

WP 7: National and EU Policy Recommendations

Recommendations for local, national and EU policy on retrofitting multi-occupancy, mixed tenure buildings.

FULL REPORT

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Lead organisation: Centre for Sustainable Energy (UK)

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CONTENTS

1	Summary	4
2	Introduction	5
2.1	Aims and objectives	5
2.2	Methodology	5
3	Policy background	8
3.1	EU law and energy efficiency of buildings	8
3.2	Energy Performance in Buildings Directive.....	9
3.3	National policy context	11
4	Discussion of barriers and opportunities.....	20
4.1	Key barriers and opportunities	20
4.2	Results from case study partner questionnaires	20
4.3	Issues related to EPBD and EPCs.....	28
4.4	Issues from stakeholder feedback and policy analysis	31
5	Good practice examples.....	43
6	EU wide policy recommendations.....	46
6.1	List of core recommendations	46
6.2	Recommendations linked to key issues	47
6.3	LEAF policy recommendations specific to the EPBD	50
7	National policy recommendations.....	52
8	Recommendations for further research	66
Annex 1: Implementation of the EPBD in each partner country		69
Austria		69
France		70
Germany.....		72
Hungary.....		73
Sweden		74
UK		75

1 Summary

Low Energy Apartment Futures (LEAF) is a European-wide project to improve the energy efficiency of apartment blocks. It aims to identify and overcome key barriers to retrofitting these properties. The project is funded by the EU's Intelligent Energy Europe (IEE) programme and partner organisations in six countries.

Background

Energy use in homes makes up a quarter of energy-related greenhouse gas emissions in Europe and the EU has committed to a 20% reduction in these by 2020 from 1990 levels. An estimated 43% of the European population live in apartment blocks, but this is a sector that is greatly overlooked in policy and in practice. Retrofitting apartment blocks is more complex than other domestic buildings and there are additional challenges to overcome, but there are also great opportunities for achieving significant energy savings and reductions in greenhouse gas emissions.

The three year LEAF project included the development of toolkits for retrofitting apartment blocks and pilot retrofit projects on 24 case study buildings. Feedback has been collected from a wide range of stakeholders involved in multi occupancy retrofit projects, and extensive policy research and analysis has been carried out. As such LEAF partners are in a unique position to make policy recommendations, based on recent experience of carrying out retrofit projects in six European countries, to improve retrofit of multi occupancy buildings across Europe.

Key findings and recommendations

A key issue to improving apartment blocks identified through the LEAF project was the financial barrier (including funding schemes, financial incentives and difficulties in agreeing personal contributions for improvements which affect multiple householders within a building). However this is far from being the only challenge. For retrofit to be successful, additional effort must also go into addressing the difficulties associated with buildings under multiple ownership. These include information provision, engagement of building occupants and other stakeholders, and working with installers on technically complex retrofit projects. There are also specific legal and regulatory barriers to overcome, such as decision making with multiple stakeholders, limitations of EPCs, requirements for minimum standards and planning regulations.

Recommendations were developed in response to these key issues and include calls for:

- improvements to EPC methodology and accreditation schemes
- changes to the format and content of EPC reports
- improvements to public funding schemes
- expansion of financial support initiatives
- introduction of more stringent minimum standards
- improved information provision on low carbon retrofit
- upskilling of the workforce
- implementation of maintenance plans and improved management structures in multi occupancy buildings

2 Introduction

2.1 Aims and objectives

This report aims to provide recommendations for local, national and EU policy on retrofitting multi-occupancy, mixed tenure buildings.

The policy recommendations are designed to address a range of issues broadly affecting the uptake of energy efficiency measures (as recommended in an EPC) in multi-occupancy buildings. Where applicable, recommendations address relevant regulations and initiatives which impact both on the overall retrofit process in multi occupancy buildings, and on the installation of specific measures, such as communal heating/power solutions; internal and external insulation; and measures appropriate in protected (historic) multi-occupancy buildings.

This report reflects a package of work within the Low Energy Apartment Futures (LEAF) project which has the following objectives:

- 1 Analysis and assessment of existing policy relating to uptake of EPC recommendations in partner countries and at the EU level, and how it may be better applied to multi-occupancy buildings.
- 2 Identification of changes or additional policies that may aid and promote retrofit of multi-occupancy buildings.
- 3 Utilisation of evidence from project pilots and stakeholder interviews to provide justification for these changes.
- 4 Presentation of recommendations within the wider context of local, national and EU targets for carbon emission and energy reduction.
- 5 Facilitation of local and national policy changes through dissemination events.

2.2 Methodology

The policy recommendations are the result of extensive policy research, practical retrofit experience on case study buildings, and engagement with stakeholders (summarised in Figure 2-1).

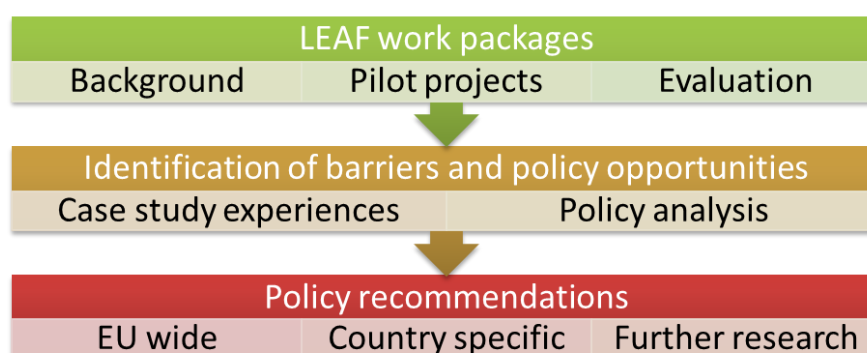


Figure 2-1: Methodology for producing policy recommendations

The work involved in creating the policy recommendations draws on findings from three other LEAF work packages: background research on national carbon emissions and energy reduction policies to inform the delivery of the LEAF toolkits (WP2), delivery of pilot retrofit projects (case study buildings) in partner countries (WP5), and monitoring and evaluation including stakeholder consultation and feedback (WP6).

These inputs were used as the basis for further work exploring barriers and policy opportunities in the retrofit of multi occupancy buildings as part of the LEAF work package solely looking at policy recommendations (WP7). This used: experiences from case study buildings (questionnaires, discussions with partners, identification of lessons learned); further policy analysis including a review of EPBD implementation in the partner countries, identification of other relevant policies, review of policy impact and relevance, and cross country comparisons.

The key barriers and opportunities were then used to draw out and refine policy recommendations, leading to:

- Examples of best practice
- A core set of policy recommendations relevant across all partner countries
- Specific national recommendations
- Recommendations for further research

Case studies and questionnaires

As part of the LEAF project, seven partner organisations identified a selection of multi-occupancy, mixed tenure buildings to work with and offer support to install energy efficiency and low carbon measures¹. Partners' experiences of identifying and working with these pilot project case study sites has provided a wealth of learning and lessons about the challenges, barriers and opportunities for retrofitting multi-occupancy buildings. Some of these are country-specific, whilst others apply across many (or all) countries.

Work on the case study buildings spanned two and a half years (April 2013 to December 2015), although initial contact with many of the buildings was made prior to the project starting (late 2012). To help monitor progress and capture lessons from this aspect of the project, all partners kept a record of key communications and actions at each site. These were then reviewed in detail to develop an in-depth understanding of the key processes, challenges and success factors in implementing energy efficiency measures at each site.

A questionnaire was also developed to capture partner's perceptions of barriers and success factors in retrofitting multi-occupancy buildings based on their experiences of working on the case study buildings, their considerable expertise in this sector (outside the LEAF project), and also building on the findings from previous LEAF activity (WP2) which explored perceived barriers and opportunities to retrofit. It listed a number of factors associated with retrofitting multi-occupancy buildings. Project partners were asked to rate each factor

¹ The eighth partner, FLAME, did not directly work with case study buildings but worked with local energy agencies in France involved in the pilots.

according to how much it applies to their experiences working on case study buildings, which triggered further discussion and exploration of the issues. Results are discussed below.

Further research and policy analysis

Responses to the first round of questionnaires (carried out in October 2014) were used to guide the development of early policy recommendations, discussed at partner meetings throughout 2015.

Between April 2014 and October 2015, further policy research and analysis was carried out, identifying and exploring local, national and EU level policies in partner countries, examining their relevance, usefulness, and potential for replication, with a particular focus on policy recommendations based on case study experiences. Further input from partners and stakeholders was also taken into account and used to help shape and prioritise the recommendations, drawing on findings from:

- local and national stakeholder meetings and events
- additional feedback from partners experiences with case study buildings
- toolkit evaluation

Policy recommendations were further developed and then discussed, revised and finalised as a collective at the October 2015 and December 2015 partner meetings².

² Includes online meetings

3 Policy background

This section of the report presents a brief overview of EU law and EPC regulations, to provide context for the policy recommendations that follow. LEAF papers 2.1 'Report on background context within each partner country' and 2.2 'Recommendations for toolkit development' provide more background on the situation in each of the project partner countries.

3.1 EU law and energy efficiency of buildings

The Energy Union strategy, launched in February 2015 as one of the EU's ten priority areas for action, has five areas of focus, one of which is 'Energy efficiency contributing to a moderation of demand'. The strategy identifies improvements to energy efficiency in buildings as crucial.

The 2010 Energy Performance of Buildings Directive (EPBD) and the 2012 Energy Efficiency Directive (EED) represent the EU's principle legislation governing energy consumption in buildings. The key areas of legislation addressed by each of these Directives is summarised in Box 3-1. The EPBD is the principle legislation of relevance to the LEAF project. Further information about the requirements of these Directives is presented below. Information about progress with implementation in each LEAF partner country is provided in Annex 1.

Box 3-1: Principle EU legislation addressing the energy performance of buildings

Energy Performance of Buildings Directive	Energy Efficiency Directive
<ul style="list-style-type: none">• Certification of building energy performance• Inspection of heating and air conditioning systems• A target for all new developments to be 'nearly zero buildings' (NZB) by the end of 2020• Setting minimum energy performance requirements• Financial support mechanisms to improve the energy efficiency of buildings	<ul style="list-style-type: none">• Energy efficient improvements in at least 3% of government-owned and occupied buildings• Energy efficiency a priority in government building procurement• Long-term national building renovation strategies to be established through National Energy Efficiency Action Plans

Several other policies are also worth mentioning, but are less relevant than the EPBD and the EED in terms of the scope of this project:

- Directive on Minimum Levels of Energy Taxation, which affects retrofit because taxes on fuel used for domestic space and water heating makes different heating systems, and addressing insulation levels, more or less attractive from a cost-benefit perspective.
- Renewable Energy Directive, which is responsible for support (including subsidies) for renewable energy technologies including domestic scale heat and electricity generation.

- Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) ('The Boiler Directive'), which sets minimum standards for energy efficiency of boilers.
- Buildings provisions in the SAVE Directive (93/76/EEC)
- Directive 2006/32/EC on energy end-use efficiency and energy services
- Energy Labelling Directive
- Ecodesign Directive
- Community framework for the taxation of energy products and electricity (Directive 2003/96/EC)

3.2 Energy Performance in Buildings Directive

Under the Kyoto Protocol, the EU is committed to maintaining the global temperature rise below 2°C and reducing overall greenhouse gas emissions by at least 20% below 1990 levels by 2020 (by 30% in the event of an international agreement being reached).

Buildings account for 40% of total energy consumption (36% of carbon dioxide emissions) in the EU and some 35% of the EU's buildings are over 50 years old³. Improving energy efficiency standards and increasing the use of energy from renewable sources in this sector therefore constitute a vital part of delivering on the EU's commitment to the Kyoto Protocol. The EPBD is a key legislative instrument for reducing the energy consumption of buildings in EU Member States. Three of the five requirements of the EPBD are relevant to the LEAF project ((1), (2) and (5) – see Box 3-2) and described further below.

Box 3-2 Requirements of the EPBD (2010/31/EU)

1. Provide an energy performance certificate at the point of sale or rental of buildings;
2. Establish inspection schemes for heating and air conditioning systems or put in place measures with equivalent effect;
3. Ensure all new buildings are nearly zero energy buildings by 31 December 2020 (public buildings by 31 December 2018);
4. Set minimum energy performance requirements for new buildings, for the major renovation of buildings and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls, etc.);
5. Establish national financial measures to improve the energy efficiency of buildings.

Minimum Requirements and Certification

Under the EPBD, Member States (MS) must establish and apply minimum energy performance requirements for new and existing buildings and ensure the certification of building energy performance.

³ <http://ec.europa.eu/energy/en/topics/energy-efficiency/buildings>

It is up to each Member State to set its own minimum requirements for the energy performance of buildings, under the proviso that these requirements should allow for a “cost-optimal” approach to delivery. ‘Cost-optimal’ is defined as “*the energy performance level which leads to the lowest cost during the estimated economic lifecycle*” (Article 2.14) – i.e. the cost of improvements are in balance with the energy cost savings over the lifetime of the building. Whilst a minimum energy performance requirement must be established to adhere to this cost-optimal level, how cost-optimal is calculated and the level of the performance is up to each MS.

The EPBD also requires MS to implement mandatory certification of buildings (new and existing). Articles 11 and 12 of the EPBD (2010/31/EU) set out the requirements for ensuring the standards of building energy performance through Energy Performance Certificates (EPCs), as follows:

“The prospective buyer and tenant of a building or building unit should, in the energy performance certificate, be given correct information about the energy performance of the building and practical advice on improving such performance... The energy performance certificate should also provide information about the actual impact of heating and cooling on the energy needs of the building, on its primary energy consumption and on its carbon dioxide emissions.”

The requirement for recommendations on EPCs for cost-effective measures that could improve the energy performance of a building place presents a key opportunity and role for EPCs in driving improvements in the energy efficiency of the EU’s housing stock.

Whilst the requirement for EPCs is valid in all EU MS, there is a degree of flexibility as to how this is implemented. For example, the Directive states that an EPC has to be issued in an independent manner by a qualified and/or accredited expert, but the assessment methodology (how the energy performance of buildings is calculated) “*may be differentiated at national and regional level*”.

Whilst the European Commission supports a certain harmonization of the implementation of the EPBD across MS (for example by proposing to use international (CEN⁴) standards for the assessment and by requesting that all MS evidence that their minimum energy performance requirements are “cost-optimal”) the actual day-to-day and practical implementation of the Directive varies from one country to the next. As a result, EPCs are not directly comparable between different countries.

