducing the economy's dependency on imported fuels.

A 2012 report from the International Energy Agency (IEA) describes the wider socio-economic outcomes that can arise from improved energy efficiency, aside from energy savings. The report enumerates many of the most prominent benefits of energy efficiency and, although the list is not exhaustive, it provides a rich menu of the variety of the benefits that may be of interest to policy-makers.

As energy efficiency programmes are often evaluated only on the basis of the energy savings they deliver, the full value of energy efficiency improvements in both city and national economies may be significantly underestimated. This also means that energy efficiency policy may not be optimised to target the full range of outcomes possible. There are several reasons why the full range of outcomes from energy efficiency policy is not generally evaluated. First, it is due to the non-market, somewhat intangible, nature of the socio-economic benefits, which makes them difficult to quantify. Second, it can be complex to isolate and to determine the causality of the effects due to energy efficiency alone. Third, evaluators and policy-makers working in energy efficiency are usually energy professionals, working for an energy agency or city or ministry, with little experience of how energy efficiency might impact on other non-energy sectors. The result is under-appreciation and related underinvestment in energy efficiency, and as a consequence, many opportunities are missed. These foregone benefits represent the 'opportunity cost' of failing to adequately evaluate and prioritise energy efficiency investments (Ryan and Campbell 2012).

The International Energy Agency's *World Energy Outlook* (IEA 2012) also notes that while energy efficiency is widely recognised as a key option in the hands of policy-makers, current efforts fall short of tapping its full economic potential. Even with newly strengthened policies and programmes in the EU and other major economies, a significant share of the potential to improve energy efficiency – four-fifths of the potential in the buildings sector and more than half in industry – will remain untapped. In a special focus on energy efficiency the IEA identified six broad areas that need to be addressed:

- Energy efficiency needs to be made clearly visible, by strengthening the measurement and disclosure of its economic gains;
- The profile of energy efficiency needs to be raised, so that efficiency concerns are integrated into decision-making throughout government, industry and society;
- Policy-makers need to improve the affordability of energy efficiency, by creating and supporting business models, financing vehicles and incentives to ensure that investors reap an appropriate share of the rewards;
- By deploying a mix of regulations to discourage the least efficient approaches and incentives to deploy the most efficient, governments can help push energy efficient technologies into the mainstream;
- Monitoring, verification and enforcement activities are essential to realise expected energy savings;
- These steps need to be underpinned by greater investment in energy efficiency governance and administrative capacity at all levels.

2.2 EU legislation

The EU agreed three headline 2020 targets in the climate change and energy area: greenhouse gas emissions 20% lower than 1990 (or even 30%, if the conditions are right), 20% of energy from renewables, and a 20% increase in energy efficiency. The efficiency target is the most seriously lacking in progress.

The Energy Performance of Buildings Directive (EPBD) requires energy performance certificates to be issued for buildings, giving owners and tenants a convenient way of gauging their dwelling's energy performance. The more recent EPBD Recast requires that Member States set minimum performance requirements for new buildings and for buildings undergoing major renovation "with the view to achieving cost optimal levels". The Recast Directive places a strong focus on the existing building stock, encouraging Member States to promote and support refurbishment and to set higher standards for buildings undergoing retrofitting. The 2012 Energy Efficiency Directive establishes a common framework of measures for the promotion of energy efficiency within the EU in order to achieve the 2020 20% target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date. Each Member State will be obliged to set an indicative national energy efficiency target. By June 2014, the Commission will assess the progress achieved and whether the Union is likely to achieve its specific energy consumption targets. However, by early 2013 a majority of Member States were in breach of the EPBD (which was adopted in 2002 and recast in 2010), and could face the threat of financial penalties.

Cities Action for Sustainable Housing – CASH, URBACT Thematic Network

CASH(i) was an URBACT Thematic Network of 11 partners led by the French city of Echirolles, which sought to reduce energy consumption in the built environment while delivering integrated and sustainable urban development. It aimed to propose new policies and looked for new solutions to renovate social and affordable housing units, in order to improve their energy efficiency and to influence users' behaviour through citizens' involvement. Its implementation phases ended in December 2012, having compiled many valuable outputs which individually can be useful tools for other cities, such as a guide to financial instruments.

The network also prepared some eight Local Area Plans, hosted a series of transnational thematic seminars, and published an excellent series of 'mini-guides' on topics such as citizen involvement in the energy efficient renovation of social housing, the legal framework, and technological development. The Local Action Plan that Echirolles prepared illustrates the integration of a wide range of stakeholders in pursuing common targets:

- Social: reduce the energy bills of vulnerable households;
- Environmental: reach the 20-20-20 targets Echirolles has committed itself to achieve by signing the Covenant of Mayors;
- Economic: contribute to the development of an efficient economic sector with regard to energy renovation, with a holistic approach, well-trained professionals and synergy between stakeholders of the different segments of the energy-renovation chain.

(i) http://urbact.eu/en/projects/low-carbon-urban-environments/cash/our-project/

Cascina Cuccagna – An old farmhouse in the centre of Milan has become a new energy efficient public space.

When the 'Building Energy Efficiency' workstream had its final meeting in Milan in November 2012, it visited one of the most interesting renovation projects going on in that city. The project has taken a holistic approach that combines urban regeneration, high-quality architecture, energy efficiency and social involvement.

In 2004 ten associations operating in Milan joined together to form the 'Associazione Consorzio Cantiere Cuccagna' and developed a programme to rehabilitate the farmhouse as a multifunctional collective space for the urban community. Restoration works preserved original materials and structures (Lombard terracotta floors, original wooden beams etc.), but new facilities were added including renewable energies such as a hydro-geothermal heating system and ecological insulation. After an expenditure of €3.5 million, today Cascina Cuccagna(i) is the most centrally located of the 60 farmhouses owned by the municipality of Milan, just four metro stops from Piazza Duomo but bringing the most tangible aspects of the countryside into the city centre. It comprises over 2,000m^2 of buildings and 1,500m^2 of green areas and courtyards. In the coming years, the challenge for the Cascina Cuccagna will be to achieve economic sustainability based on income from its commercial activities (bar, restaurant, food shop, hostel and services for children) and permanent fundraising from companies, institutions and other partners.

(i) http://www.cuccagna.org

The Energy Efficiency Directive also provides that from January 2014, 3% of the total floor area of heated and/or cooled buildings owned and operated by central government must be renovated each year, while member states will establish a long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings. Member States will set up an energy efficiency obligation scheme ensuring that energy utilities will meet, by the end of 2020, a cumulative end-use energy savings target of 1.5% of annual energy sales to final consumers. This is a significant step in pushing energy supply companies (ESCOs) to become integrated energy service providers instead of simply energy suppliers.

2.3 Local policy

Much energy policy research has focused on improving energy efficiency by addressing the infamous energy efficiency gap: why is it that proven technologies that are cost-effective are at best only slowly adopted. Mainstream economists have argued that the main barriers to energy efficiency are market failures such as the principle-agent problem and imperfect information. On the other hand, non-economic researchers, such as engineers and policymakers, have conducted surveys to identify and rank the possible barriers. Only recently have researchers sought to address the energy efficiency problem using a systems perspective which takes into account the possible interactions between the various elements such as barriers, stakeholders and policies (Chai and Yeo 2012).

Every EU Member State is active to a greater or lesser extent in implementing national priorities in energy policy. A particular challenge in the formulation of municipal and local policy is to understand how local and national energy policies interact over long periods. For example, a local

First activities of the local associations in Cascina Cuccagna, Milan. Photo: Courtesy of Cascina Cuccagna

authority may be interested in the trade-offs and relative timing of deploying local renewables versus the greening of the national electricity grid. An appropriate decision support tool should provide guidance as to which local energy technologies are cost-effective given other developments in the energy system. Similarly, there are questions about the sequential deployment of technologies and the relative priorities to be accorded to energy efficiency measures versus renewables and other low-carbon technologies. Knowledge of the relative penetration rates of energy efficiency measures and appreciation of the potential for those technologies, which require an understanding of spatial variations in building type and energy demands, may be important. Local authorities need more sophisticated urban energy and carbon modelling tools to develop appropriate responses to the challenge.

Opportunities for improving urban energy use can include direct policy actions, empowering different stakeholders, and providing the information necessary to foster behavioural change by consumers.

Policies instituted by municipal authorities should comprise integrated packages of measures (Giraud et al. 2010), as it is not enough for technical solutions to be available if no one can afford them.

The package should comprise an appropriate set of technical, institutional, policy and financial measures. Regulations must be combined with incentives, information and other actions, aimed at improving market efficiency. Policies dealing with funding and financing cannot be separated from policies for design and/or implementation. Governance and accountability with appropriate targets should go hand in hand. Given that

sustainability policies have wide impacts, they should be part of a coherent policy framework. Finally, regulations are best based on long-term and stable objectives, not short-term ones.

2.4 Shallow or deep interventions

A 2012 study by Ecofys for Eurima (Boermans et al., 2012) analyses and compares possible tracks for the renovation of the EU's building stock, quantifying and illustrating graphically energy saved and CO_2 emissions avoided, financial impacts and employment effects. Its findings are straightforward:

- a so-called 'shallow' renovation track will completely miss both energy and emissions targets while not providing substantial economic advantage; and
- a 'deep' renovation track, combining a focus on energy efficiency with the use of renewables, can be considered as a financially viable route, meeting emissions targets while showing the lowest energy consumption and offering the largest job creation potential of the tracks assessed.

'Shallow' retrofit measures comprise low-cost measures, typically draught stripping and attic insulation in the North, while 'deep' renovation involves comprehensive improvement of roof, walls, windows, heating/cooling system efficiency and controls, and the addition of renewables. Considerable differences in upfront financing required for shallow versus deep can mean that selective approaches have to be adopted. In newbuild, provision can be made for the later addition of solar thermal systems, for instance; the staging of deep renovation can help reduce the extra costs arising from breaking up the necessary work.

Giving clear guidance and developing suitable policies for deep renovation of the building stock can however be seen as an important measure in helping achieve long-term EU energy and climate ambitions, as very significant savings are required in order to achieve Europe's 2050 decarbonisation objectives.

Key messages

Energy efficiency improvement delivers multiple benefits, aside from energy savings. As energy efficiency programmes are often evaluated only on the basis of energy savings, the full value of energy efficiency improvements in both city and national economies may be significantly underestimated. And programmes must be designed to implement sufficiently ambitious whole-building efficiency.

Legislation and regulation have crucial roles to play in advancing European policy; but implementation is currently inadequate. There is considerable scope for strengthening local policy and practice and developing integrated technical, institutional, policy and financial measures.

3. Encouraging and facilitating urban energy efficiency

3.1 A city-level response

The energy associated with buildings can be divided into embodied energy and operating energy (including lighting, space and water heating, cooling, and ventilation). Operating energy represents the dominant share of global consumption in our stock of buildings, although this is not necessarily the case in new low-energy buildings. Technical solutions to increase buildings' energy efficiency must be integrated into a comprehensive urban planning process, steering urban forms and human behaviour towards more efficient environmental models.

Energy efficiency over the past four decades has focused on individual buildings. More recently, building environmental assessment systems and methods such as LEED, BREEAM, HQE, and DGNB[1] are being extended to address sustainability issues at neighbourhood and district scales. Where energy is concerned, the neighbourhood or city cannot be considered simply as an aggregation of buildings. As Bourdic and Salat (2012) report, when scaling up, complex interactions appear within urban fabric, which significantly alter the results that were valid on the building scale. Their analysis emphasises the need for more systemic, multi-scale and transverse approaches to deal with the intrinsic complexity of the urban fabric. They propose four intervention points for urban efficiency: urban morphology, building efficiency, system efficiency and individual behaviour.

City-level response and local action play a significant part in responding adequately to climate protection and sustainability challenges. In cooperation with relevant national and EU policies, municipal leaders and urban regions are capable of taking action at city level. Hungary, to coincide with its EU Presidency in 2011, published a *Handbook on Climate Friendly Cities* (Ministry of Interior, Hungary & VÁTI, 2011[2]), with the aim of supporting cities and urban policies and empowering creative, well-prepared city leadership and adaptive management. The handbook describes the opportunities available to city authorities that can be put to good use in both mitigation and adaptation. While varying widely across the EU, local authorities may have many direct tools for mitigation and adaptation, such as their institutions, local regulations, taxes, financial incentives and investments; however, the means by which they can influence other actors are of similar importance. The handbook emphasises the crucial importance of integrating strategies and governance aspects.

3.2 Stimulate demand for retrofit

Cities have a vital role to play in stimulating demand for retrofit amongst consumers. They are ideally placed to drive action on sustainability through local action plans, targeted policies, awareness campaigns and workshops to bring professionals and stakeholders together to discuss optimal solutions for their cities.

1 Respectively Leadership in Energy and Environmental Design, Building Research Establishment Environmental Assessment Method, Haute Qualité Environmentale, Deutsche Gesellschaft für Nachhaltiges Bauen

2 http://climate-adapt.eea.europa.eu/viewaceitem?aceitem_id=3248

Holistic energy efficiency training in South Moravia

The INTENSE project(i) – From Estonia till Croatia: Intelligent Energy Saving Measures for Municipal housing in Central and Eastern European countries – is supported by the European Commission's Intelligent Energy Europe programme. It addresses the complexity of energy in holistic urban planning and aims to trigger comprehensive thinking about energy efficiency in 12 countries from Estonia to Croatia. The partners want to highlight the fact that energy saving is not just about putting better insulation on the walls of a building or placing solar panels on its roof – they believe that the greatest savings can be achieved if energy efficiency plays a central role in the planning phase of a new residential area, or the retrofitting of a house. Location and orientation of buildings and their connection to public transport are as important as the choice of materials, technical solutions, and their proper installation. In addition, the residents must be well informed about what they can do to reduce their consumption of electricity and heat. A modular holistic training programme has been prepared, bringing together different aspects of energy efficient urban planning down to details of construction and indicating how to make energy efficient houses more attractive and desirable for citizens.

Among INTENSE's eight strategy projects, in Rájec-Jestřebí (3,675 people) and Řícmanice (650) in South Moravia in the Czech Republic, both municipalities were interested in exploring the possibilities of developing tools for municipalities to help them increase energy-optimised urban development. Although the circumstances of each project are different, they emphasise energy efficiency in new buildings. There are public and private dimensions, and notwithstanding considerable challenges tools will be developed to aid the mayors of the Moravian Karst region to support future decision-making and planning.

(i) http://www.intense-energy.eu

The existing building stock must undergo an energy efficient transformation. Notwithstanding the urban growth of the last 60 years, one third of European buildings were built before 1945, and most have not been retrofitted for better energy performance. In the next few decades retrofitting will be the core business of the European building sector in many member states. The case for refurbishing existing buildings is simple – improve the building stock, and energy consumption and greenhouse gas emissions will reduce. The challenge lies in how to communicate the benefits of energy efficiency and retrofitting to the wider community, and how to address the upfront capital costs.

Understanding what motivates consumers to undertake retrofit works is an integral component of stimulating retrofit demand in sustainable cities. Many consumers have a poor understanding of their energy bills and an even poorer understanding of what their own actions, such as turning a light bulb on or off, may cost. The connection between behaviour and cost-consequence is not well understood.

Energy consumption for heat and electricity pose quite different challenges. Electricity for lighting and appliances involves immediate decision-making, while heat energy consumption patterns are usually based on settings that don't often change, the room thermostat or time clock. Electricity is a consumable product whereas heat and coolness are perhaps less tangible. According to an Irish study, heat is associated with health and well-being, so it can be difficult to address consumers about reducing home temperatures or heat energy use because it is seen as compromising comfort standards (SEAI, 2010). There is an emotional attachment to warm cosy homes in the North, and cool comfortable homes in the South.

The same Irish study demonstrated that there are various drivers for consumers taking part in retrofit works. Consumer comfort was the main motive for investment; however consumers were also conscious that bills fell after undertaking retrofit works. Cost savings were seen as a secondary benefit. Attic, wall and floor insulation were associated with improved thermal comfort. Investing in home improvement was seen as a life-style investment and less of an economic calculation. There is also a perception (and increasing evidence) that the market value of dwellings increased after the upgrade.

In a German study (BMVBS, 2012), the four most frequently stated drivers for investing in energy retrofits were high energy costs, buildings in need of renovation, improvement in thermal comfort and environmental and climate protection. On the other hand, barriers to retrofit included the need for heating system or building envelope

Strategic energy planning in Albertslund, Denmark

The municipality of Albertslund is a suburb of 28,000 people west of Copenhagen, built in the 1960s and 1970s. Sixty percent of dwellings are houses and apartments for rent, and many of them are poorly insulated, with deficient indoor climates. A major part of the town will be completely renovated during the next ten years.

Albertslund has considerable experience of strategic energy planning. The town has prepared green accounts since 1992, became 100% EMAS(i) certified in 2008, and was appointed Nordic Energy Municipality in 2011. Compared to a 2006 base, by 2011 Albertslund had reduced CO_2 emissions by 19.5%, and targets 25% by 2015 and 67% by 2050.

The town has had district heating since 1964, municipally-owned and meeting 97% of the town's heat demand. The heat comes from cogeneration and waste incineration, and is purchased from VEKS, owned by the West of Copenhagen municipalities. A low-temperature network is being developed in new and refurbished areas.

The energy upgrading is funded through a levy on the district heating supplied. The Albertslund Concept involves a Users' Council with representatives of each housing area involved in all decisions; together with co-operation with consultants, universities and suppliers. Considerable effort is invested in identifying the best renovation solutions, and an industrial approach is adopted where appropriate.

(i) The EU's *Eco-Management and Audit Scheme*, see http://ec.europa.eu/environment/emas/index_en.htm

Cascina Cuccagna, Milan, after 10 years of planning and fund raising the building site started in 2009. Photo: Courtesy of Cascina Cuccagna

renovations, the lack of financial resources and uncertainty about the payback period of retrofit measures. The Danish municipality of Albertslund is a notable illustration of a town with a long-standing awareness of environment issues, and a proven strategy for funding retrofitting.

As an output of a workshop facilitated by Emilio D'Alessio at the URBACT Annual Conference 2012 it was suggested that every city should promote a single point of contact, an information desk for citizens wishing to renovate their homes. There are several examples of this kind in Europe, for instance the Stadswinkel/Centre Urbain[3] in the centre of Brussels, which promotes energy efficient and heritage- and ecologically-sensitive retrofitting, delivering information, education and *ad hoc* advice.

There is evidence that better energy rated buildings can command a premium in the market-place. A Dutch study found a significant premium for A rated homes, which sell for prices 10.2% higher than similar homes with a D rating. Conversely, they also found that homes with a G rating sell at 5% less than similar D rated homes (Brounen and Kok, 2011).

Evidence of a positive association between 'green' certification and the financial performance of commercial property in the United States has been found by Wiley et al. (2008), Das et al. (2011), Fuerst and McAllister (2011) and Reichardt et al. (2012).

3 http://www.curbain.be/

Cascina Cuccagna, during renovation 2009. Photo: Courtesy of Cascina Cuccagna

3.3 Awareness and information campaigns

Effective communication on energy efficiency is an important mechanism to create demand and stimulate political engagement. Many consumers understand the concept of investing in energy efficiency and appreciate the benefits associated with it: improved comfort, reduced spending on energy, and other associated environmental benefits.

In some cases the primary benefits are not associated with energy efficiency. For example, measures such as boiler replacement can be associated with concerns about health and safety rather than energy efficiency, and may not be naturally connected with installing attic insulation. Independent city-specific guides can advise and encourage building owners, occupants and builders of the energy efficiency options available to them. This would also be an opportunity to advise on taking advantage of 'trigger points', such as when other renovation work is going to be undertaken. The roll-out of smart metering could give this a major impetus.