Support Initiatives

The EPBD requires the application of financing and other instruments to facilitate and support improvements in the energy efficiency of buildings in each MS. The nature and design of policies, programmes and interventions will have significant implications for the uptake of measures. This is particularly important in the context of the LEAF project to understand the potential drivers and barriers to installing measures in the pilot projects.

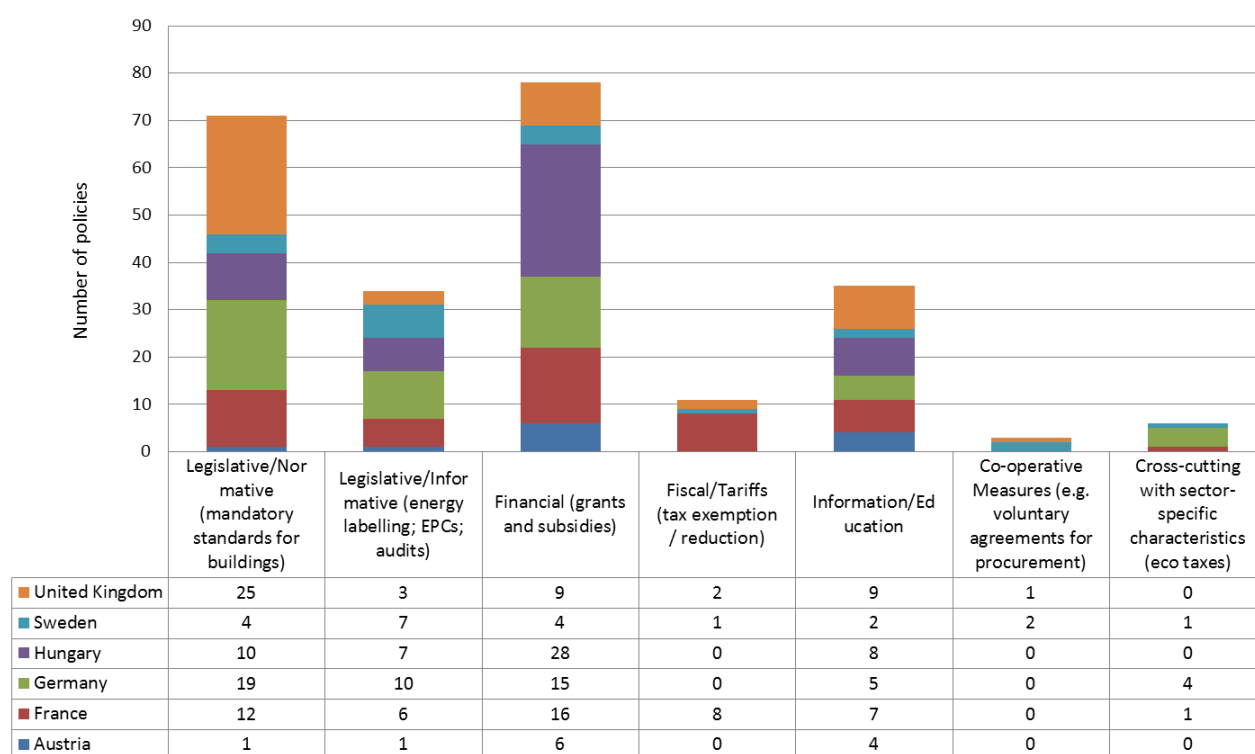
⁴ CEN is the European Committee for Standardization - an association that brings together the National Standardization Bodies of 33 European countries.

3.3 National policy context

Under previous work carried out through the LEAF project⁵ comparisons have been carried out on national and local policies and legislation, prevalence of multi-occupancy housing, the EPC situation and finance mechanisms in partner countries. In order to refine policy recommendations, relevant national policies have been examined in more detail.

Across the European Union Member States, there are a very large number of policies and policy instruments which aim to improve energy efficiency in buildings. That number reduces when policies are narrowed down to those which specifically impact on retrofit of measures in existing multi occupancy buildings (i.e. excluding new buildings and individual owner-occupied dwellings). Nonetheless the ODYSSEE and MURE Databases⁶ identify several hundred policy instruments and measures (current, completed and proposed) for energy efficiency policy measures in the six LEAF partner countries (see **Hiba! A hivatkozási forrás nem található.**).

Figure 3-1: Policy instruments and measures (by measure type) in the residential sector implemented in LEAF partner countries



Source: MURE database, November 2014 <http://www.odyssee-mure.eu/http://www.odyssee-mure.eu/>

⁵ http://www.lowenergyapartments.eu/wp-content/uploads/2014/01/LEAF_Background_Context_D2.1_Jan14.pdf

⁶ www.odyssee-mure.eu and www.measures-odyssee-mure.eu/summarytype_mr.asp

Based on examination of national policies and discussions with LEAF partner organisations, national policies of relevance have been identified and are listed in the tables below. Making use of these policies, and in some cases making improvements to them, provides opportunities to facilitate retrofit in multi occupancy buildings. Note these policies are in addition to the EU wide legislation, including the EPBD, explained above.

*Key to policy type abbreviations used in tables below:
 'Information' means information provision; 'Demand' refers those policies directed at creating demand; 'Supply' to those affecting the supply chain; 'Financial' includes funding and fiscal measures; 'Regulatory' includes legal and regulatory policy.*

Austria

Policy	What is it	Type	Relevance
Minimum thermal standards for buildings	Definition of holistic refurbishment and minimal standards	Regulatory	High
Residential building subsidy, local to Vienna	Subsidy for building refurbishment, where the amount depends on the energy standard after renovation	Financial	Medium / high
Residential building subsidy, national (Sanierungsscheck)	Grants for energy efficiency improvements for households and businesses	Financial	Medium
Energy Efficiency Law	National standards for energy efficiency	Regulatory	Currently low; but high potential
klima:aktiv building	New standards for efficient buildings	Information	Low
Energy advice for householders	Information provision	Information	Low
Smart Metering and Informative Billing	Smart meter rollout	Information	Low
EU-related: Energy Performance of Buildings and Energy Certificates for Buildings (Energieausweis für Gebäude)	EPBD implementation	Regulatory	Low

France

Policy	What is it	Type	Relevance
Sustainable Development Tax Credit	30% tax credit for purchase and installation of energy efficient materials and equipment	Financial	High
VAT reduction on energy efficiency investments (fiscal)	Lower VAT on refurbishment works for buildings, including energy efficiency improvements	Financial	High; it helps with financing
OPAH subsidies for retrofitting for low income owner occupiers	Grants distributed by local government for renovation of older buildings	Financial	High; the low income owners are identified and vote for energy performance measures
Zero interest loan (individual or communal)	Loans to help finance improvements, from a list of 6 measures	Financial	High
ADEME subsidised energy audits	50% of the cost of carrying out an audit in buildings with individual heating systems	Financial, Information	High; information provision to small buildings
Relief from property tax on existing buildings		Financial	Low; it depends on city-level adoption, & very few cities choose to adopt
Mandatory energy performance diagnosis and audits in co-ownership properties with common heating system	Co-owned residential dwellings with 50+ lots, built before 2001 must undergo an independent energy audit with proposals for measures to improve energy performance of the building.	Regulatory, Information	High; it highlights energy consumption and measures that could be taken
ADEME energy-saving awareness campaign	TV, radio and press campaign backed up with call centres to provide information and advice to members of the public	Information	High; it creates a background noise of energy performance that motivates owners in conducting energy performance actions
Local energy information centres (EIE)	Co- financed by ADEME and local authorities, 241 centres across France provide energy advice to householders, and organisations.	Information	High; they give independent advice on project management
Energy efficiency of	Local authority led support to	Regulatory,	Low; it only concerns a

residential and tertiary buildings – Program OPATB	improve thermal and energy efficiency of residential and tertiary buildings.	financial, information	small area
Refurbishment plan for housing (PREH)	National programme to increase retrofit in private and social housing. 3 core elements: information and impartial advice; financial support for improvements; training and qualification of professionals.	Regulatory, financial, information	Related to local energy information centres
EPC (DPE) ratings in house purchases and leases	EPC ratings must be shown when properties are leased or sold.	Regulatory, Information	High, recent surveys show that buyers look for house with low energy consumption
2015 law for an energy transition: Requirement to include energy efficiency improvements with maintenance work	This created an obligation (from 2017 onwards) for energy efficiency work to be addressed at the same time as maintenance work (façade and roof) is carried out.	Regulatory	
2015 law for an energy transition: Planning permission for external wall insulation	The 2015 energy transition law gives power to French cities to set local planning permission in order to allow external insulation (overruling national laws)	Regulatory	
2015 law for an energy transition: decision making excludes people not present at AGM	Changes to decision making rules so that a majority of owners in a shared building <i>present at the general assembly</i> meeting can vote for improvements to be made.	Regulatory	
Fund for energy efficiency works/maintenance	Minimum of 5% of annual budget has to go into a bank account to pay for work	Financial	
“reconnu garant de l’environnement” certification for contractor	Minimum of qualification for contractor, Certification Needed to have access to subsidies	Financial Regulatory	

Germany

Policy	Type
Building Regulations	Regulatory
Energy Consultancy and Energy Checks of the Federation of German Consumer Organisations (Energieberatung und Energie-Checks der Verbraucherzentralen Bundesverband)	Regulatory, Information
BAFA Onsite Consultancy (BAFA Vor-OrtBeratung)	Information
Market Incentive Programme for Renewable Energies in Heat Market (Marktanreizprogramm für erneuerbare Energien im Wärmemarkt– MAP)	Financial
Energy efficiency checks (Caritas) (StromsparChecks für einkommensschwache Haushalte)	Information
Quality assurance and the optimization of existing energy consultation	Regulatory
Upgrading the CO2 Building Renovation Programme	Regulatory
Granting tax incentives for energy efficiency renovations	Financial
Smart Metering	Regulatory, Information
Energy Performance of Buildings (Directive 2002/91/EC). EU EPBD legislation mainly incorporated into the Energy Savings Ordinance (Energieeinsparverordnung-EnEV).	Regulatory
Crowd financing to raise funds to pay for energy efficiency improvements (with energy bill savings used to pay return to investors).	Financial

Hungary

Policy	What is it	Type	Relevance
Environment and Energy Efficiency Programme 2014-2020	Part of the European Commission Partnership Agreement with Hungary. Strategy for use of ESIF funds including shift to a low carbon economy, improved energy efficiency in buildings and more renewable energy generation.	Financial	High
Regulations on minimum standards of buildings and energy certificates	New upgraded minimum energy requirements came into force from 2015 and 2018 with the revised building regulations (7/2006 Decree of Ministry). To qualify for any public financial subsidy the retrofitted building has to meet these new requirements.	Regulatory	High
Mandatory EPC	Since 2012, EPCs have been required for all new buildings and for the sale or lease of existing properties. From 2014 legislation required the energy rate/band of the property to be shown in public advertisements (if available).	Regulatory	Medium
Green Investment Scheme (ZBR)	Investments and technology developments in energy production, district heating and energy efficiency in buildings, including subsidies.	Financial	High
National Energy Efficiency Action Plan	includes goal to develop a network of trained energy advisers to support householders and organisations with energy reduction	Regulatory	Medium
National Building Energy Strategy	Programme for 2014-2020, based on building stock survey, to launch a building energy support programme and meet Hungary's commitments in energy efficiency of buildings, facilitating low carbon retrofit.	Regulatory	Medium
National Strategy of Climate Change	Identifies national duties imposed by international treaties on climate change, and provides guidelines to harmonise climate protection with development policy. 2013 revision of 2008 strategy.	Regulatory	Low
National Energy Strategy	Contains detailed proposals for the Hungarian energy sector and decision-making to 2030, including a roadmap to 2050.	Regulatory	Low

Sweden

Policy	What is it	Type	Relevance
Building regulations (Planning and building law)	Regulations state that building work must limit energy use by minimising heat loss and need for cooling, ensuring efficient heating and cooling systems and electricity use. Maximum yearly energy use levels are set. Regulations for energy efficiency are for renovations as well as new buildings.	Regulatory	High importance
Energy Performance of Buildings Directive implementation	Requirements under the EPBD have largely been implemented in Sweden, including mandatory energy efficiency certificates for existing and new buildings, mandatory audits in large and small residential buildings, a national database of EPC reports, and EPCs carried out by registered experts.	Regulatory, Information	High importance
Good Built Environment	Includes targets for buildings and amenities to promote sustainable management of land, water and other resource within one generation.	Regulatory	Medium importance
Investment support for photovoltaic cells	Funding for solar PV under a grants programme administered by the County administrative boards (Länsstyrelsen) and open to households, companies and organisations	Financial	Low importance

UK

Policy	What is it	Type	Relevance
Green Deal and Energy Company Obligation (ECO).	Grants and subsidies for low carbon home improvements	Financial, Regulatory	Green Deal no longer running; ECO being reviewed. These schemes are (and will be) highly relevant as the main financial incentives for low carbon retrofit.
Feed in Tariff and Renewable Heat Incentive	Payments for generation of electricity and heat through renewable energy technologies	Financial, Regulatory	Highly relevant as key driver for domestic (and larger) renewable energy installations. Rates for the FIT are currently under review and likely to be reduced significantly whilst still being a good incentive and reducing the payback period considerably.
Smart Metering and Billing	Rollout of smart meters is starting across the UK.	Financial, Regulatory	Anticipate medium relevance to multi occupancy housing, with greater awareness of energy use being a potential driver for improvements.
EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Building Regulations	Implementation of EPBD in the UK.	Regulatory	Medium – this is a core driver for low energy retrofit and provides essential infrastructure driving policy, but does not direct funding or address consumer engagement.
Local planning policies including on designated heritage buildings and areas.	Building regulations and statutory planning	Regulatory	To date not widely used for neighbourhood sustainability improvements, the Localism Act devolved powers to local authorities, providing more scope for giving planning approval for low carbon improvements, with potentially high impact for retrofit.
Scottish Government target (set through the Housing (Scotland) Act 2001) to eradicate fuel poverty by 2016	Targets for Scotland to address fuel poverty levels	Regulatory	Whilst being an overall target, this manifests in local authorities' housing strategies and has low relevance currently.
Scottish Government target to reduce final energy consumption by 12% by 2020 (as part of Energy	Scottish targets to reduce energy use	Regulatory	Not yet achieved but potential to have high impact.