Repayments for retrofit work based solely on energy modelling carried out prior to retrofit work being undertaken can be problematic, as user behaviour is very difficult to control. However, user behaviour is critical to making investment in retrofit work. To realise and improve the likelihood of achieving actual savings, occupant input into the retrofit design stage is important. Central to this involvement should be getting occupants involved in campaigns to change their energy behaviour. Behavioural change and improving user

attitude towards energy use and heating is an integral part of retrofitting.

Originally launched in 2003, the Display Campaign promoted by Energy Cities with the support of Intelligent Energy Europe is an information tool to enable municipalities to publicly display the environmental performance of their buildings, and raise public awareness on energy and environment related questions. To date the campaign has involved 558 participants with 16,763 buildings.[4] The campaign's main objective is to improve building performance by changing users' habits. Continuous monitoring helps sort out faults early on, and allows the user to fine-tune the energy efficiency strategy and get real energy savings.

Householders are often concerned about the quality of the retrofit measures and the overall service. In many parts of Europe, industry experience of ambitious retrofitting is still quite limited, and risks can arise, for example as a result of incompetent control of water vapour in insulated constructions, or inappropriate automatic controls. This highlights the importance of instruments that guarantee quality, such as standards and labelling for material and equipment and the certification of installers. There is scope for the development of new business models too, for instance one-stop integrated technical and financial packages with a guaranteed performance.

3.4 Industrial development

A more developed energy efficiency construction sector can support greater opportunities for internal markets within Europe for innovative construction products and services. Improved resource efficiency, a better environmental performance of the construction sector, and promoting innovation and technological development in the refurbishment of existing stock could provide vital stimulus to local economies.

BUILD UP Skills is a strategic initiative under the European Commission's Intelligent Energy Europe (IEE) programme to boost continuing and further education and training of craftsmen and other on-site construction work and systems installers in the building sector. The final aim of the initiative is to increase the number of workers across Europe who are qualified to deliver high energy performance renovations as well as new, nearly zero-energy buildings. The initiative started in November 2011

Old Home Superhome network, Sustainable Energy Academy (SEA), UK

Over 115 homeowners who have retrofitted their homes joined forces to showcase retrofitting to the public on open days in cities and towns. Public interest in the show homes has been immense with over 20,000 visitors on average each year learning about a broad range of retrofit techniques. The power of the network is the impartial learning exchange between visitor and homeowner. The SEA estimates that more than a quarter of visitors to a show home go on to spend over €5,000 on their own home following the visit.

The show home pictured here was part of the 'Retrofit South East' project and while open received over 400 visitors, including the local MEP. Residents of social housing were responsible for helping to determine the future of their prefabricated homes which were upgraded from a band E to a band A Energy Performance Certificate rating. The retrofitted homes have restored pride to the local community and reduced annual running costs by as much as 60%.

4 http://www.display-campaign.org/spip.php

Manchester's Low Carbon Hub

Manchester city has created a 'low-carbon hub'(i) as part of a scheme that will allow the city to repay loans for energy efficiency works from rebated tax. The city will use the principle of 'earn back' under which the British government has agreed that money invested in infrastructure improvements in Greater Manchester will be 'paid back' from additional taxes that result as real economic growth is seen. The key focus of the Low Carbon Hub will be the prioritisation of energy efficiency in homes.

In Manchester, the Energy Saving Trust (EST) piloted a project to test whether it is easier to persuade householders to install insulation when they are already carrying out other refurbishment work. EST's research revealed that most domestic retrofit activity takes place room by room or project by project, whereas the recommendations in energy performance certificates (EPCs) cover whole-house solutions.

EST developed a series of independent and trusted 'trigger point' guides to better equip homeowners and builders with information on the energy efficiency options available to them when they complete projects within their homes. The guides cover the most common retrofit activities (kitchen, bathroom and living spaces), and will enable homeowners to work towards achieving a better EPC rating. In addition, 55 builders took a one-day training course on how to use the guides and how to deliver high-quality, low-carbon refurbishment. They are best placed to advise clients on energy efficiency measures. This project demonstrated that once builders were aware of the benefits they are empowered to drive low energy, low-carbon retrofits.

(i) http://www.agma.gov.uk/what_we_do/gmlowcarbonhub/index.html

and addresses skills relating to energy efficiency and renewables in all types of buildings.

Many challenges in the building sector initially seem country-specific, but turn out to be common to other Member States. In BUILD UP Skills, 30 European countries are working towards national roadmaps for qualifying their building workforce for the Europe 2020 challenges. In each country, key public and private players work together to improve the qualification and skills of building workers, which are essential to deliver low-energy buildings. In 20 countries the status quo analysis has been finished and results are available.[5]

Professionals such as architects and engineers must also upgrade their expertise, and building energy experts need to engage positively in partnership with the wider public using understandable language. Energy efficiency should preferably be an integral part of design, not merely an add-on. Building professionals should be well equipped to advise clients on taking advantage of 'trigger points' that arise when conventional refurbishment work is taking place, allowing the cost of retrofitting to be significantly reduced.

3.5 Retrofit targets

Clear energy saving and emission reduction targets for European cities can be helpful in further stimulating retrofit demand. Too rarely is data available on the energy consumption or emissions of individual European cities. Real potential for reducing emissions and energy use lies in master

5 For more information see: http://www.buildupskills.eu/en/national_projects

Vienna – a typology for the refurbishment of large residential buildings

The city of Vienna owns 220,000 flats – it is the largest public housing owner in Europe. 'Stadt Wien – Wiener Wohnen' is in charge of the maintenance and renovation of the residential buildings owned by the City of Vienna. The MA39 administration unit is responsible for the energy performance certificates (EPCs) and technical consultancy for these buildings. It took part in the Request project supported by Intelligent Energy Europe programme. The project developed a data management process in co-operation with the municipal authority.

The Viennese pilot project(i) also looked at how to improve the EPC recommendations. It was found that refurbishment recommendations were often missing in Viennese building certificates. In other cases measures suggested did not fit the building typology, because the wall construction was often not known. To be able to offer high-quality refurbishment measures, building typologies were developed, and energy efficiency measures were defined for the different types of buildings. These measures may also be applied to similar buildings not owned by the City of Vienna.

The building typology for the multi-family houses was done by studying the geometry, construction type, construction period, building physics and heating supply system of the dwellings. Refurbishment options and the potential energy savings were developed.

Key lessons learnt from the pilot are:

- The building typology gives an overview of the existing Viennese building stock. It provides a baseline to demonstrate the effectiveness of energy efficient refurbishment measures.
- The typology also offers a survey of existing EPCs and reduces the frequency of errors.
- Investments can be estimated and energy/carbon saving/performance can be predicted. It is an important instrument to quantify energy and carbon emission reduction potentials.

(i) http://www.building-request.eu/pilot-project/austrian-pilot-project

planning sustainable zones within cities. Energy upgrading buildings one by one is very unlikely to achieve the results needed: by integrating mass retrofit in local area master plans and regeneration programmes, and making appropriate use of 'green' electricity and district heating and cooling, areas can be transformed into energy efficient low-carbon zones.

3.6 Best practice examples

The URBACT capitalisation process has addressed the five main challenges identified in DG Regional Policy's 2011 report on *Cities of Tomorrow* – mobility, shrinking cities, youth, jobs and spatial polarisation – plus the issue of energy efficiency in the built environment – underlining how intimately these challenges are interwoven. Considerable European experience demonstrates how refurbishing the built environment can have additional positive effects on communities, such as improving cultural landscapes, facilitating a more balanced demographic distribution of population, and providing a solid base for local economic activities. The levels of retrofit required to meet environmental targets are unlikely to be achieved if stakeholders rely solely on the economic benefits of retrofit. The broader advantages – they include improved thermal comfort, improved productivity and reduced health problems – can

act as powerful motivators, but the improved quality of living and associated non-energy benefits are harder to monitor and evaluate in energy efficiency programmes.

Many energy efficiency interventions are not very visible and do not lend themselves readily to political launches and profiling. However, best practice examples of completed retrofit projects can be a very useful way of generating interest, confidence and demand. Homeowners like to see before they invest.

Social housing makes up 12% of the EU building stock, and an estimated 90% of it consists of buildings with poor energy efficiency and in need of refurbishment. In many Member States, less than 2% of traditional buildings are renovated each year. The ownership of residential buildings is also a variable factor that can influence local policies. Northern European countries have a tradition of single-owned buildings, while in Southern Europe properties are often divided on the condominium model, further complicating retrofitting strategies. Many European cities take the public sector as their priority and develop programmes to improve the energy efficiency of their buildings, such as annual city-wide renovation targets for public buildings. Initial financing may be provided through local authorities. Financial tools are a crucial element of stimulating retrofit demand, but a retrofitting strategy must take into account other elements like citizen participation, best practice solutions, city administration involvement, advertisement and behavioural change campaigns. Successful cases often illustrate all of these features, but in Manchester's Low Carbon Hub there was a particular focus on householders and house builders, while in Vienna the emphasis was on the development of typologies for high/quality refurbishment measures in apartment buildings.

Key messages

Most attention in building energy efficiency over the past four decades has focused on individual buildings. More recently, a growing awareness of the need to address sustainability issues at local, district and urban scales has coincided with a realisation that the switch from the individual building scale to neighbourhoods or cities cannot be considered simply as an aggregation of buildings and that when scaling up, complex interactions appear within the urban fabric.

Cities have a vital role to play in stimulating demand for retrofit amongst consumers. They are ideally placed to drive action on sustainability through local action plans, targeted policies, awareness campaigns and workshops to bring professionals and stakeholders together to discuss optimal solutions for their cities. But the need for more systemic, multi-scale and transverse approaches to deal with the intrinsic complexity of the urban fabric underlines the challenges faced by urban policy-makers and practitioners in developing best practice in urban energy efficiency.

4. Financing energy retrofitting

Notwithstanding general support for building energy efficiency, there remain substantial gaps between consumers' actual investments in energy efficiency and those that appear to be in the consumer's own interest.

New strategies to secure sufficient financing for the deep renovation of the European building stock are needed, drawing on private and public investment. More innovative ideas and initiatives will be necessary as deep renovations are costly, even if cost-effective. The considerable up-front capital required is normally the single greatest barrier. A variety of financial mechanisms have been employed and are being designed to incentivise energy efficiency upgrading in domestic and non-domestic buildings, including:

- subsidies and grants
- energy performance contracting (EPC)
- energy services agreements
- national/municipal loan programmes
- energy utility obligations
- mortgage-backed financing
- preferential taxes or mortgage rates
- utility on-bill financing, such as PAYS (pay as you save)
- revolving guarantee funds
- green banks and climate funds

Enhancing energy efficiency represents one of the largest and most important opportunities for Europe to expand economic growth and job creation. Relative to almost all other investments, it cost-effectively creates more distributed jobs and

Cascina Cuccagna, Milan, digging the wells to connect the heatpumps to underground water table. Photo: Courtesy of Cascina Cuccagna

enhances economic activity, reduces energy costs for businesses and households of all income levels, reduces emissions and improves energy security.

4.1 Financing large-scale energy efficient retrofitting

Financing retrofit on the scale required presents a variety of difficulties including from where to get finance, how to implement retrofit measures that make economic sense and how to encourage building owners to invest. Products must be tailored to local markets and different segments of the population. For example, for high-income groups the focus could be on incentivising the deployment of savings or the use of short-term loans; perhaps one-off cashbacks to incentivise action such as Poland's Thermo-Modernisation Programme, which is supported by EU structural funds. At the same time, for middle-income groups the emphasis could be on affordability in relation to monthly outgoings; examples would be subsidised loans and grants to incentivise deep retrofits such as Germany's KfW House Programme. KfW banking group is a German government-owned development bank, based in Frankfurt. Its name originally comes from *Kreditanstalt für Wiederaufbau*, meaning Reconstruction Credit Institute. It was formed in 1948 after World War II as part of the Marshall Plan, and is particularly active in promoting energy-efficient housing for owner-occupied houses as well as for landlords. Finally, for low-income groups higher grants can be appropriate such as the London Warm Zone programme, and possibly subsidised loan opportunities. London Warm Zone has carried out energy efficiency improvements in over 50,000 homes in London; its parent company Warm Zones CIC is a social enterprise wholly owned subsidiary of the independent charity National Energy Action.

A key challenge to financing retrofit is return on investment. Many energy efficiency solutions

Cascina Cuccagna, geothermal pipes installation, 2009
Photo: Courtesy of Cascina Cuccagna

have to be viewed long term to become financially viable. This problem is amplified when building owners and occupiers do not intend to remain in their property long term. Understandably, attitudes towards improving buildings will be less positive where occupants feel they will not see the benefits of investing.

Financial institutions are reluctant to participate in new financial mechanisms if there isn't a high level of confidence in the result, which is slowing the spread of solutions to financing retrofit. The financial community needs to be educated on how to reduce the perceived risks associated with investing in energy efficiency. Investment in energy efficiency now will lead to reduced maintenance and running costs and help improve the capacity of borrowers to service their loans. However, the specialist energy community also needs to better appreciate the risk assessment and decision-making frameworks of the financial community, so that a solid case can be made for retrofitting existing buildings.

The 'principal/agent' challenge occurs for instance when difficulties arise in establishing financial viability for a project where city authorities own the buildings but do not occupy them, as the benefits associated with retrofitting accrue to the

occupant and not the investor. In the Netherlands, legislation such as 'Warm Rent' has helped address this problem, whereby a landlord can increase the rent charged when a property has undergone an energy efficient upgrade.

4.2 EU financial support for energy efficiency

Retrofit activities can attract EU cohesion funding through the European Regional Development Funding (ERDF), subject to match funding from the participating country.

The ERDF fund for 2007-13 is €201 billion with €55 billion allocated to the competitiveness and employment objective, including €4.6bn for energy efficiency. In 2009 rule changes to the structural funds allowed regions to allocate up to 4% of ERDF budgets to the energy-retrofitting of social housing. CECODHAS Housing Europe – a network of 45 national and regional federations which together manage over 27 million homes, about 12% of existing dwellings in the EU – has witnessed mixed success with the uptake of funds set aside for this purpose by their members, as the workstream heard at its second hearing.

It is worth noting that in France for example, the reallocation of 4% of ERDF funding to social housing is expected to lead to €320 million of ERDF finance, triggering investment of up to €2.2 billion, delivering 40% average savings in heating costs for 110,400 households and creating 31,000 jobs.

In May 2012 the European Commission hosted a meeting which outlined the sources of European support for energy efficiency in buildings.[6] Other programmes are the Intelligent Energy Europe programme (2007-2013), with €735m for 'soft' energy efficiency/renewables projects; the ELENA Facility, €97m for technical assistance to mobilise investments; and the European Energy Efficiency Fund (EEE-F), with €265m for investments in mature, bankable efficiency/renewables projects, and €20m for technical assistance.

Integrated, sustainable urban renewal projects are supported through JESSICA (Joint European Support for Sustainable Investment in City Areas). A range of sophisticated financial tools are used including equity investments, loans and guarantees, offering new opportunities for the use of EU structural funds. JESSICA is a policy initiative of the European Commission (EC) developed jointly with the European Investment Bank (EIB) and in collaboration with the Council of Europe Development Bank (CEB). The enabling framework for JESSICA is provided by general and specific regulations, which allow Member States to use some of their structural fund allocations to take advantage of financial engineering mechanisms to support investment in integrated urban renewal and regeneration schemes.

The proportion of ERDF funds available for energy efficient retrofit from 2014 is expected to increase substantially. Proposals for the next EU multi-annual financial framework (2014-2020) include cohesion funding allocating some €17 billion to energy efficiency and renewable energy, doubling current allocations, as well as Horizon 2020 where €6.5 billion is to be allocated to research and innovation in 'Secure, clean and efficient energy'. Among the investment priorities proposed for the cohesion funds and ERDF is to support the shift towards a low-carbon economy in all sectors, through the production and distribution of renewable energy, energy efficiency and renewable energy in SMEs, energy efficiency and renewable energy in public infrastructures

6 http://ec.europa.eu/energy/efficiency/buildings/buildings_en.htm

and residential buildings (only through the ERDF), and smart distribution systems as well as low-carbon strategies for urban areas. It is envisaged that the 4% limit on investment in housing will be abolished, with at least €17 billion to support the shift towards a low-carbon economy through various types of investments, including physical investment in energy efficiency in public buildings and housing, district heating infrastructure, education and training in the building sector, and innovation, using different types of financing such as grants and various financial instruments including loans, interest rate subsidies and support to energy supply companies (ESCOs).

"Energy efficient upgrade of the EU's infrastructure – kick started by targeted fiscal stimulus and set up to complement wider structural reforms – could provide a convincing route map to European recovery. However it is only likely to happen if the EU and member state governments start to regard identification and delivery of energy efficient projects as being on a par with delivery of other major infrastructure projects – and provide fair and equivalent treatment to supply and demand side solutions."
– Ingrid Holmes and Rohan Mohanty, *The Macroeconomic Benefits of Energy Efficiency*

4.3 Successful examples of finance for retrofit

In Germany, the KfW development bank aims to promote the construction of new energy efficient homes and the energy efficient refurbishment of older residential buildings by offering grants or loans under favourable conditions. Government support enables KfW to offer a lower rate of interest on finance for retrofit, which encourages substantial rates of adoption. In the KfW 'energy efficient building and renovation' programmes, every euro invested returned €2 to €5 to state coffers, mainly through job creation, while the KfW

GESB Revolving Guarantee Fund in Hungary

The Hungarian social enterprise Global Environmental Social Business (GESB) has been responsible for house and apartment building upgrades in several EU countries. It has piloted and mainstreamed the Revolving Guarantee Fund mechanism in Hungary, where 300,000 homes have already been refurbished and a yearly 100,000 will be refurbished according to the current government's plan. The revolving guarantee fund mechanism has demonstrated that it can provide financing in a fuel-poor environment where other finance mechanisms fail. The advantages of this mechanism over alternative means of financing energy efficiency include:

- Borrowing takes place against a guarantee fund, which greatly reduces the risk for investors;
- The volume of loans coupled with the derisked fund enables borrowing at lower interest rates than social housing providers are able to access;
- The guarantee fund enables the scheme to operate continually in the event of loss or temporary default at an acceptable level and marks a move away from traditional mortgage-based finance;
- Leverage rates of the guarantee fund programme are higher than leverage rates of alternative financing programmes, so that with the same amount of investment the revolving guarantee fund is able to support a larger volume of projects.

KredEx, Estonia

KredEx improves the financing possibilities of Estonian investment in energy efficiency. The KredEx model is an alternative to the state-funded grant scheme. It is a self-sustaining, non-profit guarantee fund. The funds provide low-interest loans through a revolving fund scheme. The scheme combines a loan from the Council of Europe Development Bank (CEB) and an ERDF grant. The objective of the project is to implement energy efficiency measures in multiple-unit residential buildings built before 1993.

In Estonia multiple-unit buildings represent 75% of the national housing stock. The building stock is of low quality and has poor energy efficiency. According to the Ministry of the Environment in Finland, Estonia uses two to three times more energy than the Nordic countries even though the average temperature is higher.

The objective of the refurbishment works is to realise a minimum 20% to 30% saving, at least 20% of energy in buildings up to 2,000m² and 30% in bigger buildings. An energy audit is required plus reporting on energy consumption of the building for the three years before the loan and during the loan period. The loan period is up to 20 years. The interest rate of the loan is a maximum of 4.4% and is fixed for 10 years. In the case of higher risk loans, financial institutions can use KredEx as a guarantor.

Eligible works included thermal insulation of roofs, walls and ceilings, replacement of windows, renovation or replacement of heating or ventilation systems and installation of renewable energy devices.

KredEx loans have been available since June 2009. By March 2012, 420 buildings or approximately 15,500 apartments had applied for loans. The total loan amount was €36 million. An energy saving of 36.5% was achieved in the refurbished apartments.

The direct results are real energy savings in multi-storey apartments and the improved living environment of the residents. Indirect results come from reductions in fuel consumption.