Efficiency Action Plan)			
Home Energy Scotland	Home energy advice and interest free loans for owner occupiers to install renewable energy	Information, Financial	High in Scotland, in particular for raising awareness of options, although the loans for renewable energy technologies are less relevant for most multi occupancy housing retrofit plans.
Resource Efficient Scotland	A programme delivered by Zero Waste Scotland which provides advice to businesses on energy reduction	Information	Low – principally for businesses and just in Scotland, but potential for landlords, management companies and letting agencies to access advice.
Home Energy Efficiency Programmes for Scotland (HEEPS)	Schemes for improving energy efficiency including: Affordable Warmth, Area Based Schemes (ABS) and the Energy Assistance Scheme.	Financial	High in Scotland.
Energy efficiency standard for social housing (ESSH)	New standard which has just come into force in Scotland to improve social housing stock. Social landlords have to meet specified EPC ratings (by property type) by 2020.	Regulatory	Medium in Scotland.
Tenements (Scotland) Act 2004	Outlines rights and duties of property owners in tenements. This combined with an amendment to the Climate Change Act, which logs insulation as a maintenance measure rather than an 'improvement' so changes can be approved via a majority rather than unanimously where it applies.	Regulatory	Potential to have high impact if applied more widely.
Public provision of EPC reports (England)	All EPC reports are publically available on the internet (via the EPC Register)	Information	Highly relevant as gives stakeholders information about the energy efficiency rating of properties and retrofit options.

4 Discussion of barriers and opportunities

This part of the report begins with a summary of the key challenges for retrofit in multi occupancy buildings. The three subsequent sections discuss in more detail how these barriers and opportunities were identified, by: presenting the results of the case study questionnaires; reviewing issues related to the EPBD and use of EPCs; explaining issues raised in stakeholder meetings, via local and national policy analysis and through feedback from the case study and toolkit evaluations.

4.1 Key barriers and opportunities

The key issues identified through partners' experiences in retrofitting case study buildings, policy analysis and stakeholder feedback and discussed below, are summarised in Figure 4-1.

INFORMATION PROVISION	DEMAND SIDE FACTORS	SUPPLY CHAIN ISSUES	FUNDING AND FINANCE	LEGAL AND REGULATORY
<ul style="list-style-type: none">• Understanding of energy use, including costs and benefits of improvements• Engaging stakeholders (occupiers, owners, agents)• Delivery of information provision• Quality of information available	<ul style="list-style-type: none">• Motivation and engagement• Communication and decision making barrier• Large number of stakeholders in multi occupancy buildings• Whole building approach• Access to reliable installers	<ul style="list-style-type: none">• Availability of tradespeople• Project management• Ambition of retrofit projects• Installer networks• Accreditation schemes• Proactive identification of opportunities• New and innovative measures	<ul style="list-style-type: none">• Split incentives, personal contributions, competing purchase decisions• Inconsistent and inaccessible funding schemes• Expansion of financial incentives• Range of funding mechanisms to incentivise take up	<ul style="list-style-type: none">• Planning and building regulations• EPC methodology and accreditation schemes• Improvements to EPCs• Minimum standards• Regulations for multi occupancy buildings

Figure 4-1 Key barriers and opportunities in retrofit of multi occupancy buildings

4.2 Results from case study partner questionnaires

The questionnaire was designed to capture experiences and learning from the LEAF partner organisations and the case study buildings where retrofit projects were piloted. The questionnaire was structured around four main themes (listed below). The issues emerging from the questionnaires are discussed in more detail under each theme heading. Figure 4-2 shows the average modal ratings in the questionnaire responses given to the different barriers identified in the questionnaires, grouped by theme heading. Although these averages do not account for significant differences experienced between countries (and in

some cases between case study buildings within the same country), they give a simple indication of the issues identified and the main barriers.

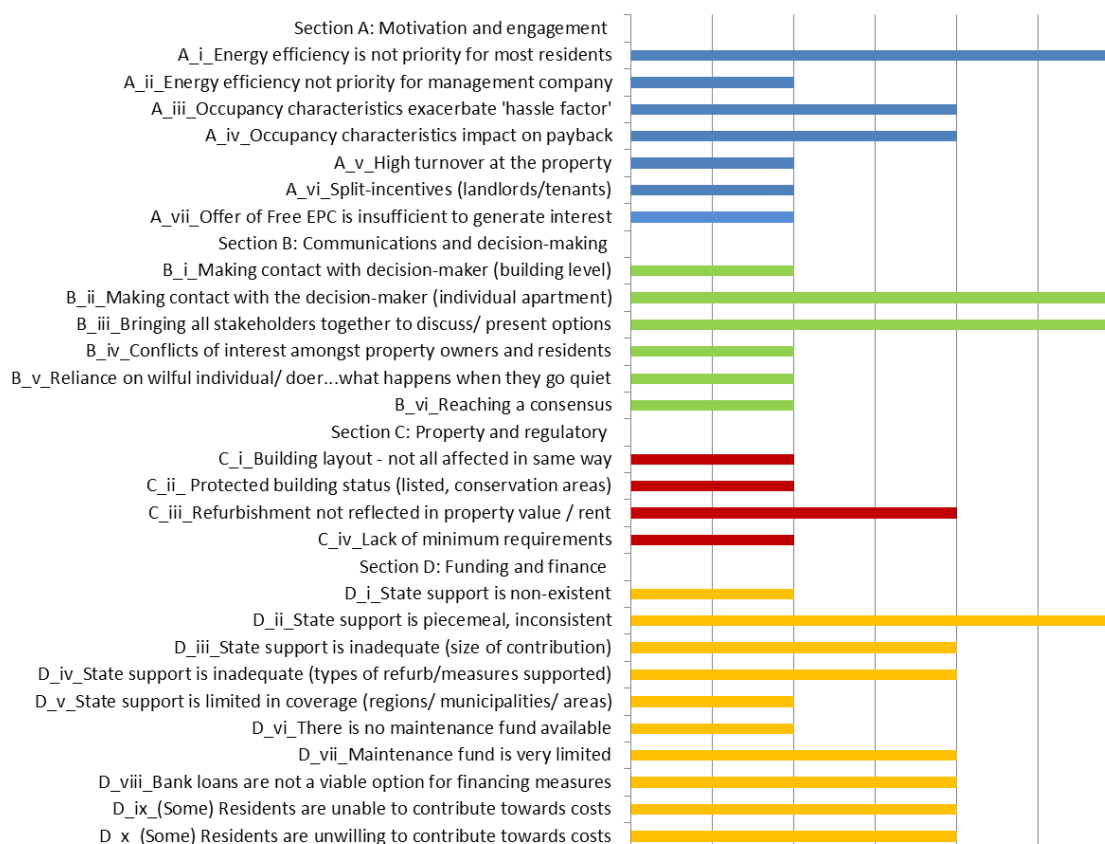


Figure 4-2: Overall ratings of motivational and engagement barriers to retrofit

The main themes used in questionnaire (and shown in Figure 4-2 above) were:

- Section A: Motivation and engagement
- Section B: Communications and decision-making
- Section C: Property and regulatory
- Section D: Funding and finance

Section A. Motivation and engagement

This section of the questionnaire covered issues associated with engaging residents in the retrofit process and their level of understanding of, and motivations for, installing energy efficiency measures. Feedback from project partners suggests that of the factors listed, energy efficiency not being a priority for residents and the length of payback period are, on average, the most significant barriers across all case studies (as shown by the highest average scores in Table 4.).

Energy efficiency being of low priority to residents appears a particularly significant barrier in the UK (England and Scotland) and Sweden. In the case of the former, this reflects

experiences in the LEAF project: despite the offer of very generous subsidies, project partners still faced major barriers in trying to persuade residents to install measures (or even be involved in the project through the offer of an EPC). In Sweden, the results should be viewed in the context of the case study location: being located in a World Heritage Site, preserving the appearance of buildings is important (and indeed there are strict regulations around what measures are permitted), which affects residents' willingness to undertake improvement works.

In Germany on the other hand the results from the case study questionnaire suggest that energy efficiency being a low priority is far less of an issue. Although resident engagement is still a factor in German multi occupancy buildings with a complex owner structure (particularly in the LEAF case studies), activity can be stimulated through the property management companies instead.

Differences in priorities given to energy efficiency improvements between different countries is interesting and whilst it is beyond the scope of the LEAF project to identify why this may be the case, it is likely to encompass a range of social, economic, political and cultural factors. Developing understanding of these factors is key to developing policy which helps move energy efficiency up the order of priorities.

Whilst energy efficiency being a low priority appears less of a barrier to retrofit in Germany, by contrast the length of payback period appears of slightly higher importance here compared to other partner experiences. Whilst this is partly due to the specific characteristics of occupants at one of the German case study sites (being of an older demographic, implementing measures that have long payback times is far less appealing to residents) it also suggests residents make decisions about retrofit on an economic, cost-benefit basis.

Payback periods appear less of an issue in Austria. This reflects the level of funding available, which includes state subsidies and low-cost loans, which make measures more affordable.

Another issue to note on motivational barriers is that of split-incentives where those responsible for paying energy bills and benefiting from energy saving improvements, (i.e. the occupiers), are not the same people that are responsible for deciding on and paying for energy efficiency improvements (usually the landlord or building owner). Because the owner is not resident and does not stand to benefit from many of the benefits of improvements to buildings such as reduced energy bills, there is less incentive for them to invest. In practice they may benefit through increases in property value or rent but this is not always recognised.

Low motivation to install energy efficiency improvements can also be seen in buildings where the heating and hot water systems are centralised and the cost is shared between residents based on apartment size (as is normally the case in Sweden). There is less incentive for those with lower bills to contribute to the high up front cost of implementing improvements. In Swedish cooperatives the problem is that monthly fees paid by residents include heating and hot water as well as other costs (e.g. maintenance, the cooperative's interests on loans and other overheads) aggregated into one bill. The energy costs are not separated out, so the savings from the energy efficiency improvements would have to be

substantial in order to reduce overall monthly fees. A large retrofit could in fact make the monthly fee higher, since the cooperative might need to take on a loan to pay for improvements. In the long run the retrofit might reduce costs for the cooperative but residents would see little difference on a day to day basis.

Table 4.2. Partner ratings of motivational and engagement barriers to retrofit

	Austria	England	France	Germany	Hungary	Scotland	Sweden	Overall
EE not priority for (most) residents	1.7	3.0	2.3	1.0	1.8	2.7	3.0	2.1
EE not priority for management co.	2.0	2.5	3.0	1.3	1.0	1.3	1.3	1.6
Hassle factor	1.3	3.0	1.0	1.7	1.8	1.3	2.0	1.7
Payback period & occupants	1.0	2.5	1.5	2.3	2.5	1.5	2.0	2.0
High turnover of residents	1.0	3.0	1.0	1.0	1.3	1.3	2.0	1.5
Split-incentives (tenants-landlords)	2.0	2.5	2.0	2.0	1.0	1.7	2.3	1.9
Free EPC offer insufficient to generate interest	3.0	2.0		1.0	1.5	2.3		1.9
Overall	1.7	2.6	2.1	1.4	1.5	1.7	2.1	1.8

Partners identified some additional factors specific to their experience with case study sites:

- Scotland:
 - Hassle factor can be even more of a barrier in places where major renovations have recently been done.
 - Holiday homes present a greater challenge with respect to payback time (lengthened by the fact the house is only occupied and using energy for short periods).
- France & Hungary: Low/ no turnover at the property can be a barrier (as moving house actually presents a key opportunity/ motivation to retrofit).
- France: EPC rating impacts positively on property value: buildings with F-rating are sold for 15% less than the same with D rating; A-rated are 10% more expensive than D-rated. This is therefore an opportunity rather than barrier.
- Germany:
 - Frequent changes in property management staff undermined progress with proposals for improvement measures.
 - Conversely, this can also be a positive, because the short term contracts drive a more competitive market, which means that property management companies are more likely to look to make improvements.
 - Preparing funding proposals takes a significant amount of time but is not paid for by the owners or factored into cost-benefit calculations, so the actual cost of work (including securing funding) is underestimated.
- Hungary: Decreasing energy prices presents the wrong message (removes/ reduces motivation to reduce energy consumption).

Section B. Communications and decision-making

This section explores issues around communications with and between building residents, owners, managers and other relevant stakeholders; and the process of making a decision about implementing energy efficiency improvements.

The results from this section of the questionnaire are largely dependent on the occupancy characteristics and building management structure specific to each site. The size of the building may also influence findings here: larger buildings may prove more difficult than those with relatively few individuals involved in the decision-making process.

The results suggest that making contact with the decision-maker at the individual apartment level and bringing all stakeholders together to discuss renovation options proved very challenging across all case study sites (Table 4.). The former was consistently rated as a significant problem for Hungary and Scotland. For Scotland and England, due to a number of dwellings being privately rented in case study sites, there was no obvious route for obtaining contact details of the landlords, whilst sending communications to tenants also proved ineffective.

In France, making contact with the decision-maker at the whole-building level has been a problem due to frequent changeover of building managers and the building's general assembly (meeting of building managers and owners) only taking place once a year.

Table 4.3. Partner ratings of communication and decision-making barriers to retrofit

	Austria	England	France	Germany	Hungary	Scotland	Sweden	Overall
Making contact with decision-maker (building)	2.0	2.0	3.0	1.0	1.3	1.0	1.0	1.4
Making contact with decision-maker (apt)	1.0	2.5	2.0	1.3	3.0	3.0	2.0	2.1
Bringing stakeholders together to discuss options	1.0	2.0	2.0	2.0	2.8	2.3	3.0	2.2
Conflicts of interest	1.7	2.0	2.3	1.7	1.0	1.3		1.6
Reliance on wilful individual/ doer	1.0	2.0		1.0	1.5	1.3	2.3	1.5
Reaching a consensus	2.3	2.0	2.3	2.0	1.0	1.0		1.7
Overall	1.5	2.1	2.3	1.5	1.8	1.7	2.1	1.83

Additional issues with communication and engagement at case study sites raised by project partners included:

- Scotland: Reliance on a key contact proved both beneficial and a hindrance at one case study site: the main contact was very helpful in establishing contact and communications with other residents, but had little interest in installing any measures. If this had been a priority for them, they could have been pivotal in persuading others.
- Hungary: This case study highlighted the importance of language in communicating technical issues – words and phrases used by architects or installers proved difficult for the (non-technical) target audience of residents.

- Sweden: Whilst establishing contact with relevant stakeholders at case study sites did not prove a problem, the experience in Sweden highlighted the challenge of *maintaining* communications and dialogue with decision-makers (at both the building and individual apartment level).

Section C. Property and Regulatory Issues

This section considers factors associated with the physical property characteristics and regulatory issues (including building regulations that may govern the types of measures that are permitted).

This category of issues appears greatest for England and Sweden. This is at least in part due to the specifics of the case studies in the LEAF project however. The Swedish case studies were all within a World Heritage Site, hence there were strict regulations on what measures are permitted. Similarly, one of the English case studies was technically a perfect candidate for external solid wall insulation, but the building's heritage designation prevented this from being permitted.

With regard to building specifications, the layout of one of the English case studies was also such that a large area of external wall belonged to the stairwell and in England any energy savings resulting from improvements in this part of the building are not taken into account in funding applications, nor would any one resident benefit substantially from insulating this wall. France experienced similar problems related to layout of the building, with respect to how much different residents would benefit from the work proposed.

These examples show the importance of considering planning and building regulations which limit or affect the type of improvement work which can be carried out on a building *alongside* technical assessments (e.g. EPCs), rather than as a follow up activity. This would result in more realistic assessments of options from the outset, and would avoid raising expectations and wasting time investigating improvements which are not allowed.

Table 4.4. Partner ratings of property and regulatory barriers to retrofit

	Austria	England	France	Germany	Hungary	Scotland	Sweden	Overall
Building layout - not all affected in same way	1.3	2.5	3.0	1.0	2.0	1.0	1.8	1.7
Protected building status (listed, conservation areas)	1.0	3.0		1.5	1.0	2.0	3.0	1.9
Refurb. not reflected in property value/rent	1.0	1.5	1.7	1.0		2.0	2.0	1.6
Lack of minimum requirements	1.0	2.5		1.0		1.3	2.0	1.5
Overall	1.1	2.4	1.8	1.1	1.5	1.6	2.2	1.63

Additional factors associated with property and regulatory issues encountered by project partners in supporting energy efficiency retrofit in multi-occupancy buildings included:

- Hungary:
 - Quality control of the installation (contractors, processes and materials).
 - Lack of quality control on EPCs – there have been examples of the same dwelling being given very different ratings by multiple assessors. Similarly, EPCs have been known to be issued without the assessor even visiting the property. This undermines consumer confidence in the EPC rating and its value/ utility.
- Germany:
 - The challenge of preserving the heritage value of buildings, and the technical challenge presented by different brick facade layouts in different regions, are often significant barriers during the energy retrofit motivation process.
- Scotland:
 - There was a sense that energy efficiency refurbishment probably does increase rental/property value, but there is a lack of evidence to show this and therefore a missed opportunity to use this as motivating factor.
 - Lack of quality installers and who to trust, particularly with more innovative and less mainstream measures.
- France :
 - In France there are not only regulations governing measures permitted in listed/ protected buildings, but this extends to buildings within the vicinity (500m) of a protected building.
 - Minimum requirements apply to insulating only; not overall, general 'refurbishment'.

Section D. Funding and Finance

The final category of factors associated with retrofitting multi-occupancy mixed tenure buildings relates to the availability of funding and finance for measures.

Issues related to paying for energy efficiency and low carbon retrofit are not unique to multiple-occupancy buildings. However, these are exacerbated in buildings of this type due to the number of different stakeholders involved and differences between residents' ability and/or willingness to pay and/or borrow to finance the work. Differences in residents' circumstances has been apparent across nearly all the case studies in the LEAF project, as shown by the high average score for this factor ("*Some residents unwilling to contribute towards the costs*" - Table 4.).

Similarly, limited resource in building maintenance funds was consistently rated as a challenge by project partners. Whilst funds exist, these are often over-stretched and funding for energy efficiency improvements loses out to essential maintenance work.

Whilst most countries have some form of state support for energy efficiency measures, partners have encountered a number of issues in relation to the structure and availability of this support. For some, funding has been inconsistent and piecemeal over the duration of

the LEAF project, to the extent that it actually proved a hindrance rather than facilitator of retrofit.

In England (and Scotland, though to a lesser extent), at the time of the case study work, the focus of the UK Government's energy efficiency scheme (the Energy Company Obligation) changed and whilst some small pots of funding offered some generous grants (the Green Deal Home Improvement Fund) these offers were unreliably brief (opening and closing to applicants within a matter of days). As a result, it was very difficult to present a proposal for work to the case study sites with any confidence of funding support. The complexity of funding streams (too many; different routes to support with different criteria; frequent changes) makes it difficult for householders to understand and undermines confidence in the supply chain. Time-limited offers can also result in rushed jobs, problems with poor quality installations, unmanageable demand on the supply chain and poor customer service. On the other side, if managed well time-limited offers can encourage residents to sign up quickly: however, the whole process needs to be very-well managed by a project manager who is experienced with energy efficiency retrofit.

The UK has a legacy of relatively stable and consistent funding for energy efficiency measures (prior to 2013). As a result, there is a lingering perception that support is and will continue to be available, and indeed is almost expected: case study residents would not proceed with any measures in the absence of any funding (in part due to personal financial circumstances).

France encountered similar problems with inconsistent and unreliable offers of state funding, which vary (and can even be contradictory) from one region to the next, creating a complex picture of support.

Germany has a stable, long term, targeted and consistent funding system for energy efficiency measures and in some federal states, (for example in Baden-Württemberg), public funding can be combined with local communal funding grants to cover 30 % or more of the total retrofit costs.

In Hungary, there was little, if any funding available from the state at the time of the case study work and what was available was again inconsistent, piecemeal and unreliable. Volatility of state support can do as much harm as it does good: undermining confidence amongst contractors and general public.

Table 4.5. Partner ratings of funding and finance barriers to retrofit

	Austria	England	France	Germany	Hungary	Scotland	Sweden	Overall
State support is non-existent	1.0	2.0	1.0	1.0	3.0	1.0	1.0	1.4
State support is piecemeal, inconsistent	1.0	3.0	3.0	1.0	3.0	1.7	3.0	2.3
State support is inadequate (size of contribution)	2.0	2.5	2.0	2.5		1.7	2.0	2.1
State support is inadequate (types of measures supported)	1.0	2.5	2.0	1.8		2.0	3.0	2.1
State support is limited in coverage (areas)	2.0	3.0	1.0	1.8		1.7	1.0	1.6
There is no maintenance fund available	1.7	1.5	3.0	1.0	1.3	2.3	2.0	1.7
Maintenance fund is very limited	2.3	2.0		2.0	3.0		2.0	2.3
Bank loans are not a viable option for financing measures	2.0	1.5	2.0	2.5	3.0	1.0		2.1
(Some) Residents unable to contribute towards costs	2.0	2.0	2.5	2.3	1.5	1.7		2.0
(Some) Residents unwilling to contribute towards costs	2.3	2.5	2.5	2.3	1.8	2.3	3.0	2.4
Overall	1.8	2.3	2.0	1.8	2.4	1.7	2.1	2.00

4.3 Issues related to EPBD and EPCs

Key differences in the implementation of the EPBD EPCs between MS that have implications for the LEAF project (i.e. focusing on retrofitting multiple-occupancy buildings) include:

- The method for calculating energy consumption of the building
- Whether this is on an individual dwelling or whole building basis
- What information is presented on the certificate
- Level of support for energy efficiency and low carbon measures

Previous LEAF research includes a Guidance Document on Energy Performance Certificates⁷ for each partner country as well as papers providing more detailed background information about how the Directive has been implemented in each country and the barriers to retrofitting multi-occupancy buildings⁸. This provides important context for the lessons learned through the pilot case studies and policy recommendations that follow.

⁷ http://www.leaftechnicaltoolkit.de/files/LEAF_EPC_Guidance_EnglandWales_final_26_03_14.pdf

⁸ <http://www.lowenergyapartments.eu/about-leaf/background/>

The EPBD acts as a core driver for national policy in all MS and as such provides excellent opportunities to support implementation of energy efficient retrofit, but some important issues have been flagged up through the LEAF project where the EPBD either is not being fully implemented, or could be improved to address barriers being experienced on the ground. Progress made towards meeting EPC requirements varies in different countries, with some significant gaps identified, including the absence of publically available databases of EPCs, and problems with quality, content and appearance of EPCs. Key issues are summarised below:

Method for calculating energy consumption of the building

- Methodologies for calculations of energy efficiency in buildings are applied inconsistently, and do not allow for cross country comparisons. In particular, a detailed specification for methodologies for assessing building performance is needed to improve accuracy and reliability of data and allow for better comparison. In some cases the methodologies provide inaccurate recommendations. This isn't because of the assessor making errors but the actual methodology behind the calculations.
- Calculation of cost effectiveness should include grants and expected bill savings and allow for maintenance costs over the lifetime of the planned improvement and replacement when it is no longer effective.
- Accreditation schemes are urgently needed in some countries to improve the quality of EPC assessments – EPCs are not always accurate and measures recommended are not necessarily the most appropriate for the building, or for maximising energy efficiency in a given property.
- Because of the differences in EPC methodology, data, appearance and quality control, it is not possible to use EPCs to compare buildings across different countries. This impacts on the quality of consistent EU data available to measure achievement of EPBD goals and also on aims to facilitate a single market.

Format & presentation of information on the EPC

- EPCs have been criticised for being complex and not very “user-friendly” , with insufficient explanations about the different information presented. Member States need to improve the format of EPCs, to create a clear and engaging document that residents are encouraged to use and act upon.
- Recommendations for improvement measures are often poorly presented in the EPC. The experience of partners in the LEAF project has provided further evidence of this. For example, in Austria EPC recommendations have been criticised for being embedded within an annex; in Sweden recommendations are considered too general in nature and to offer limited energy savings; in France recommendations for improvements are lacking altogether.
- Whilst differences in the content and layout of EPCs in each country are perhaps necessary, LEAF partners would like to see, as a priority for action, a tightening of regulations to ensure that recommended measures are an integral part of the EPC in all countries and are tailored to the property through a site assessment.
- The provision of information in EPCs could be modified to make it easier for consumers to understand, including the financial implications of making energy efficiency renovation decisions. For example, including information on: savings on energy bills; potential

maintenance costs; grant levels; and costs (both upfront and bill saving) of energy performance measures as compared with similar maintenance measures (e.g. external insulation as compared with simple façade painting). Modifying the terminology used could also help to address a language barrier where use of technical terms disengages householders. For example, talking about running costs rather than energy efficiency would be more meaningful for many people.

- It needs to be made very clear whether EPCs are based on *predicted* energy consumption (as is the case in most EU countries) or on *measured* energy consumption (as happens in Sweden).

Individual dwelling vs whole building EPCs

- In some countries (for example the UK, and for some cases in France) Energy Performance Certificates (EPCs) are only produced for individual apartments and not for the whole building, so carrying out whole building retrofit based on EPC recommendations is virtually impossible (although the LEAF project has developed a workaround as part of its technical toolkit).
- Further, communal areas are not always included within EPC assessments. This means that recommendations regarding lighting and stairwell insulation would not be included in the EPC.
- Conversely, in countries where whole building EPCs are available but not individual dwellings within the building (for example in Sweden), the potential for energy savings at apartment scale are not considered and opportunities may be missed for individual owners or occupiers to make improvements.
- All EPCs for individual dwellings within multi occupancy buildings should include certain information, as a minimum requirement, about the building within which they are located. In England and Wales EPCs for apartments do not even contain the basic address information to allow easy identification of the block where they are based. This is a major barrier for example to Local Authorities who wish to use EPC data to promote energy efficiency programmes.
- Beyond this basic information, information provided in EPCs for building units should ideally allow consideration of the comparative costs and benefits of taking action on the whole building as opposed to taking action on the individual building unit. Comparative information of this sort is very important and useful particularly for owners of private apartments who (depending on different MS property law) may have the opportunity to collaborate to make energy efficiency upgrades at the building level rather than just in their individual units.

Access to EPC information

- Not all countries currently have an EPC database, and in those countries where there is a database it is not necessarily publically accessible. This is a requirement of the EPBD but has not yet been fully implemented in all countries. Making EPC information freely and publicly available, for example through national databases (or one central EU wide database) could provide a valuable resource to improve access to information about energy performance of buildings and inform decisions about improvements.

- In some countries (e.g. France, Netherlands) there an association has been recognised between good energy ratings and properties attracting greater sale and rental prices. As such the EPC itself can be a driver for energy efficiency improvements. Anecdotal evidence does indeed indicate that EPC recommendations steer decisions on which energy efficiency improvements are made in buildings. If the potential for EPC ratings to be used to stimulate behaviour change, further work is needed in this area, firstly to establish the link and secondly to flag it up more widely to encourage more retrofit.

4.4 Issues from stakeholder feedback and policy analysis

The issues identified in this section build on the case study questionnaires and the EPBD analysis, using more in depth stakeholder feedback, further local and national policy analysis, and feedback from the case study and toolkit evaluations.

The issues associated specifically with EPBD implementation overlap considerably with broader problems around retrofit of multi occupancy buildings. Complexities of occupancy, finance, planning regulations, building regulations, technical options, timescales and supply chain issues have all been reported as barriers. In most countries (and often within countries) there are different planning requirements and building regulations, differences in provision of information, availability and eligibility of funding and finance, not to mention cultural differences affecting take up and financing of energy efficiency measures. These differences mean that policy recommendations will vary in different countries and areas. However, one barrier consistently flagged up by stakeholders and partner organisations is inconsistent funding: their stop-start nature, complex eligibility criteria, and often inefficient delivery mechanisms severely constrain the potential for momentum to build in this sector.

The issues in this section are explained more fully as separate points under five broad (but overlapping) headings:

- Information provision
- Demand side factors
- Supply chain issues
- Funding and finance
- Regulatory mechanisms

Information provision

General findings have emerged from the LEAF project regarding the nature of information provision, at all scales. This topic links closely with EPCs, discussed here and again in the 'Regulations' heading below.