House programme led to €1.8bn in avoided welfare payments in 2010 (Research Centre Jülich, 2011).

In Estonia the KredEx model is an alternative to the state-funded grant scheme. It is a revolving, non-profit guarantee fund. In the UK the Green Deal has seen an Energy Company Obligation being implemented, whereby energy providers are obliged to achieve energy and emissions saving by engaging with their customers to retrofit buildings throughout the UK. Other Member States are also encouraging and/or obliging utilities to deliver energy savings, and the Energy Efficiency Directive will require all Member States to set up an energy efficiency obligation scheme, as previously noted.

These types of financial initiatives have resulted in a significant improvement in energy efficiency in the building sector over the last decade. Many city authorities take an active role in encouraging the wider uptake of retrofit, and outstanding examples that have resulted in sustainable urban development being implemented at a local level in European cities include initiatives such as the Covenant of Mayors, Renovate Europe and Agenda 21.

The Danish city of Sonderborg (76,236 inhabitants) took part in the URBACT CASH Thematic Network to fine-tune energy efficiency retrofitting approaches in housing. The local housing stock is on average 35 years old,

one-third subsidised and two-thirds privately owned. More than half has already been retrofitted with additional insulation. The city has become famous for its decision to shift to zero carbon, developing a new green economy. To support this transition a strong partnership between district heating suppliers and the municipality has been established, with citizen participation. The objective to become carbon neutral by 2029 is advanced by the Action Plan on Energy Efficiency and Project Zero, a public/private foundation dealing with retrofitting of different kind of existing buildings: private households, public buildings, social housing, farmhouses, etc.

Among the actions already under way are:

- replacement of natural gas in district heating with geothermal, solar, biomass etc.;
- a new pipeline connecting all existing district heating networks;
- generating biogas from pig manure, organic waste and energy crops;
- generating power from biogas, wind and photovoltaic;
- installing photovoltaic cells and heat pumps in rural areas.

The government has allocated funds allowing 30,000 households to receive €2,500 as a subsidy to replace oil burners with new heat pumps, costing about €12,000 in total. Further actions planned by the municipality involve various dimension of an urban policy for energy efficiency:

- Renovation of the building fabric in 48 individual houses as a pilot project, providing new insulation, low-energy windows and a new heating system;
- Educating citizens in energy efficient behaviour through installation of smart meters;
- Surveying and listing of buildings by type, indicating engineering and architecture specific retrofitting actions;
- Establishment of an energy labelling system in co-operation with banks and real-estate agents;
- Upgrading craftworkers' competencies with *ad hoc* training.

"The cheapest, most competitive, cleanest, and most secure form of energy for the European Union thus remains saved energy."

– former European Commissioner for Energy Andris Piebalgs

Key messages

New strategies to secure sufficient financing for the deep renovation of the European building stock are needed, drawing on private and public investment and building on existing good success stories. Innovative ideas and initiatives will be necessary as deep renovations are costly, even if cost effective and the considerable up-front capital required is normally the single greatest barrier.

5. Tackling fuel poverty, reducing the energy bill

The *Cities of Tomorrow* report noted: "*Energy efficiency in buildings is directly related to social inclusion and the alleviation of energy poverty. [...] 90% of social housing consists of buildings in need of refurbishment. These buildings often have low energy efficiency with many tenants living in fuel poverty. Better energy efficiency is key to alleviating the poverty of the most vulnerable, while increasing the quality of life for all citizens.*"

Fuel poverty can be defined as the inability to keep a home adequately warm at an affordable cost. A common definition of fuel poverty, used in several European countries, is where a household spends more than 10% of its disposable income on fuel. Recent studies undertaken in Western Europe reveal that 12% of all households are living in fuel poverty, by this definition. But in Mediterranean climates fuel poverty will relate more to the possibilities of relief from thermal stress, since heatwaves are causing increasing numbers of deaths during summer months.

The problem is particularly prevalent in Europe's social housing sector, representing some 25 million homes. Occupants are typically on lower than average household incomes, and live in dwellings with poorly performing thermal envelopes. The issue, however, is certainly not limited to social housing. The private and private rented sectors can also be affected by fuel poverty, though it can be much harder to identify, as households are usually not in receipt of energy or income subsidies.

Today, outdoor spaces of Cascina Cuccagna, Milan.
Photo: Courtesy of Cascina Cuccagna

Fuel poverty is heavily influenced by a combination of the energy performance of a home and household income, although external factors such as energy supply prices also have an impact on the ability to provide affordable warmth.

The effects of fuel poverty can be drastic, with poor health very common amongst those caught in the trap. Thousands of excess winter deaths occur every year, especially amongst the elderly.

Many households are today facing the unacceptable choice of whether to 'heat or eat'.

In many regions the demand for 'affordable cooling' is growing too, adding to overall household running costs. Tackling fuel poverty is not solely about saving money, reducing running costs or reducing the impact of climate change – it affects the efficiency of the health service, child poverty, educational ability and productivity.

While there is growing awareness and understanding of fuel poverty and its causes, the issue is not clearly defined in all European Member States, even though similar problems are observed such as unpaid energy bills, an increased burden on health services, underheating and self-disconnection from fuel supplies.

Today, Cascina Cuccagna sales organic food from surrounding farmhouses. Photo: Courtesy of Cascina Cuccagna

Fuel poverty and low income are not synonymous, but there is substantial evidence showing that there is a tendency towards fuel poverty in low-income areas (Heffner et al., 2011). Fuel poverty is a major social problem, causing hardship and negative health impacts – and it also impedes progress in lowering carbon emissions.

5.1 How to eradicate fuel poverty

Fuel poverty eradication is a long-term objective for sustainable cities. However, it will take careful planning to achieve.

At a city scale, policy-makers need to outline long-term plans to alleviate fuel poverty. These plans need to include local methods of defining, ascertaining and measuring fuel poverty. Broad definitions with a fixed set of criteria mean that effective targeting of the households most in need will not take place. It is unlikely that a common measurement of fuel poverty that is meaningful throughout the EU could easily be adopted. Set against increasing energy costs and static household incomes, the 10% definition would itself appear to be in need of urgent review.

An effective method to tackle fuel poverty is to implement a community- or area-based approach that uses local poverty indices to identify zones affected. This approach should be coupled with the analysis of social and economic data.

In England in 2005 the Health Housing and Fuel Poverty Forum (HHFPF[7]) was set up to provide information on energy efficiency and fuel poverty alleviation measures for vulnerable people suffering the consequences of living in cold, damp homes. The forum is a collaboration between professionals across the health, housing, energy and fuel poverty sectors. While health

7 http://www.warmerhealthyhomes.org.uk/

professionals see the impacts of fuel poverty, it is not their competence to fix poorly performing homes. As a result of co-operation between different sectors, the Central Clearing House Model ensures that both the root cause of the problem and its symptoms are addressed. This project was piloted in Manchester to develop processes of data sharing and referral both individually at the patient-GP level, and at population level, by data-overlay mapping between local authorities and primary care providers. This enabled evidence-based targeting of fuel poor households. Fuel poverty indices were combined with data from the English House Condition Survey (2003) to help predict fuel poverty at electoral district level. This facilitates better-designed and targeted area-based programmes.

Data sharing and data-overlay mapping are invaluable to energy suppliers with utility obligations, as they can provide them with efficient and cost-effective methods of delivering solutions to their customers to meet both carbon and fuel poverty targets.

Other solutions include installing individual meters and smart meters in buildings. This will make consumers more accountable and aware of their energy use. When smart meters were supplied to Irish homes with time-of-day pricing, significant changes in behaviour leading to energy savings were noticed (CER, 2010).

5.2 Non-energy benefits

It is difficult to make the case for retrofitting social housing on a solely energy and cost saving basis as the benefits accrue to the occupant and not the investor. However, in rented social housing the benefits of energy efficiency are much broader than financial gain. Investing in energy efficiency is an important tool in mitigating fuel poverty (Boardman, 2010).

Non-energy benefits can be categorised according to the beneficiary. These include (a) benefits to the participant, (b) socio-economic benefits to wider society, and (c) direct financial benefits to government and energy suppliers.

Examples of non-energy benefits include:

- Improved health and comfort of residents, local community rejuvenation, local job creation, improved work and school attendance, reduced mobility and reductions in condensation and mould;
- Increased property values, improved economic activity, local income and local jobs through increased spending on energy efficiency programmes, improved community pride and social inclusion;
- Lower government and utility energy subsidies, improved energy security, reduced spending on cut-offs, notices, arrears and bad debt write-off.

The presence of condensation and mould can be particularly problematic in poor quality energy inefficient housing. In Ireland, for example, less than 10% of social housing units are energy rated at Grade A or B, while over half are rated D or worse (O'Connor, 2011). A study by Green and Gilbertson (2008) found the incidence of anxiety and depression was reduced by 50% after energy efficiency measures were installed.

The costs associated with fuel poverty are often outside the control of households suffering from it. The only control they have is to reduce household temperature, which has an adverse affect on health. The effect on the health and well-being of occupants living at low temperatures is a major contributor to excess winter deaths. The Hills Report (2012) estimates that there were 27,000 excess winter deaths (EWDs) in England and Wales each year over the last decade.

Low household temperatures can lead to health problems, such as asthma and other respiratory problems. This leads to much higher demand and cost being placed on health services. In the World Health Organisation report on the Environmental burden of disease (2011), Rudge estimates that, each year, 38,200 excess winter deaths occur in 11 European countries. These are related to low indoor temperatures.

Studies have demonstrated links between deteriorated physical environments and higher rates of crime, antisocial behaviour and social isolation (Kuo Fe, 2001). Through energy efficiency improvement works the local community and local housing stock are often rejuvenated, which improves community pride (Schweitzer at al., 2003). This can also lead to reductions in antisocial behaviour, improved social cohesion and reduced social exclusion.

Including non-energy benefits in analysing and approving retrofit programmes maximises the benefits of a retrofit programme (Skumatz, 2000). Non-energy benefits have the potential to reduce the burden on health systems and improve overall quality of life.