4.4.1 Understanding of home energy use

In domestic retrofit, energy efficiency, and its benefits, is poorly understood and (often as a consequence) is not a priority for most home owners. The experience of LEAF partners highlighted the need for excellent information provision (including about opportunities for

making improvements, the costs and benefits of improvements, payback periods, and the retrofit process itself). Partners found understanding of energy a barrier in terms of case study building retrofits because stakeholders found it hard to make, and agree, on issues they did not fully understand or see as priorities. Provision of information is an essential first step in helping occupiers, owners and building managers to gain a good understanding of their options for retrofit and the benefits of making improvements. This in turn is necessary for engaging and motivating those individuals to make decisions to proceed with improvement works.

4.4.2 *Quality of information*

Much information is available about retrofit opportunities, particularly on the web, but not all is accurate or up to date which can lead to confusion and disengagement. Information also tends to be fragmented. By this we mean that information on retrofit opportunities tends to be about specific improvements (and not a whole-building, multiple improvement approach), and although much information is often very technical (sometimes too technical), there is little in the way of practical guidance on how to make improvements or proceed with work (e.g. accessing financial support, finding installers, checking regulations and so on). The LEAF technical toolkit goes some way to addressing this gap. In order to improve the quality of information provision, encouraging and sharing customer feedback on advice and information provided to them is an avenue worth exploring (in the same way that other service provision receives customer feedback). In any case, efforts must be made to ensure that the information which people access is accurate, up to date, engaging and practical.

4.4.3 *Communication with residents and stakeholders*

To engage with householders and other stakeholders who do not proactively seek information on energy efficiency improvements, other approaches are also needed. Information should be provided alongside other types of information (which correspond with other home or life functions/stages) – for example, information on energy efficiency could be provided alongside utility bills; alongside information on maintenance and repair work, and so provided by companies who are currently engaged with the latter but not necessarily the former; and to consumers engaged in buying a property.

Research demonstrates that consumers benefit from peer-to-peer information provision, and so supporting opportunities for this is important. In several of the LEAF case studies, it made a difference when an ambassador within the building who was able to explain and promote planned improvements to other residents. Where possible this peer to peer (and often word of mouth) dissemination of information should be encouraged.

However, when consumer choice plays a part, simply providing information does not lead directly to improvements being taken up. Information campaigns must be local and targeted, and carried out over relatively long timeframes. Information could be made available through various channels such as websites with documents and material free to download and local energy advice services (telephone and/or drop-in centres). Having different media for communicating information is useful to ensure accessibility and reach. Regardless of the interface, information must be relevant and specific and sources of information need to be impartial and reliable.

4.4.4 Addressing building owners and managers

In the case of multi occupancy buildings, residents are often not the building owners and so lack the power to respond to information. Information therefore needs to be directed towards building managers (e.g. estate agents) and owners. This can be achieved via local government initiatives, strong and well organised supply chains and individual tradespeople where energy efficiency advice can also be linked in with other building services (e.g. kitchen refit, roofing, electrical work), as well as local business support initiatives (e.g. landlord events).

LEAF partners point to local energy advice services as the most effective avenue for the provision of energy efficiency information to this audience. Such information provision is informed but unbiased and garners the trust of householders and building managers. However, there are geographical gaps in provision so there is a need for professional advice services to be further supported and mapped so that gaps can be identified and filled.

4.4.5 Benefits to building owners and managers

One of the barriers to retrofit in multi occupancy buildings in which apartments are rented out is that there is no financial incentive for a building owner to pay for improvements either to individual dwellings or to the whole building. There is therefore value in clearly setting out the benefits. For the landlord or letting agent, energy efficiency improvements can mean reductions in maintenance costs (e.g. by addressing condensation problems), longer tenancies (tenants stay longer) and in many cases higher rental or sale values can be achieved.

4.4.6 Funded advice and support

We can see how local energy advice services are important for individuals and for businesses, particularly in countries where funding schemes change regularly and regulations vary from one region to the next. However, this kind of service needs funding to ensure it is freely accessible to all and is informative, impartial and reliable, providing a start-to-finish customer journey. Examples of successful information provision include ALE (France), Energy at Home (England), and Home Energy Scotland (Scotland). Information provision is best delivered locally / regionally by impartial professionals, backed up with national publicity and campaigns (as seen in France for example) and with visible demonstration projects (for example open homes events). LEAF partners would make a case for information provision to be funded by central government and delivered by local energy agencies.

Demand side factors

We have discussed the importance of information provision in stimulating demand. However the best information in the world will not, on its own, lead to people making low energy improvements to buildings. Many of the factors emerging from the case study questionnaires come into play here: motivation and engagement of individual residents; communication and

decision making between residents and with owners and managers of multi occupancy buildings; wider cultural factors, values, beliefs and expectations.

4.4.7 *Creating demand for improvements*

This is one of the biggest challenges for retrofit, and multi occupancy buildings are no exception. This challenge is an overarching one, but some of the solutions recommended by LEAF stakeholders include:

- good information provision (explained more fully elsewhere in this report) including costs, benefits, and comparisons with costs of necessary maintenance work
- addressing social norms (in other words, so that retrofit is seen as a 'normal' thing to do) via demonstration projects; behaviour change campaigns and positive media stories
- Create more opportunities for peer-to-peer communication/learning between householders – e.g. develop a case study network, open homes events
- encouraging the role of the supply chain in identifying retrofit opportunities alongside maintenance jobs and replacements
- identifying critical moments when stakeholders are open to making energy efficiency improvements (e.g. at point of sale, when renovating for other reasons, alongside planned maintenance work) and capitalising on the opportunity
- ensuring rental or sale value reflects the building's EPC rating
- regulations that drive retrofits such as minimum standards (discussed elsewhere)

4.4.8 *Multi-stakeholder issues*

Within multi occupancy buildings, engaging all the relevant stakeholders (owner occupiers, tenants, non-resident owners, management committees and so on) in order to make decisions about building improvements is no small challenge. Issues encountered in the LEAF project included:

- different levels of understanding and motivation amongst stakeholders (one example of this in Scotland is the need for social rented properties to be EESSH compliant verses no regulation (and therefore incentive) for privately rented and owner occupied properties)
- no management structure through which to make decisions and implement plans (in some buildings – specific to the UK)
- management meetings which only take place annually (e.g. in France), meaning that reaching a decision can take several years from it being raised
- not being able to easily identify the stakeholders (e.g. privately rented properties in the UK)
- simply not being able to make contact with stakeholders (e.g. in Scotland) despite multiple attempts by post and door knocking
- not having a means to make decisions where there is not unanimous agreement (encountered in several countries but a particular problem in the UK with complexities of the leasehold and freehold system)
- in the majority of cases, the length of time it takes to make decisions and the resources required to co-ordinate communications and decision-making.

4.4.9 Access to reliable installers

This issue was reported back from some stakeholders but is not a universal issue – the number of tradespeople and the quality of workmanship is variable in different areas and different countries. Upskilling the workforce is critical (this is discussed further in the section on supply chain issues), as is boosting demand (discussed in 4.4.7 above). Supporting peer to peer information sharing is recommended here since word of mouth recommendations will continue to be one of the main ways for consumers to identify reputable suppliers.

4.4.10 Whole-building approach

In most circumstances improvements tend to be made one at a time, and usually in response to an immediate need (e.g. a damp problem) or driven by a one off financial incentive. Discussions and best practice sharing within the LEAF project have highlighted best practice for planning and making low carbon improvements to any given building. They should be

- packaged up to achieve the best energy performance for the whole building (i.e. not installed in isolation)
- part of a long term (e.g. 10 year) maintenance plan for the building - so that improvements can be planned ahead
- integrated with other property maintenance works to improve cost effectiveness

This overlaps with issues raised in the context of supply chain issues and regulatory mechanisms. As a demand side factor, LEAF partners believe that forward planning, packages of measures, integration with building maintenance works and achieving cost effectiveness, would all help with stakeholder engagement, decision making, and practical installation of improvements.

Supply chain issues

4.4.11 Availability of tradespeople

The availability of builders and qualified installers to actually carry out energy efficiency retrofit work varies in different areas and different countries. Multi occupancy buildings may require different skills, and can be a different scale of work to owner occupier houses. In several countries, availability and focus of public funding has been flagged as a factor affecting availability of installers. In addition there can be massive variations in cost (for example in different regions of Germany), and trust in the supply chain has been flagged up as a consumer issue. Across all LEAF partner countries gaps were identified in the supply chain in terms of trained, accredited, reliable installers being available, able to make improvements which are right for the building, and holding appropriate accreditations.

To a certain extent this issue is due to the relatively new nature of some of the retrofit improvements being made (e.g. solid wall insulation in the UK), the complexities of installing whole-building measures, and the small scale of demand. It is hard for the supply chain to respond until there is a stronger market for improvements, so efforts need to be made to stimulate demand. Once demand scales up it will mean that there are more players in the supply chain so it will be easier to find reliable installers, costs are likely to reduce, and take up will increase. Training and accreditation programmes are also seen by LEAF partners as

important. Programmes to upskill installers and develop local networks could be run in different ways. One example is Bath and North East Somerset Council's Trade Support programme in the UK, where CSE provide courses to help local skilled tradesmen, like plasters and renderers, enter the market for external wall insulation. However, more work is needed to ensure that the materials and systems used are also fit for purpose, especially in older buildings, and that quality control systems are adequate.

4.4.12 Accreditation schemes and quality systems

Government-backed accreditation schemes can help ensure quality and instil confidence in the market. In the LEAF project there have been multiple instances of EPC recommendations being unsuitable for the building, and projected energy savings being inaccurate, particularly in blocks of apartments. Not all LEAF partner countries have implemented effective accreditation schemes for installers and EPC assessors (issues have been highlighted in Hungary in particular). Information on approved installers/ assessors should be part of improving information provision, and accreditation could extend to the software used in generating EPCs, to make recommendations more accurate. The implementation of accreditation schemes for installers and EPC assessors across all countries is one of the core LEAF policy recommendations.

It's not an issue which is specific to EPCs however. The sector overall tends to meet only minimum requirements set in national and regional building regulations. Programmes for training tradespeople and professionals are infrequent, and where they do exist they are perceived as poor value for money in terms of time and money commitments. Participating in (costly) accreditation schemes is not seen as leading to a greater customer base or more work. LEAF project findings point to the need to improve quality systems, including training and accreditation programmes for the supply chain, and mechanisms to gather and share customer feedback, with a particular focus on developing local networks and working co-operatively (e.g. one-stop-shop arrangements).

4.4.13 Improving ambition and quality of retrofit projects

Accreditation schemes help to ensure minimum standards are achieved. However, to maximise the potential for improving energy efficiency in multi occupancy buildings, we should also actively encourage building renovation projects which deliver the highest standards possible and address the whole building, not just individual elements. This poses a challenge on two fronts. Firstly, the availability of funding, since aiming for higher standards and a package of the most suitable measures to achieve the best carbon reduction potential (rather than one or two single measures based on cost) will inevitably mean higher project costs. Secondly, decisions on improvements should be based on a comprehensive building audit which is more extensive and holistic than the EPC report, which is widely used and fairly well understood, but recommended improvements might only be made one at a time, and are seen in isolation (not linked to maintenance work or long term improvements to the building).

4.4.14 Project manager role

The two main issues here are the value of professional project management, and the importance of factoring in project management costs. The absence of strong project management was seen by LEAF as a potential barrier to retrofit in multi occupancy buildings in future: professional project management would be recommended wherever possible.

One problem frequently encountered during LEAF was linked with the number of specialists needed in most retrofit projects. There is seldom a piece of work that a single contractor can deliver alone. For example, even a straightforward solid wall insulation project might need four separate companies to put up the scaffolding, move the pipework, extend the roof, and apply the insulation and rendering. Good management of the work being done is time intensive and requires construction sector expertise.

Where projects are led by residents they lack the expertise and experience of professionals, (for example, the ability to make supply chain links, check value for money on quotes, deal with invoicing, check quality or workmanship, and liaise with construction companies), which can affect the quality of the retrofit, and the time it takes. Where projects are managed by a professional (for example a property manager, architect, engineer or dedicated managing agent) acting on behalf of the building owners and residents, the installation process is likely to be more efficient, but the time and cost of providing a project management service is often underestimated.

4.4.15 Installer networks

There are some good examples of local installer networks working together, offering 'one stop shop' services, linking to other installers and builders, using quality standards to ensure good installation, and developing programmes for training employees, and rewarding competent installers. LEAF case study experiences certainly bear out the need for a project management role. Stakeholder feedback also highlighted both the importance of separating out the assessor-advisor role from businesses being paid to install specific measures, and also of encouraging installers to work together and propose whole building action plans. These issues could all be addressed through stronger, well co-ordinated installer networks of contractors with defined roles, meeting agreed standards for workmanship and customer service.

4.4.16 Increasing demand by proactively identifying opportunities

Improved models are also needed for engaging the supply chain, some of which could be enforced through legislation. For example, identification of opportunities for energy efficiency renovations which can be carried out alongside other maintenance and repair work, is perhaps best achieved through a combination of training tradespeople in the supply chain and mandatory requirements for long term building maintenance plans (e.g. in multi occupancy buildings) where maintenance work and opportunities for energy efficiency improvements can be planned and carried out more efficiently and cheaply.

4.4.17 Development of new and innovative measures

In several of the LEAF case study buildings, an issue was encountered where the ideal technology was not available, did not exist, or measures currently available on the market were not fit for purpose. Whilst some supply chains and retrofit techniques may be very well established, tried and tested (and this varies by country), there is a need to develop the market for newer, more innovative measures. Energy efficiency improvements for non-standard buildings are more complex to develop, install and accredit. The term 'non standard' might cover a wide range of buildings including heritage buildings, properties built from unusual materials (e.g. metal or timber frames, concrete walls rather than brick), or constructed wholly or in part from prefabricated materials. Overcoming this barrier requires investment in research and development of new technologies, investment in training programmes to develop local skilled networks of installers and assessors (particularly for the more innovative, less market-mature measures), improvements in EPC methodology (currently unsuited to many older and non-standard buildings) and a market for these skills and measures to actually be taken up. This may require incentives (e.g. subsidies), but also needs to be implemented sensitively with regard to the target audience (i.e. to ensure low-income vulnerable households do not bear the risks of becoming 'guinea pigs').