5.3 Changing behaviour

Approaches to alleviating fuel poverty will require targeting user behaviour as well as improving the energy efficiency of buildings. Behavioural change has modest cost implications but can result in large financial and energy savings. Simple attitude changes may benefit building occupants and the built environment. These changes can include turning down the boiler temperature or the room thermostat, switching off radiators in unused rooms and installing energy efficient lighting and appliances.

Recruiting and training volunteers in retrofitting techniques will enable them to advise homeowners (often their neighbours) on energy efficiency, providing them with simple easily understandable solutions that are cost/effective.

Sustained public information campaigns outlining the benefits of energy upgrading and the importance of tackling fuel poverty through retrofitting can play an important role in bringing about the necessary changes. Clear information that signposts what support mechanisms are available to the fuel poor should be included in these campaigns. Campaigns need to be followed up with effective evaluation of the schemes implemented.

In May 2011, CECODHAS published two research pieces on the positive impact of structural funds on the affordable housing market. Both reports show that enabling the ERDF to be used for energy upgrade and refurbish social housing is a powerful and cost-effective cohesion tool.

Key messages

Tackling fuel poverty is an urgent problem that no city or citizen can ignore. Better energy efficiency in fuel poor homes directly contributes to lowering carbon emissions and energy use, and provides several other essential benefits to society in health, comfort and demographic mix. Furthermore improving local economy investment in energy efficiency will also improve community pride and social cohesion.

6. The European built heritage and energy efficiency

Historic centres shape European cities; they are part of a city's culture. The buildings they comprise have specific values arising from their form and construction, which relate to the material evidence of the past. Historic buildings represent a significant part of the European building stock and have an important role to play in improving energy efficiency in cities.

These buildings are protected by law: a few of them are monuments and many others constitute the fabric of the European compact city which holds a special quality for citizens. They differ from modern structures both in architecture and in construction, which increases the difficulties in assessing and improving their energy efficiency.

In many cases, historic buildings do not respond well to modern needs. As a result, they can often be less desirable and may remain empty and ultimately decay, detracting from the city image but also damaging our cultural inheritance. In general, the best conservation strategy will be to ensure their continued use. Meanwhile, although special attention is always devoted to historic landmarks, a major retrofit challenge is how to successfully retain those historic buildings which do not have extraordinary architectural or artistic value, while bringing them up to satisfactory comfort levels and energy standards. At the same time, the robustness and innate redundancies of older buildings may make possible a degree of adaptability not often offered by modern, brittle and 'optimised' constructions. The different hygrothermal characteristics of historic and traditional buildings (how they react to humidity and temperature) require especially careful consideration of the applicability of codes and standards developed for modern construction technologies.

Normally, facades are fully retained and only minimal alterations can be made to their internal form and structure. The internal installation of double-glazed windows, floor, ceiling and wall insulation is sometimes permitted. Other options include improving the efficiency of building services such as heating and lighting and engaging users in energy or water-saving campaigns. The use of renewable energy in certain cases may also be allowed. Interventions should preferably be reversible. Possible retrofit measures for historic buildings need to suit the specific building while respecting its individual qualities and the needs of the users.

6.1 What can cities do to improve energy efficiency in historic buildings?

The best way to keep historic and traditional buildings alive is to ensure their continuous and proper use. This means adapting them to current needs. Until recently, heritage was exempt from the energy discussion, because improving the energy efficiency of historic buildings usually meant alterations, which impact upon their integrity and historical value. The general exemption of historic buildings from energy regulations is increasingly questioned, including by conservation interests.

Historic and traditional buildings have different thermal behaviour characteristics when compared to modern construction, which poses the question of how realistic it is to talk about standards and certificates, as it is evident that there are no 'one-size-fits-all' solutions. Any change must be undertaken with great sensitivity to the preservation of the unique qualities of the individual building or complex, from which

their importance is derived, and with thorough understanding of the building physics implications.

A number of initiatives of the EU can potentially support European cities in preserving and upgrading their built heritage. For instance, the reinforced urban focus of the European Regional Development Fund may offer an opportunity to recognise the key role of historic city centres in sustainable urban development.

6.2 Future-proofing historic centres

The older European town possesses a number of advantages: urban density, high architectural quality, constructions that are efficient in their use of natural resources, diversity and proximity of urban functions as well as the potential for economic, cultural and educational development. All these assets make it *the* sustainable city model. This is why revitalisation and capitalisation of historic districts is a special challenge for sustainable urban development. The members of URBACT's LINKS Thematic Network aimed to renew their historical cities, to give them a dynamic of residential attractiveness while preserving their architectural identity, cultural heritage and historical values. The challenge is to improve the quality of life in older centres while creating comfortable, affordable and sustainable housing achieving a good balance between preservation and sustainability.

Some of the major challenges the LINKS partners face in trying to future-proof historic city centres are mobilising networks of economic stakeholders, helping them to identify opportunities for the local economy, participating in structuring the local market for eco-restoration, and stimulating demand.

Key messages

Historic and traditional buildings play crucial roles in the identity of cities. The best way to keep these buildings alive is to ensure their continuous and proper use. This means adapting them to current functions and standards. Any change however must be undertaken with great sensitivity to the preservation of the unique qualities of the individual building or complex, from which their importance is derived. A thorough understanding of the building physics implications is essential. A number of initiatives of the EU can support European cities in preserving and upgrading their built heritage.

The ring-fencing of ERDF funding for cities represents a major opportunity to focus a percentage of these resources specifically for energy retrofitting of residential buildings in historic centres. It is recommended that the aim should be clearly identified as the provision of exemplary solutions of eco-restoration in order to help municipalities to kick-start energy retrofitting of the existing building stock, which at the same time represents a key opportunity to aid recovery from the current economic crisis.

7. Supports for urban energy efficiency practice

The previous sections of this paper have considered challenges and opportunities associated with urban energy efficiency, with an emphasis on those matters studied within the URBACT workstream Building Energy Efficiency in European Cities. Before attempting to draw conclusions, it may be useful to review important and potentially useful programmes and activities which offer resources and support to urban policy-makers and practitioners.

URBACT

Among the URBACT publications, the I 2009 publication *Thematic Pole: Cities and Integrated, Sustainable Development* (URBACT, 2009) presents a synthesis of some eight relevant project baseline studies. The associated city partners and agencies are concerned with building capacity in their cities to achieve sustainable development through integrated policy-making, planning and action. The publication presents sustainability in the urban context as being about the creation of durable development patterns based on responsible best use of resources with respect for the environment; it is about reconciling the demands of economic prosperity, environmental quality, cultural diversity and social equity. It means raising the bar to generate better conditions and opportunities for each member of the urban community, pursuing a quality of life which can respond to both the current and the future needs and expectations of urban societies. In this sense sustainability is not a brake but an alternative, progressive dynamic force to be explored and exploited. More thematic publications are available on www.urbact.eu.

Today, Cascina Cuccagna, a meeting point for the local community. Photo: Courtesy of Cascina Cuccagna

Energy Cities

Energy Cities is a European association of local authorities, which was established in 1990 and now represents more than 1,000 towns and cities in 30 countries. Its objectives are:

- to strengthen its members' role and skills in the field of sustainable energy;
- to represent their interests and influence the policies and proposals made by EU institutions in the fields of energy, environmental protection and urban policy;
- to develop and promote initiatives through the exchange of experiences, the transfer of know-how and the implementation of joint projects.

In 2012 Energy Cities published a booklet of proposals,[8] containing more than 80 examples from European cities and towns, which illustrate Energy Cities' proposals for the energy transition, and feature various innovative approaches and new ideas. It aims to provide practical answers and link today's action to the long-term vision of a low-energy city with a high quality of life for all. Its IMAGINE initiative offers online resources

8 http://www.energy-cities.eu/spip.php?page=energy_transition_en

and a toolbox as well as providing a platform to discuss relevant ideas and strategies.[9]

The Covenant of Mayors

The Covenant of Mayors[10] is a mainstream EU initiative uniting local and regional authorities in a common commitment to improve the quality of life of citizens by contributing to the Europe 2020 climate and energy objectives. In December 2008, following the adoption of the EU Climate and Energy Package, the European Commission decided to directly involve local and regional decision-makers in the achievement of EU objectives. Through energy efficiency measures and investment in renewable energy, Covenant of Mayors signatories undertake to curb CO_2 emissions by at least 20% by 2020.

Signatories officially commit themselves to submitting, within a year of joining the initiative, a Sustainable Energy Action Plan (SEAP) outlining the measures they intend to adopt to reach these objectives. An assessment is carried out through the development of a Baseline Emission Inventory, which is submitted alongside the SEAP and pinpoints the carbon-intensive sectors on which action should be focused. Additional steps, such as the adaptation of administrative structures, appropriate training of municipal staff, and stakeholder engagement – for example through the organisation of local energy days – are then taken to support the implementation of the action plan.

ESMAP Energy Efficient Cities

The Energy Sector Management Assistance Program (ESMAP)[11] is a global knowledge and technical assistance programme administered by the World Bank. Its mission is to assist low- and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. The Energy Efficient Cities Case Studies Database is home to several dozen urban energy efficiency case studies across all sectors – transport, buildings, lighting, water, solid waste, heating/power – in both developing and developed countries.

The goals of the case studies database are to:

- demonstrate the range of approaches and measures various cities have used to undertake efficiency improvements;
- document implementation arrangements, costs, results and lessons learned;
- provide a platform for cities to share their own experiences and programmes; and
- help guide cities around the globe in designing effective urban energy efficiency policies and programmes.

9 www.imaginelowenergycities.eu
10 http://www.covenantofmayors.eu
11 http://www.esmap.org

8. Conclusions

Cities must play a central role in tackling Europe's greatest challenge, climate change. A major opportunity lies in the energy efficiency retrofitting of existing buildings: an activity which can offer important economic and employment opportunities, as well as improving energy security and saving more than it costs. In light of the significant challenges highlighted, to realise these opportunities we need to adopt and implement stable, integrated policies and legislation, which will provide certainty to the market and enable the transformation of the buildings sector, at European, national and municipal levels.