Funding and finance

It goes without saying that for retrofit of buildings to take place, the improvements must be paid for. In different countries there are different levels of willingness to pay (partly or in full) for energy efficiency improvements. This is explored in section 4.1 above and involves a whole set of variables including expectations, values, cultural differences, building management and factors specific to individual buildings. Financial and fiscal incentives to encourage the uptake of energy efficiency measures could take many forms such as grants and subsidies, low and zero-interest loans, payments from renewable energy generation (Feed-in tariffs) and lower stamp duty on higher EPC-rated properties. However the implementation and administration of schemes varies in effectiveness. Financial support for improvements to buildings is essential, and to be effective LEAF partners and stakeholders were unanimous in stressing the importance of long running financial incentives that can be understood easily and factored into reasonable timeframes for planning.

4.4.18 Consistency and simplicity in funding schemes

A major problem experienced by LEAF partners and stakeholders was the lack of consistency and simplicity in funding schemes. Many funding schemes do not allow realistic timescales for uptake and installation of measures. Complex eligibility criteria make it hard to navigate the system and hard to access funds. Where financial contributions are made by individuals issues of acceptable payback periods need to be addressed, and where financial contributions from individuals for (communal) improvements to multi occupancy buildings a huge amount of engagement and management work is required to make installations possible.

Where funding is made available for energy efficiency and/or low carbon measures, it should be explained as clearly, simply and consistently as possible so as not to undermine consumer confidence. Allowing sufficient timescales for offers to be taken up and measures

installed is also important: these processes can take many months and rushed jobs can result in poor quality outcomes. The recommendation for consistency applies in the context of a single scheme. Having different offers (for example to support different measures, different target groups or area-based schemes) is positive, but the target group should be clear, and eligibility for one stream of funding should not preclude access to others. The message is about keeping things simple so consumers know what is available, where, to whom and for how long. Local, area-based schemes with effective marketing and local advice services can be highly successful in this respect.

LEAF partner organisations would recommend subsidies which are more accessible, better explained, and which run over longer timeframes in order to provide consistency and increase confidence for consumers and suppliers (and ultimately increase installation rates).

4.4.19 Financial incentives

Expanding the type and level of financial support initiatives is one of the LEAF project recommendations. Financial incentives are proven to incentivise installation of energy efficiency measures. They are likely to have most success driven nationally in response to specific EU level requirements.

In Scotland local decision making bodies are able to direct support where it is most needed which has increased impact. However sometimes a lack of knowledge about different financial incentives in different regions can also be a barrier to take up (as in Germany). As with subsidy based funding, key to the success of national financial and fiscal policies is to avoid short term, inconsistent and single-measure schemes and instead concentrate on long term support which encourages cost effective whole building retrofit and engages a quality orientated supply chain (i.e. which is not constantly 'chasing the money'). This is also really important where public funding is being used to leverage private finance. In France for example there is more and more evidence that combining subsidies with loans is an effective financial model.

4.4.20 Range of funding mechanisms

Various funding mechanisms and considerations have been put forward through the LEAF project consultations and discussions to broaden access to finance for low energy improvements and incentivise take up. Examples include:

- Maintenance funds ring-fenced for energy improvements, so that finding money to pay for improvements is not a barrier
- Ensuring adequate funding is made available for low income households, and targeting support to address fuel poverty
- Paying subsidies directly to installers (similarly to the way the ECO works in the UK) to take out a level of complexity in the management of the installation process
- Combining subsidies and loans, a mechanism used successfully in France.

4.4.21 Split incentives

The experiences of the LEAF project partners show that split incentives in rented properties are a big barrier to energy efficient retrofit. There's no incentive for either the building owner

or the tenant to make improvements because neither will recoup the costs. Some examples which solve this problem are highlighted in the best practice section below. Broadly speaking, by reducing the running costs of properties and/or increasing their value, rent can be increased to cover (over time) the costs of making improvements. Long term building maintenance plans, and ring fenced funds for improvements also address this issue.

4.4.22 *Personal contributions*

Across all the LEAF partner countries there were problems accessing financial support for energy efficiency improvements and personal contributions from residents were contentious in many of the case study buildings. One issue is that the benefits of building-wide improvements are seldom felt equally. One resident benefitting substantially less than another (for example a ground floor apartment resident where loft insulation is proposed) or being unwilling to contribute to the costs could mean the measure doesn't get the go ahead.

In multi occupancy buildings there are additional complexities related to the amount of money each individual occupier should (and is financially able to) contribute (for example where the benefits of improvements are not felt equally), and the amount of funding or finance they are able to access because of their personal circumstances. Calculating personal contributions is a real challenge in some situations (although in others this may be outlined in property deeds or property management arrangements).

Different stakeholders also have different expectations for the payback periods of improvements, particularly where they are paid for through monies invested by occupiers. An example of this is when heating and hot water is centralised and paid for collectively (as in most Swedish multi occupancy houses), so savings are not quickly noticeable economically, but the upfront costs for installing improvements can be significant. On the face of it, this is a financial issue but it links back to barriers to stimulating demand – including fundamental shifts in cultures and values. To some extent, strong stakeholder consultation and provision of information in the right format and at the right time can help to address payback expectations.

4.4.23 *Competing purchase decisions*

Similarly, different parties within a multi occupancy building will have different priorities for purchases. This is often related to practical factors. For example, residents in a cold or damp part of the building (say, a flat in the roof) where improvements to the building would improve comfort may be more enthusiastic about improving the buildings insulation than other building occupiers. To address these competing purchase decisions, wider behaviour change programmes will take time but in the short term it is important to provide incentives and capitalise on opportunities for making energy efficient improvements (e.g. in parallel with maintenance work, when new occupiers move in).

Legal and regulatory mechanisms

4.4.24 *Improvements to EPCs*

Use of EPCs to stimulate retrofit in multi occupancy buildings is a tool which is not currently being used to its best potential. This is in no small part because the EPC could be improved

significantly. Issues include: the methodology used for EPC calculations which mean that currently recommendations are not always accurate or suitable; the quality systems in place to ensure EPCs are carried out effectively; differences between whole building and individual dwelling EPCs; the format of the EPC and the information which is presented; access to EPC data. These issues are explained more fully in an earlier section of this report.

4.4.25 Minimum energy performance requirements

The experiences of all LEAF partners demonstrated the difficulties of making energy performance improvements to multi-occupancy buildings (detailed in Section 4.1). Introducing minimum energy performance requirements at the point of sale and/or lease (before a property could legally be sold or rented) could be an effective mechanism for engaging with these difficulties and ensuring gradual progress towards retrofitting the entire residential building stock. Minimum requirements would ensure that when a property does change hands/occupants, the opportunity for improvement work is realised; the lease or sale of a dwelling below a certain EPC rating could be prevented, for example.

It is well known that moving house, both for residents and building owners (if these are different people), can be a key trigger point for undertaking improvement works. In part this is because the 'hassle factor' is lessened – an issue encountered by LEAF partners in case study buildings, where there is unwillingness to make improvements because of the effort required or the resulting disruption. Introducing a minimum requirement may also go some way to addressing the issues of split incentives and of energy performance not being reflected in property value or rent in the short term. In the longer term a minimum requirement should create a more level playing field, gradually reducing the number of very low EPC-rated properties on the sale or rental market. Finally, this change would also support better consumer awareness of energy performance, and would encourage national and/or local initiatives to train estate agents to make EPCs a more integral part of the buying/selling and renting/leasing process.

Similar requirements could also apply at the point of renovation of a building. This would also engage with the 'hassle factor' described above (i.e. having disruptive work done all at the same time) as well as being more cost-effective in the long term since there are potential cost savings (economies of scale) from undertaking multiple improvements at one time.

There would need to be consideration of how improvement work is paid for, and whether certain buildings could/should be exempt (e.g. non-traditional and hard-to-treat buildings which might be too costly or unsuitable for improvements and therefore risk falling into disrepair or being abandoned). Also, this mechanism would be 'triggered' less in areas where there is very low turnover of tenants and owners; in such areas, other enabling factors will be critical.

4.4.26 Specific regulations for multi occupancy buildings

For communal improvement measures, it can be very difficult and time-consuming to reach agreement between different owners in a block. Even identifying the owners is not always straightforward. Legal agreements regarding communal measures can be complex to negotiate.

Evidence collated by Future Climate for England, and reinforced by the experiences of LEAF project partners, shows that energy efficient retrofit of apartment blocks is much less common than of individual houses. Subsequently, multi occupancy buildings tend to have very poor energy performance. The reasons for this are multiple but include: complicated decision-making structures; split incentives (i.e. where the person paying the energy bills and experiencing the discomfort of living in a cold home is not the person who owns the property); and cultural resistance to financing improvements where there is an expectation of state funding.

The setting of national targets specific to multi occupancy buildings could drive forward national programmes targeting the energy efficiency retrofit of such buildings. Such targets could be required through the EPBD. This would in turn increase the experience of multi occupancy retrofitting by building managers, residents, and within the supply chain, and create more case examples demonstrating the cost comparison of taking action on the whole building as opposed to taking action on the individual building unit. This is particularly key in the UK, where whole building EPCs do not exist, meaning there is no mechanism through which whole building recommendations are made and detailed. In addition, current requirements to provide information to residents regarding energy improvements do not extend to energy efficiency measures (but do, for example, cover district heating).

4.4.27 Planning and building regulations

All of the partner countries have national frameworks for planning and building regulations. In most cases, this is translated into more local level frameworks (e.g. at the local authority, region or federal state level). This provides scope for the development of local frameworks which better meet local needs and situations. For some of the partner countries, local historic designations meant that the local planning regime restricted opportunities for improving the energy performance of buildings. In some cases, a lack of understanding on the part of building residents and managers with regards what was and wasn't allowed led to a precautionary approach where no improvements were made. These issues stress the importance of firstly, local policy frameworks striking a balance between preservation of historically and aesthetically significant buildings and necessary low carbon improvements to the building stock; and secondly, accurate information provision to building decision-makers and residents so that they accurately understand what changes are allowed, and how to ensure changes made are sensitive to the significant characteristics of the building⁹.

⁹ The 2015 STBA publication 'Planning responsible retrofit of traditional buildings' is a good example of this: <http://stbauk.org/resources/stba-guidance-and-research-papers>

5 Good practice examples

Long term national renovation strategies are not sufficient to stimulate the level of renovation which is needed. Some countries have done more to address this than others (e.g. Germany). The LEAF project has flagged up some examples of best practice, several of which are listed below. These include both national strategies and also regional/national schemes which could be replicated elsewhere.

- a) **Maintenance funds ring-fenced for energy efficiency improvements.** This exists in only a very few situations currently and tends to be specific to management arrangements in certain multi occupancy buildings. It stimulates renovation of buildings by making funding accessible for energy efficiency improvements (as distinct from general building maintenance), getting around the financial barrier to retrofit. This could be adopted as a national strategy and could be used to target, for example, the worst EPC-rated multi-occupancy buildings to ensure funding is available to undertake essential work. As a policy it would work effectively alongside the introduction of minimum requirements.
- b) **Requirement to do energy efficiency work at the same time as maintenance work is carried out.** This policy is being introduced in France from 2017 and is an excellent example of best practice which not only stimulates energy efficient retrofit but also makes improvements more cost effective. When improvements are made alongside other maintenance work rather than separately, there are associated cost savings on, for example, scaffolding, access to pipes and wires, or re-decoration following building work.
- c) **Funding for measures which exceed legal requirements.** In Germany a national programme offers grants or cheaper interest rates for retrofit of residential buildings and buildings of communal and social infrastructure. Measures supported exceed the legal requirements of the Energieeinsparverordnung and as such encourage a level of retrofit beyond simply meeting requirements. Similarly, Austrian subsidy systems calculate the amount of funding based on the quality of the refurbishment achieved in order to improve energy performance in buildings (i.e. beyond legal requirements).
- d) **Minimum standards for energy performance at point of sale / let.** This policy measure, currently in place in Scotland for housing associations, sets a minimum rating (in Scotland a D rating is currently required), and ensures that when a property is sold or leased to new tenants, improvement work must be carried out if the property does not meet minimum energy performance levels.
- e) **Rental Price Points System.** In the Netherlands, rent setting is based on a 'home points system', in which various features like space and facilities add points. Energy efficient improvements add points, meaning that a higher rent can be charged so the landlord or building owner can recoup the cost of making improvements, whilst the occupier benefits from cheaper running costs which balance out a higher rent.
- f) **Local trade support programmes.** A UK scheme run by CSE as part of a Local Authority retrofit programme provides training courses to help local skilled tradesmen,

like plasters and renderers, enter the market for external solid wall insulation, addressing the barrier of gaps in the supply chain.

- g) **Scottish area based programmes for home energy efficiency improvements.** In Scotland, the Home Energy Efficiency Programmes' (HEEPS) Area Based Schemes form a 10 year programme which is funded by the Scottish Government and tops up ECO funds. Schemes are delivered through local authorities, who are best placed to understand the nature of local housing provision and co-ordinate a local supply-chain. The programme is focussed on the most deprived areas in the country and hard-to-treat measures, such as external wall insulation (with previous programmes having installed easier low-cost measures).
- h) **Long term leases.** In Germany leases tend to be long term and residents have more of a vested interest in paying for improvements to properties which they do not own. In addition, management arrangements in multi occupancy buildings are well structured and improvements can be co-ordinated centrally.
- i) **Subsidies paid directly to installers.** The Energy Company Obligation is a UK scheme which provides funding for energy efficiency improvements. Unlike most other schemes, payments for improvements go straight to the installers (not the resident), ensuring that funds are actually used to pay for energy efficiency improvements, and making it easier for residents to manage payments in multi occupancy buildings. This system limits consumer choice of installer, but in some situations this drawback is outweighed by the advantage of simplifying the payment process.
- j) **Subsidies for building-wide energy efficiency improvements paid to building management committees.** The greater Lyon federation of cities offers subsidies to owners associations to pay for works which are implemented across multi occupancy buildings such as external wall insulation, shared ventilation systems, and shared heating system.
- k) **Demonstration homes.** The UK Green Open Homes programme was set up with funding from central government in the UK and stimulates renovation through demonstration projects and using the principle of social norming. Householders who have made energy efficiency improvements to their homes open them to visitors to explain what they have done, how it works and what the benefits are. Evaluation data show that visitors are influenced to make improvements to their own homes.
- l) **Combining subsidies and loans.** In France, subsidies are often combined with loans. Loans are easily to obtain for owner associations because of lending arrangements which are not dependent on age, health or income. The only criteria is that the borrower pays building management fees (i.e. costs requested by the property manager to pay for cleaning and lighting of the shared parts of the building). The amount borrowed can be as much as the total cost of improvement measures minus the subsidies and the length of the repayment period is flexible (monthly instalments spread over 3, 5, 7 or 10 years). This is an opportunity which could be trialled in other countries.