Today, Cuccagna, a great succes.
Photo: Courtesy of Cascina Cuccagna

Energy efficiency improvement delivers multiple benefits, aside from energy savings. As energy efficiency programmes are often evaluated only on the basis of energy savings, their full value in both city and national economies is significantly underestimated. Programmes must be designed to implement sufficiently ambitious whole-building efficiency.

Legislation and regulation have crucial roles to play in advancing European policy, but implementation is currently inadequate. There is considerable scope for strengthening local policy and practice and developing integrated technical, institutional, policy and financial measures.

Building energy efficiency over the past four decades has focused on individual buildings. More recently, a growing awareness of the need to address sustainability issues at local, district and urban scales has coincided with a realisation that neighbourhoods or cities cannot be considered simply as an aggregation of buildings and that when scaling up, complex interactions appear within the urban fabric.

Cities have a vital role to play in stimulating demand for retrofit amongst consumers. They are ideally placed to drive action on sustainability through local action plans, targeted policies, awareness campaigns and workshops to bring professionals and stakeholders together to discuss optimal solutions for their cities. But the need for more systemic, multi-scale and transverse approaches to deal with the intrinsic complexity of the urban fabric underlines the challenges faced by urban policy-makers and practitioners in developing best practice in urban energy efficiency.

The scale and extent of the radical changes required of urban citizens and systems is still not generally appreciated, and progress in tackling European energy efficiency targets remains disappointing. New strategies to secure sufficient financing for the deep renovation of the European building stock are needed, drawing on private and public investment. More innovative ideas and initiatives will be necessary as extensive renovations, while being cost-effective, are also costly. The considerable up-front capital required is normally the single greatest barrier to their implementation.

Tackling fuel poverty is an urgent problem that no city or citizen can ignore. Better energy efficiency in fuel-poor homes directly contributes to lowering

carbon emissions and energy use, and provides several other valuable benefits. Not addressing these issues presents a barrier to the implementation of policies to mitigate climate change.

Historic and traditional buildings play crucial roles in the identity of cities. The best way to keep these buildings alive is to ensure their continuous and proper use. This means adapting them to current functions and standards. However any change must be undertaken with great sensitivity to the preservation of the unique qualities of the individual building or complex, from which its importance is derived. A thorough understanding of the building physics implications is essential. A number of initiatives of the EU can potentially support European cities in preserving and upgrading their built heritage.

URBACT, as a European exchange and learning programme, promotes sustainable and integrated urban development in line with the objectives of the Europe 2020 strategy. URBACT projects focus on key urban issues, enabling cities and other public authorities to meet and exchange experiences, identify and transfer good practices, build new local policies, and draw conclusions for dissemination to urban policy-makers and practitioners. While focused on particular themes, city networks demonstrate the importance of understanding interventions within the context of an integrated approach to urban development, drawing together the social, economic and environmental dimensions of policy, the various governance levels, and the diverse stakeholders.

Finally, a number of programmes and activities offer resources and support to urban policy-makers and practitioners in addressing the challenges and opportunities of building energy efficiency in European cities.

"The major strategic task for the future is the local and regional implementation of the energy transition. Only with greater energy efficiency and the use of renewable energies can the era of cheap fossil energy be left behind. And only by doing so will an effective contribution be made to fight climate change. Cities are once again called upon. The *Energiewende* (energy transition) can only be successful if it is not considered as an isolated task but rather if it is embedded in integrated urban development strategies. This requires extraordinary economic, social, ecological and cultural sensitivity."

– International Conference 'Urban Energies' Berlin, October 2012. German Federal Ministry of Transport, Building and Urban Development

Annex 1.

Capitalisation process and methodology

The first meeting of the core group of the URBACT workstream 'Building Energy Efficiency in European cities' took place in Paris in July 2012; the core group members, five expert witnesses and the director of the URBACT Secretariat attended. In the first part the workstream co-ordinator outlined to the core group members the history, structure and objectives of the URBACT programme, the 2012 capitalisation process, the purpose of this workstream, the role of the core group, the specific tasks assigned to each member, and finally the rationale and objectives of the forthcoming hearing.

The workstream core group then heard evidence from the following:

- Frédérique Calvanus – *Eco restoration as green growth factor for European historic cities: The experience of Bayonne*
- Martin Seelinger – *Energy efficient refurbishment projects: case studies from Germany to identify gaps and potentials in technology, policies, regulations, skills etc.*
- Eleni Goni – Architects' Council of Europe: *The contribution of European funded projects to develop energy efficiency in the building sector and experience of the IEE SHELTER Project*.
- Jan Dictus – URBACT CASH Thematic Network: *Policies for energy efficient housing – experiences from EU cities*
- Peter Schilken – Energy Cities, Covenant of Mayors: *EU Networking as a tool to support energy efficiency planning and implementation – the experience of the Covenant of Mayors*

The second witness hearing took place in Milan in November 2012. It provided an opportunity for the core group to finalise preparations for the URBACT conference in Copenhagen.

Among the experts giving evidence were Maria Berrini, Head of the Territorial, Environment and Mobility Agency of Milan, AMAT, who made a contribution on *Policies for energy efficiency in the Municipality of Milan*. Stefanie Ubrig, project officer at INTERACT, briefed the group on the MARIE and ELiH-MED[12] projects and the policy paper (*Answers to energy efficiency in buildings and challenges*) that is being developed by both projects; she also described how the Mediterranean Lab Group is promoting capitalisation of energy efficiency in buildings in the Mediterranean area. Anna Maria Pozzo, consultant at Federcasa and Cecodhas / Powerhouse Europe Project spoke on the key role of the housing sector to promote sustainable urban development.

The group visited an exemplary eco-restoration project, the *Cascina Cuccagna*, for a guided tour of the XVII century farmhouse among the tall apartment buildings of the Porta Romana area, including over 4,000 m^2 of covered spaces and garden.

Francesco Cricchio, material engineer at D'Appolonia, Genoa, described the FP7 project *IREEN – ICT Roadmap for Energy Efficient Neighbourhood*. Adrian Joyce, secretary general of EuroACE, explained the current Renovate Europe campaign strategy and targets, and Dr Aniko Dobi-Rozsa, managing and finance director at Global Environmental Social Business Budapest spoke on

12 MARIE = Mediterranean Building Rethinking for Energy Efficiency Improvement; ELiH-MED = Energy Efficiency in Low Income Housing in the Mediterranean

Financing retrofit projects in the housing sector: case studies from Eastern Europe and the UK. Francesco Tutino of the Energy Unit, Municipality of Bologna, presented *GovernEE – Good Governance in Energy Efficiency*. Prof. J Owen Lewis outlined some innovative Irish programmes on building energy efficiency and Ricciarda Belgiojoso, Professor at the Politecnico di Milano, closed the hearing with an inspiring contribution on *Art Practices and Sound Design for Sustainable Urban Development*.

Other national and international special guests included Antoaneta Tsanova, LEED Associate from Bulgaria, Sara Van Rompaey, architect from Belgium, Chiara Wolter from Milan/Ambiente Italia, Martin Seelinger and Juergen Rauch, architects from Germany and Carlo Venegoni, responsible for the *Milano che Cambia* project for the Milan Chamber of Architects.

During the **2012 URBACT Annual Conference**, the workstream organised a series of workshops on the theme *Retrofitting our way out of recession!* Four parallel workshops took place, to stimulate dialogue and active participation from all the attendees in order to gain concrete feedback on the following key questions:

- Tackling fuel poverty, reducing energy bills, notably in the 25 million social housing units, in a realistic cost-benefit perspective
- Sustainable financial tools to drive retrofitting while boosting economic activity, considering the effectiveness of each tool in mainstreaming large/scale retrofitting
- What can cities do to improve energy efficiency in historic buildings, solving the conflict between heritage and energy efficiency, revitalising historic centres, etc.
- How can the demand for, and appeal of, retrofit be stimulated (subsidies, citizens' participation, addressing single houses and condominiums, urban/rural specificities... How to find the best strategy to boost retrofit?

Workstream participants

Core Group Members

- Antonio Borghi, Lead Expert of the URBACT LINKS Thematic Network and coordinator of the URBACT workstream 'Building Energy Efficiency in European cities'
- Marco Pozzo, Polytechnic of Milan
- Kleopatra Theologidou, City of Veria, partner in the URBACT LINKS Thematic Network, Greece
- Emilio D'Alessio, European Sustainable Cities and Towns Campaign
- Paul Ciniglio, Sustainability Strategist, First Wessex
- J Owen Lewis, Former CEO of the Sustainable Energy Authority of Ireland (SEAI), Professor Emeritus, UCD Dublin

Witnesses

- Frédérique Calvanus, City of Bayonne, Lead Partner of the URBACT LINKS Thematic Network, France
- Eleni Goni, Architects' Council of Europe, Brussels
- Martin Seelinger, Architect, Darmstadt
- Peter Schilken, Project manager, Energy Cities
- Jan Dictus, Lead Expert of the URBACT CASH Thematic Network
- Anna Maria Pozzo, CECODHAS consultant
- Stefanie Ubrig, Project manager, INTERACT, Valencia

- Xavier Martí i Ragué, Government of Catalonia, Barcelona
- Francesco Cricchio, Material Engineer, D'Appolonia, Genoa
- Adrian Joyce, Renovate Europe Campaign, EuroACE, Brussels
- Aniko Dobi-Rozsa, Managing and Finance Director at Global Environmental Social Business GESB, Budapest
- Francesco Tutino, Head of Energy Department, Municipality of Bologna
- Ricciarda Belgojoso, Site specific public art professor, Polytechnic of Milan

Special Guests

- Maria Berrini, Head of Territorial, Environment and Mobility Agency of Milan, AMAT
- Alfredo Spaggiari, Head of Urban Center Milan
- Chiara Wolter, Project manager, Ambiente Italia, Milan
- Emanuela Plebani, Cascina Cuccagna
- Antoaneta Tsanova, Architect, Sofia
- Sara Van Rompaey, Architect, Gent
- Juergen Rauch, Architect, Munich

Annex 2.

European Territorial Cooperation projects and programmes working on energy efficiency

ESPON

ESPON Climate (Climate Change and Territorial Effects on Regions and Local Economies in Europe) – http://www.espon.eu/main/Menu_Projects/Menu_AppliedResearch/climate.html

ReRisk (Regions at Risk of Energy Poverty) – http://www.espon.eu/main/Menu_Projects/Menu_AppliedResearch/rerisk.html

List of programmes provided by INTERACT

- **Spain-France-Andorra**

REHABITAT – Promotion of social cohesion and eco-efficiency through the restoration of social housing http://www.adigsa.cat/wps/portal/rehabitat

ENERTIC – Energy efficient business centre http://enertic.eu/es

- **South-West Europe**

E4R - Energy efficient restoration of existing buildings http://www.e4rproject.eu

EnerBuilCa – Life Cycle Assessment for Energy Efficiency in Buildings http://www.enerbuilca-sudoe.eu

Ecohabitat – Sustainable social housing http://www.ecohabitat-sudoe.eu

Mi Ciudad AC2 – Local policies for climate change mitigation http://www.miciudadac2.eu

- **MED**

Marie – Mediterranean strategy for the energy efficiency of buildings http://www.marie-medstrategic.eu/projet.html (MED)

Elih-Med – Energy Efficiency in Low Income Housing in the Mediterranean http://www.elih-med.eu/Layout/elih-med (MED)

- **Spain-Portugal**

ESOL – Local Sustainable Energy http://www.esol-project.com

RED_GENERA - Competitive recycling sector for the region http://www.redgenera.org/

ALTERCEXA and ALTERCEXA_II – Promotion of renewable energies in the building and industrial sector http://www.altercexa.eu

- **Baltic Sea Region**

Urb.Energy - promoting sustainable and holistic rehabilitation of the residential areas in the Baltic Sea Region www.urbenergy.eu

Baltic Biogas Bus - increasing the use of biogas buses in cities within the Baltic Sea Region www.balticbiogasbus.eu

COOL Bricks – improving energy efficiency in buildings www.co2olbricks.eu

- **Hungary-Austria**

ESP - Energy Information Service Package for Businesses: http://www.wien.gv.at/wirtschaft/eu-strategie/eu-foerderung/etz/projekte/esp.html

- **INTERREG IVA North Programme (Sweden, Finland & Norway)**

IEEB – Increasing Energy Efficiency in Buildings, http://www.oamk.fi/hankkeet/ieeb/

HIGHBIO (developing an alternative for a high refinement of bio energy), http://www.interregnord.com/en/projects/north/2-research-development-and-education/highbio.aspx

- **Central Baltic INTERREG IVA (Estonia, Finland, Latvia & Sweden)**

Baltic cooperation in energy efficiency and feasibility in urban planning, http://www.balticenergy.info/web/page.aspx?sid=7427

ECOHOUSING – Energy Efficient Ecological Housing, http://www.tts.fi

ECO-SUPPORT ACTIVITY – Working together for a better environment, http://www.centralbaltic.eu/component/content/article/6-project-info/293-eco-support-activity-working-together-for-a-better-environment

- **South Baltic CBC programme (Poland, Sweden, Germany, Denmark & Lithuania)**

Increasing Energy Saving though Conversion LED lighting in Public Space (LED), http://www.ledlightproject.eu/

Innovation in District Heating (Inno-Heat), http://en.southbaltic.eu/db/index.php?p=6&id_db=4&id_record_=344;

- **CBC INTERREG IVA Germany-Netherlands**

Stoken op Streekhout- Energiequelle Wallheck - waste products of typical local wooded banks as sustainable energy source, http://www.energiequelle-wallhecke.de/nl/start

- **North Sea programme**

Build with Care - Mainstreaming energy - efficient building design, contributing to a new EU building directive http://www.northsearegion.eu/ivb/projects/details/&tid=74&back=yes

North Sea Sustainable Energy Planning - a future oriented development on regional level by an energy oriented approach, new methods, roadmaps and tools for sustainable energy planning http://www.northsearegion.eu/ivb/projects/details/&tid=120&back=yes

- **INTERREG IVB, North-West Europe**

Livinggreen.eu - nine organisations and municipalities in five countries help to create the conditions for a 'living green' lifestyle in North-West Europe's beautiful and characteristic cities. http://www.livinggreen.eu

INTERREG IVC

EnercitEE – European networks, experience and recommendations helping cities and citizens to become Energy Efficient

SERPENTE – Surpassing Energy Targets through Efficient Public Buildings

IMEA – Integrated Measures for an Energy Efficiency Approach

RE-GREEN – REgional policies towards GREEN buildings

IMAGINE – IMAGINE Low Energy Cities

PLUS – Public Lighting Strategies for Sustainable Urban Spaces

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URBACT II PROJECTS

PROJECTS	ISSUES ADDRESSED	LEAD PARTNERS
1ST CALL PROJECTS (2008-2011)		
Active A.G.E.	Strategies for cities with an ageing population	Roma – IT
Building Healthy Communities*	Developing indicators and criteria for a healthy sustainable urban development	Torino – IT
CityRegion.Net	Urban sprawl and development of hinterlands	Graz – AT
Co-Net	Approaches to strengthening social cohesion in neighbourhoods	Berlin – DE
Creative Clusters	Creative clusters in low density urban areas	Obidos – PT
C.T.U.R.	Cruise Traffic and Urban Regeneration of port areas	Napoli – IT
EGTC	Sustainable development of cross-border agglomerations	Mission Opérationnelle Transfrontalière – FR
FIN-URB-ACT	SMEs and local economic development	Aachen– DE
HerO*	Cultural heritage and urban development	Regensburg – DE
HOPUS	Design coding for sustainable housing	University La Sapienza, Roma – IT
JESSICA 4 Cities	JESSICA and Urban Development Funds	Regione Toscana – IT
Joining Forces	Strategy and governance at city-region scale	Lille Metropole – FR
LC-Facil	Implementing integrated sustainable urban development according to the Leipzig Charter	Leipzig – DE
LUMASEC	Sustainable land use management	University of Karlsruhe – DE
MILE*	Managing migration and integration at local level	Venice – IT
My generation	Promoting the positive potential of young people in cities	Rotterdam – NL
NeT-TOPIC	City model for intermediate/peripheral metropolitan cities	L'Hospitalet de Llobregat – ES
Nodus	Spatial planning and urban regeneration	Generalitat de Catalunya – ES
OPENCities*	Opening cities to build-up, attract and retain international human capital	Belfast – UK
REDIS	Science districts and urban development	Magdeburg – DE
RegGov*	Integrated policies and financial planning for sustainable regeneration of deprived areas	Duisburg – DE
REPAIR	Regeneration of abandoned military sites	Medway – UK
RUnUp	Strengthening potential of urban poles with triple helix partnerships	Gateshead – UK
Suite	Sustainable housing provision	Santiago de Compostela – ES
UNIC*	Promoting innovation in the ceramics sector	Limoges – FR
URBAMECO*	Integrated sustainable regeneration of deprived urban areas	Grand Lyon – FR
Urban N.O.S.E.	Urban incubators for social enterprises	Gela – IT
WEED	Promoting entrepreneurship for women	Celje – SI
2ND CALL PROJECTS (2009-2012)		
ACTIVE TRAVEL	Promoting walking and cycling in small and medium-sized cities	Weiz – AT
CASH*	Sustainable and affordable energy efficient housing	Echirolles– FR
ESIMeC	Economic strategies and innovation in medium-sized cities	Basingstoke and Deane – UK
EVUE	Electric Vehicles in Urban Europe	Westminster – UK
LINKS	Improving the attractiveness and quality of life in old historical centres	Bayonne – FR
OP-ACT	Strategic positioning of small and medium-sized cities facing demographic changes	Leoben – AT
Roma-Net*	Integration of the Roma population in European cities	Budapest – HU
SURE	Socio-economic methods for urban rehabilitation in deprived urban areas	Eger – HU
TOGETHER	Developing co-responsibility for social inclusion and well-being of residents in European cities	Mulhouse – FR
3RD CALL PROJECTS (2012-2015)		
4D Cities	Promoting innovation in the health sector	Igualada – ES
CITYLOGO	Innovative city brand management	Utrecht – NL
Creative SpIN	Cultural and Creative Industries	Birmingham – UK
CSI Europe	Role of financial instruments (Jessica Urban Development Fund) in efficient planning	AGMA Manchester – UK
ENTER.HUB	Railway hubs/multimodal interfaces of regional relevance in medium sized cities	Reggio Emilia – IT
EUniverCities	Partnerships between cities and universities for urban development	Delft – NL
Jobtown	Local partnerships for youth employment opportunities	Cesena – IT
My Generation at Work	Youth employment with focus on enterprising skills and attitudes	Rotterdam – NL
PREVENT	Involving parents in the prevention of early school leaving	Nantes – FR
RE-Block	Renewing high-rise blocks for cohesive and green neighbourhoods	Budapest XVIII District – HU
Sustainable Food in Urban Communities	Developing low-carbon and resource-efficient urban food systems	Brussels Capital – BE
URBACT Markets	Local markets as drivers for local economic development	Barcelona – ES
USEACT	Re-utilizing existing locations to avoid land consumption	Napoli – IT
USER	Involving users and inhabitants in urban sustainable planning	Agglomeration Grenoble Alpes Metropole – FR
WOOD FOOTPRINT	Local economic development through the (re)use of brownfield and buildings of the wood furniture sector	Paços de Ferreira – PT

*Fast Track Label

URBACT is a European exchange and learning programme promoting integrated sustainable urban development.

It enables cities to work together to develop solutions to major urban challenges, re-affirming the key role they play in facing increasingly complex societal changes. URBACT helps cities to develop pragmatic solutions that are new and sustainable, and that integrate economic, social and environmental dimensions. It enables cities to share good practices and lessons learned with all professionals involved in urban policy throughout Europe. URBACT II comprises 400 different-sized cities and their Local Support Groups, 52 projects, 29 countries, and 7,000 active stakeholders coming equally from Convergence and Competitiveness areas. URBACT is jointly financed by the ERDF and the Member States.

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