- m) **Paying for improvements linked to energy bills.** The Green Deal model in the UK (no longer running) provided a way around occupiers not having access to funds to pay for up-front costs of low carbon improvements. Finance packages were calculated based on potential improvements and anticipated energy savings, with costs recovered through an additional payment added to electricity bills. The energy saving improvements which are installed reduce energy use in the property (and therefore the running costs), so the overall bill, in theory, does not increase. The Green Deal itself did not prove to be a success for a number of reasons, (such as the interest rate applied), but the premise of up front costs paid back through a payment added to energy bills is replicable.

6 EU wide policy recommendations

The LEAF project addresses barriers and identifies opportunities to retrofit apartment blocks. Key issues identified through the project have been used to develop a set of policy recommendations for addressing the challenges and barriers to undertaking energy efficiency refurbishment in multi-occupancy buildings. The recommendations are framed around the experiences and lessons learned in the LEAF project, particularly the work with case study sites, and take into account partner expertise in this sector, stakeholder feedback, in depth policy analysis by the project partners, and evaluation of the LEAF toolkits.

Core policy recommendations are grouped into five topic headings and are listed below. There is considerable overlap across the topic headings so the recommendations are also presented by topic in section 6.2. Recommendations specific to the EPBD are set out in Sections 6.3 and 6.4 , and section 6.5 makes recommendations for further research in this field. National policy recommendations specific to the LEAF partner countries have been separated out and can be seen in part 7 of this report.

These recommendations should be read in the context of the full discussion of issues and opportunities identified during the LEAF project, including local considerations to be taken into account when considering suitable policy changes.

6.1 List of core recommendations

1. Develop and maintain a publicly available database of all EPCs
2. Improve quality of energy saving calculations presented in the EPC
3. Improve communication of recommended measures on EPCs
4. Improve overall clarity and explanation of content of EPCs
5. Improve comparability of EPCs between different MS
6. Ensure there are whole building EPCs in all MS (with minimum standards linking to communal areas)
7. Improve the availability, design and management of public funding schemes,
8. Expand the level and type of financial support initiatives
9. Develop the role of EPCs in financial support initiatives for energy efficiency improvements
10. Introduce minimum requirements at the point of renovation
11. Introduce minimum requirements at the point of sale and/or lease
12. Improve the provision of information on low carbon retrofit
13. Expand local energy advice services and demonstration projects
14. Implement accreditation schemes for installers and EPC assessors
15. Upskill the workforce, with a focus on developing local networks and improving ambition and quality of retrofit projects

16. Improve integration between low carbon retrofit and maintenance and renovation work
17. Require maintenance plans and funds for multi occupancy buildings
18. Require management arrangements for multi occupancy buildings which include communication structures and decision making processes.

6.2 Recommendations linked to key issues

Information provision

These recommendations include a strong focus on improvements to EPCs so that they can be used more effectively as a driver for low carbon retrofit. There are also recommendations around provision of information to address barriers which have been identified.

• Develop and maintain a publicly available database of all EPCs
• Improve quality of energy saving calculations presented in the EPC
• Improve communication of recommended measures on EPCs
• Improve overall clarity and explanation of content of EPCs
• Improve comparability of EPCs between different MS
• Ensure there are whole building EPCs in all MS (with minimum standards linking to communal areas)
• Improve the provision of information on low carbon retrofit
• Expand local energy advice services and demonstration projects

Demand-side factors

Stimulating demand is a challenge for policy makers since so much depends on consumer attitudes and behaviour. Many of these recommendations focus again on EPCs and information provision in order to address the information barrier which is one step in the process leading to a decision to install energy efficiency improvements. Access to finance and funding also features here since money to pay for improvements is obviously crucial, and subsidies have been shown to stimulate demand. Incentives (implying voluntary take up) should be combined with regulations to mandate improvements to properties at key points in time (i.e. when a building is renovated; when a dwelling is sold or a new tenant takes on a lease). We also note the importance of combining low carbon improvements with other retrofit and maintenance work (including a supply chain role in identifying opportunities and a requirement for long term building maintenance plans so that works can be planned ahead and carried out more cost effectively). Finally there is a recommendation for basic management structures to be in place in all multi occupancy buildings to overcome communication and decision making barriers where multiple stakeholders are involved.

• Develop and maintain a publicly available database of all EPCs
• Improve quality of energy saving calculations presented in the EPC

• Improve communication of recommended measures on EPCs
• Improve overall clarity and explanation of content of EPCs
• Improve the availability, design and management of public funding schemes
• Expand the level and type of financial support initiatives
• Introduce minimum requirements at the point of renovation
• Introduce minimum requirements at the point of sale and/or lease
• Improve integration between low carbon retrofit and maintenance & renovation work
• Require maintenance plans & funds for multi occupancy buildings
• Require management arrangements for multi occupancy buildings which include communication structures and decision making processes.

Supply-side factors

The supply chain of course has a vital role to play in any retrofit project, but there are currently barriers around the accessibility of trained and reliable installers, the difficulties in co-ordinating where multiple contractors are needed, and the overall lack of a joined up approach integrating the supply chain. Our recommendations are twofold, looking at improving quality of retrofit works on the one side, and on the other improving support for the sector so that it can expand to deliver the scale of retrofit which is required. This second area includes improving funding schemes (where appropriate moving away from single-measure schemes) and expanding financial support initiatives so that builders and installers have more leverage to market low carbon measures to householders, including making improvements alongside existing retrofit and maintenance work.

• Improve the availability, design and management of public funding schemes
• Expand the level and type of financial support initiatives
• Improve integration between low carbon retrofit and maintenance & renovation work
• Implement accreditation schemes for installers and EPC assessors
• Upskill the workforce, with a focus on developing local networks and improving ambition and quality of retrofit projects

Funding & finance

Issues related to paying for low carbon retrofit are exacerbated in multiple-occupancy buildings because of the number of different stakeholders involved, limited resource in building maintenance funds, length of time to make a decision between multiple stakeholders, and low priority given to energy efficiency improvements compared to essential maintenance work and other demands on limited funds. Most countries have some form of state support for energy efficiency measures, but funding is often inconsistent and piecemeal, in some cases actually acting as a barrier rather than facilitator of retrofit. These issues are reflected in our recommendations, which reinforce the need for improved public funding, greater access to other financial support and development of the role of EPCs in identifying and paying for improvements. The recommendation for longer term maintenance

plans with ring fenced funding is repeated since this affects the way that energy efficiency improvements are paid for and also the ability to plan ahead and achieve cost effectiveness in retrofit projects. Where there is not already a process, basic management arrangements need to be in place so that decisions affecting multiple stakeholders can be made, allowing improvements to go ahead and not be stalled by problems with communication or one party preventing progress.

<ul style="list-style-type: none"> • Improve the availability, design and management of public funding schemes
<ul style="list-style-type: none"> • Expand the level and type of financial support initiatives
<ul style="list-style-type: none"> • Develop the role of EPCs in financial support initiatives for energy efficiency improvements
<ul style="list-style-type: none"> • Require maintenance plans & funds for multi occupancy buildings
<ul style="list-style-type: none"> • Require management arrangements for multi occupancy buildings which include communication structures and decision making processes.

Regulations

There is a strong case to be made for legal and regulatory mechanisms to be put in place or tightened or to help to stimulate retrofit in multi occupancy buildings. We have already mentioned recommendations to improve EPCs, including addressing inconsistencies between different member states which make enforcing the EPBD a challenge. There are also recommendations for appropriate minimum requirements (for energy performance) at the point of sale and lease, and when renovations are carried out. Finally the recommendation is reiterated for management arrangements to be in place to improve communication between residents and other stakeholders, and facilitate decision making and co-ordination on retrofit projects.

<ul style="list-style-type: none"> • Improve comparability of EPCs between different MS
<ul style="list-style-type: none"> • Introduce minimum requirements at the point of renovation
<ul style="list-style-type: none"> • Introduce minimum requirements at the point of sale and/or lease
<ul style="list-style-type: none"> • Require maintenance plans & funds for multi occupancy buildings
<ul style="list-style-type: none"> • Require management arrangements for multi occupancy buildings which include communication structures and decision making processes.

6.3 LEAF policy recommendations specific to the EPBD

The points below summarise progress made by the six LEAF partner countries on the EPBD, expanding on section 4.3 above and concentrating on the requirements around EPCs and actions which still need to be prioritised in order to achieve EPBD goals. There is considerable overlap with the key areas for action identified in the latest review of progress with implementation of the EPBD by the Concerted Action group.

- **Development and maintenance of a database of all EPCs is not yet complete.** One of the Key Implementation Decisions of the EPBD is for partner countries to develop and maintain a national database of all EPCs. This should be a priority action for those countries which have not yet made EPC data publically available.
- **Improve quality of energy saving calculations presented in the EPC.** The reliability of calculated energy savings presented on EPCs in some countries is questionable, particularly in blocks of apartments. This has been a real issue for the LEAF project as the EPCs lack the weight needed to garner the trust of residents and building managers and persuade them of the benefits of renovation. We therefore strongly support research to address this, with the aim of improving and standardising methodologies.
- **Improve communication of recommended measures on EPCs.** Recommendations for improvement measures are often poorly presented. The experience of partners in the LEAF project has provided further evidence of this. For example, in Austria EPC recommendations have been criticised for being embedded within an annex; in Sweden recommendations are considered too general in nature and to offer limited energy savings; in France recommendations for improvements are lacking altogether. Whilst differences in the content and layout of EPCs in each country are perhaps necessary, LEAF partners would like to see, as a priority for action, a tightening of regulations to ensure that recommended measures are an integral part of the EPC in all countries and are tailored to the property through a site assessment as far as possible.
- **Improve format of EPCs.** EPCs have been criticised for being complex and not very “user-friendly” (UK and Sweden), with insufficient explanations about the different information presented (France and Austria). Member States need to improve the format of EPCs, to create a clear and engaging document that residents are encouraged to use and act upon.
- **Ensure EPCs are comparable between different countries.** Because of the differences in EPC methodology, data, appearance and quality control, it is not possible to use EPCs to compare buildings across different countries. This impacts on the quality of EU data available to measure achievement of EPBD goals and also on aims to facilitate a single market.
- **Address funding infrastructure.** Financial support for installation of EPC recommended measures has been a major issue for LEAF project partners in working to retrofit multi-occupancy buildings. Public funding tends to be limited, short term, focussed on specific measures, with complex eligibility criteria. These issues need to be addressed for public funding to be used to successfully achieve EPBD objectives via installation of energy efficiency improvements in buildings. LEAF partner organisations

would recommend subsidies which are more accessible, better explained, and which run over longer timeframes in order to provide consistency and increase confidence for consumers and suppliers (and ultimately increase installation rates).

- **Make improvements to public funding schemes in order to leverage private finance.** The latest review of progress on the EPBD by the CA group highlights the importance of not relying solely on government subsidies for financing energy efficiency measures. However, for private finance to be leveraged against public funding, the latter must be simple, consistent, and have sufficiently long timeframes to enable take up.
- **Develop the role of EPCs in financial support initiatives for energy efficiency improvements:** The role of EPCs as a mechanism for leveraging financial support for improvement measures is still evolving, with many schemes making no formal or direct link to EPCs. Two of the LEAF partner countries have implemented schemes that make this association explicit: the French PT2+ loan scheme and the UK's Green Deal programme. The most common role of the EPC is to verify the energy savings expected from installing specific measures. This suggests the full potential of EPCs to influence energy efficiency retrofits is yet to be realised and there is work to do in most MS in making this link.

7 National policy recommendations

In addition to the core policy recommendations identified during the LEAF project, there are recommendations specific to individual partner countries. These reflect experiences of the LEAF case study buildings, local stakeholder feedback, and national policy research.

Austria

These national recommendations are in addition to, but also complement, the core LEAF findings and recommendations for low carbon retrofit of multi occupancy buildings, which include:

- EU wide policy recommendations
- Recommendations for the implementation and improvement of the EPBD
- Examples of best practice in different European countries

Information provision

EPC recommendations in Austrian EPCs should be integrated within the main EPC report (not embedded within an annex) and explained clearly, including a ranking where appropriate of which measures will achieve the biggest impact, together with an indication of cost and energy saving potential.

Establish demonstration projects for low-energy and passive house retrofits.

Demonstration projects are needed to raise awareness and understanding of potential improvements, complementing information provision and bringing retrofit to a more mainstream audience.

Funding and finance

Improve awareness of the national residential building subsidy. Current maintenance funds are often too low to cover the cost of energy efficiency improvements in multi occupancy buildings, but the national residential building subsidy (Sanierungsscheck) can be used more extensively to trigger installation of single measures and to enhance the level of holistic renovation work.

Improve access to the national residential building subsidy. In order to improve take up, the subsidy should be made easier to access by simplifying the application process for individuals, and providing support for property managers in multi occupancy buildings wishing to make use of it.

Make better use of the residential building subsidy (specific to Vienna) by using the subsidy as an incentive to initiate projects and to set high standards for energy performance.

Legal and regulatory

Ensure the standards are implemented in retrofit and renovation projects to significantly improve the quality of buildings. The standards set out in the Energy Efficiency Law should be met in all renovation projects, and the more ambitious klima:aktiv

building standards should be achieved where possible. This may require a fiscal or financial incentive, or could be linked with existing subsidies.

Enforce minimum thermal standards for buildings and encourage the development of specifications for retrofit projects which exceed the standards.

France

These national recommendations are in addition to, but also complement, the core LEAF findings and recommendations for low carbon retrofit of multi occupancy buildings, which include:

- EU wide policy recommendations
- Recommendations for the implementation and improvement of the EPBD
- Examples of best practice in different European countries

Information provision

Improve information contained in EPC reports. Changes are needed to the format and presentation of the standardised EPC report. Currently recommendations for improvements are lacking altogether from French EPCs; options should be clearly integrated and explained within the report.

Include maintenance work in energy audits and EPCs. ADEME subsidised energy audits in the LEAF case studies helped professionals to acquire experience, and helped small and co-ownership buildings with decision making on energy performance measures. LEAF experiences have shown that audits which consider only energy are less effective in terms of getting retrofit work done than audits which also address maintenance work (and specifically energy performance measures which can be incorporated with maintenance work). Encouraging energy performance measures within maintenance work also means that work is more likely to be voted for by owners, and the idea can be used to make EPCs more accurate.

Include shared measures in EPC reports. Energy saving improvements and maintenance work recommended for the building as a whole should be included in individual EPC reports when the dwelling is part of a multi occupancy building. This will help occupiers to compare the costs and benefits of proceeding individually with improvements just to their apartment with the costs and benefits of shared improvements.

Local information campaigns on energy saving. The very positive national ADEME energy-saving awareness campaign provides a background for discussing energy performance in buildings. It could be further strengthened with local communication campaigns which back up the national messaging.

Financial support for local energy advice services. Local energy information centres play a vital role in providing impartial advice to building owners and residents. Further support for local centres is needed to ensure they can provide the best impartial and reliable information about subsidies and technical aspects of retrofit, as well as providing support for building managers and committees with communication and project management.

Link up information provision, national strategies and financial incentives. The national refurbishment plan for housing (PREH) has a very positive impact in terms of encouraging more people to consider energy performance works. It is important that it links closely with the national awareness raising campaign on energy saving, and with provision of subsidies.

Demand side

Increase awareness of link between EPC ratings and property value. There is evidence to show that EPC ratings impact on property value. A-rated properties are 10% more expensive than D-rated properties, and F-rated buildings are sold for 15% less than their D rated equivalents. This is therefore an opportunity to improve awareness of the benefits of energy efficiency improvements and stimulate demand in the market.

Funding and finance

Improve availability, design and management of public funding schemes. As with most other EU countries, there are difficulties in France with inconsistent and unreliable offers of state funding, which vary (and can even be contradictory) from one region to the next, creating a complex picture of support. The core LEAF recommendation regarding improvements to the availability, design and management of public funding schemes should be prioritised in France. Financial incentives need to be long term, easy to understand, and easy to access.

Improve consistency. Financial incentives should be standardised across different regions of France in order to improve public awareness of subsidies and also avoid supply chain problems and the tendency to focus on promotion of single measures depending on where the funding is. Subsidies should also be set so that they are complementary and do not operate in competition.

More promotion of the sustainable development tax credit. The sustainable development tax credit had a positive impact in the LEAF case study buildings, and this policy could be used more to stimulate low carbon retrofit. The financial incentive encourages owners to think about energy performance measures. We therefore recommend more promotion of the subsidy to encourage take up.

Improve systems for awarding tax credit. Tax credits are claimed one year after the end of the works, using an invoice as evidence. However, work often takes more than one year and tax credit policy can change between the date on which agreement is reached to proceed with measures and the date on which work is completed. Our policy recommendations are that the decision to apply for tax credit should be included in the general assembly minutes, and the rate in place at that time is the rate which should be paid on completion of the work.

Increase awareness of VAT reduction on energy efficiency investments. This is another financial incentive which can be used to incentivise retrofit. However, the criteria need to be clearer and awareness of it improved so that more people are able to access it.

Expand use of OPAH Subsidies for retrofit. The OPAH can be used by cities to encourage energy performance measures in older buildings owned by those on lower

incomes. They are not used everywhere and there is potential to expand their use to encourage low carbon retrofit.

Provide financial support for professional expertise at the planning stage. Because improvements are often driven by subsidies, owners have often decided on improvements before applying for a subsidy. Before this decision, they may employ an architect or engineer for professional advice but on that specific improvement (rather than an overall building assessment). Funding this kind of advice would help to ensure impartiality and open up opportunities for a wider range of energy efficiency improvements to be made.

Legal and regulatory

Set minimum requirements for energy performance for all renovation projects.

Currently minimum requirements apply only to insulation work, not general refurbishment of buildings. Changing minimum energy performance requirements to cover all building renovation work would make a significant impact.

Introduce long term building maintenance plans in all multi occupancy buildings. The lack of management structures in multiple ownership buildings means that making contact with decision makers, communicating opportunities, and reaching a decision to proceed with energy efficiency improvement is incredibly hard, especially when building managers change and when the general assembly (meeting of building managers and owners) only takes place once a year. Use of long term whole-building maintenance plans is therefore strongly recommended so that improvements can be planned ahead, avoiding the need to wait several years for decisions to be finalised and reducing costs by combining energy efficiency improvements with maintenance work where possible. We strongly recommend the rollout of long term maintenance plans in all multi occupancy buildings.

Set requirements for building management and communication plans. Building maintenance plans would be strengthened further by mandating requirements to have comprehensive systems in place for communication with tenants, owners and stakeholders in multi occupancy buildings. Such agreements could potentially include standardised methods of calculating financial contributions from residents to pay for works (based on how much different residents would benefit from the work proposed).

Publicise and implement new decision making regulations in multi occupancy buildings. Similarly, the changes introduced within the 2015 law for an energy transition which make it easier for decisions to be reached should be publicised and utilised to facilitate retrofit projects. The new regulations mean that energy efficiency improvements can go ahead if they are voted for by more than 50% of owners present at the general assembly (rather than needing a majority of owners to vote even if they do not attend the meeting) making it easier to get agreement.

Improve guidance on permissible low carbon improvements in conservation zones. In France the regulations governing measures permitted in listed and protected buildings extend to buildings within a 500m vicinity of a protected building. Information provision and clear guidance on the types of improvements which are allowable under these circumstances would help to overcome a perceived barrier that no retrofit work can be carried out across quite wide areas of towns and cities.

Implement local planning exemptions to encourage solid wall insulation. The new regulations under the 2015 energy transition law devolve powers to local government to simplify the process of getting planning permission for external wall insulation. These could be made use of more widely in cities across France and applied sensitively to enable energy efficiency retrofit in circumstances where the historic and aesthetic value of buildings would not be adversely affected by improvements but where national regulations would otherwise prohibit it.

Germany

These national recommendations are in addition to, but also complement, the core LEAF findings and recommendations for low carbon retrofit of multi occupancy buildings, which include:

- EU wide policy recommendations
- Recommendations for the implementation and improvement of the EPBD
- Examples of best practice in different European countries

Information provision

EPC improvements. Improvements should be made to the layout of the EPC, in particular the way that energy performance and energy performance ratings are presented. Differentiating between fuel types in the EPC would help give consumers a more accurate idea of energy costs.

Supply chain

Improved quality control is needed across the supply chain, including the implementation of a national EPC database and quality control systems across the supply chain including EPC assessors, building contractors, installation processes and materials.

Funding and finance

Financial incentives should be easy to understand and easy to access. The large differences in financial instruments across regions affect consumer decision making as well as the availability and costs of installers, so more consistency between different regions is essential. As with the core LEAF recommendations, subsidies for energy efficient and low carbon improvements should be long term, consistent, and easy to understand and access.

Legal and regulatory

Mandatory building management structures. Difficulties in building management structures – for example frequent changes in property management staff – can undermine progress with proposals for improvement measures. Our recommendation is to set up mandatory building management structures (to include standardised data collection and record keeping and facilitating communication with and between residents and owners), to

streamline decision making processes and provide an infrastructure which can better support installation of low carbon improvements.

Hungary

These national recommendations are in addition to, but also complement, the core LEAF findings and recommendations for low carbon retrofit of multi occupancy buildings, which include:

- EU wide policy recommendations
- Recommendations for the implementation and improvement of the EPBD
- Examples of best practice in different European countries

Information provision

- **Information on approved installers/ assessors** should be part of improving information provision, and accreditation could extend to the software used in generating EPCs, to make recommendations more accurate. The implementation of accreditation schemes for installers and EPC assessors across all countries is one of the core LEAF policy recommendations and overlaps with the recommendation for national EPC databases which are publically accessible.
- **The format of the EPC report should also be reviewed**, including the language used to present information. In Hungary (as with most other countries to a greater or lesser extent) there is a barrier relating to the use of technical jargon being difficult for the (non-technical) target audience of residents.
- **Local information campaigns on energy saving.** National energy-saving awareness campaigns could be further strengthened with local communication campaigns to back up the national messaging and flag up opportunities and incentives.
- **Financial support for local energy advice services.** Local energy information centres can play a vital role in providing impartial advice to building owners and residents. Support for local centres is needed to provide access to impartial and reliable information and advice for householders (for example, available subsidies and how to apply; improvement options and technical advice), as well as providing support for building managers and committees with communication and project management.

Demand side

- **Develop a publically accessible EPC database.** Hungary has an EPC database but there is very limited access. Improvements to the existing database, or alternative means for making EPC information freely and publicly available, should be implemented as a priority. This would provide a valuable resource to improve access to information about energy performance of buildings and inform decisions about improvements.
- **Energy performance data and case studies.** To complement the EPC database, open access data and information should be provided (and maintained) including

statistics, market information and evaluation data relating to energy efficiency in buildings.

Supply chain

- **Address the development of quality control on EPC assessors** as a priority, including assessor training, accreditation, checks and enforcement. Despite current quality control systems, there have been examples of the same dwelling being given a very different rating by one assessor compared to another, and EPCs have been known to be issued without the assessor even visiting the property. This undermines consumer confidence in the EPC rating and its value.
- **Implement and enforce quality control systems for the installation of energy efficiency measures** in buildings across the whole supply chain (including contractors, processes and materials). Government-backed or independent institutional accreditation schemes can help ensure quality and instil confidence in the market.

Funding and finance

- **Long-term and easy to understand financial and fiscal incentives.** There was little funding available in Hungary at the time of the case study work and what was available was inconsistent, piecemeal and unreliable. Volatility of state support can do as much harm as it does good, undermining confidence amongst contractors and general public. Where possible long term, easy to understand, financial and fiscal incentives should be used to support the implementation of regulatory frameworks and incentivise retrofit. This is especially critical given the lack of liquidity and financial savings in the residential sector.
- **Set up financial incentives for the technical and financial planning and preparation of retrofit projects in residential buildings.** Most residential buildings in Hungary do not have EPCs or detailed retrofit plans. Financing expert fees as an investment in preparation for retrofit is not an obvious step for many owners community. Supported technical assistance would help these communities to realise the energy saving potential of their buildings.
- **Introduction of discounted VAT for energy efficiency investments.** Reduced VAT for energy efficiency services and products should vitalize/strengthen the market and encourage owners to carry out energy efficient retrofits.

Legal and regulatory

- **Strong and long-term regulatory frameworks.** Address overall policy development for the energy and environmental sectors in order to implement strong and long term regulatory frameworks, particularly for energy performance in buildings. This will help prioritise low carbon retrofit in a climate of decreasing energy prices which may otherwise remove motivation to reduce energy consumption.
- **Prioritise development of mandatory management structures in multi occupancy buildings,** with a particular focus on communication and decision making.

- **Introduce long term building maintenance plans in all multi occupancy buildings.** The lack of management structures in multiple ownership buildings means that making contact with decision makers, communicating opportunities, and reaching a decision to proceed with energy efficiency improvement is incredibly hard, especially when building managers change and stakeholder meetings do not take place very often (if at all). Use of long term whole-building maintenance plans is a means to ensure improvements can be planned ahead (avoiding the need to wait several years for decisions to be finalised) and reduce costs (by combining energy efficiency improvements with maintenance work where possible). We strongly recommend the rollout of long term maintenance plans in all multi occupancy buildings.

Sweden

These national recommendations are in addition to, but also complement, the core LEAF findings and recommendations for low carbon retrofit of multi occupancy buildings, which include:

- EU wide policy recommendations
- Recommendations for the implementation and improvement of the EPBD
- Examples of best practice in different European countries

Information provision

Review format of EPCs. Recommendations for improvement measures are often poorly presented in the EPC report in Sweden. LEAF project feedback was that recommendations are considered too general in nature and offer limited energy savings. The format of the EPC should be reviewed to make it easier for householders to understand and to act on the advice given.

Improve information on energy efficiency in historic buildings. The LEAF case studies in Sweden are all within a World Heritage Site, so there are local regulations on what measures are permitted. Information provision and clear guidance on the improvements which are allowable under these circumstances would help to facilitate sensitive low carbon retrofit.

Funding and finance

Financial incentives should be long term, well structured, clear and easy to access. As with the other European countries, where financial incentives are short term, inconsistent and confusing to consumers, they can actually be a barrier rather than an incentive for retrofit.

Legal and regulatory

National targets specific to multi occupancy buildings would drive forward national programmes targeting energy efficiency retrofit. These could form part of building regulations, be delivered as part of existing routes for implementation of the EPBD, or via

locally administered policies and schemes. Financial support will help with achievement of targets.

Decision support tailored for different ownership structures. The case studies show that there is a lack in knowledge among residents in the housing cooperatives when it comes to planning and managing retrofit.

UK

These national recommendations are in addition to, but also complement, the core LEAF findings and recommendations for low carbon retrofit of multi occupancy buildings, which include:

- EU wide policy recommendations
- Recommendations for the implementation and improvement of the EPBD
- Examples of best practice in different European countries

Information provision

Create more case studies. Examples are needed to demonstrate and raise awareness of the cost effectiveness of taking action on the whole building as opposed to individual units. This is particularly significant in the UK as there is currently whole-building EPCs are not available, meaning there is no mechanism through which whole building recommendations are made and detailed (including improvements in communal areas)¹⁰. Case studies and demonstration projects can also be used to create marketing exemplars targeting the supply chain to help with recognition of opportunities.

Carry out research into whether energy efficiency improvements in homes leads to increased property or rental value. For example, in France research has been carried out that shows a demonstrable link between energy efficiency of homes and their sale or rental value. In the UK there is a sense that energy efficiency refurbishment probably does do this, but there is a lack of evidence to show this and therefore a missed opportunity to use this as motivating factor for residents and owners.

Financial support for local and impartial information provision. The case studies showed the importance of unbiased information and advice for householders in order to raise awareness of potential energy saving measures and provide support through the (complex) process of making improvements. The role of trusted local energy advice agencies is highlighted elsewhere but is seen as particularly important since provision across the UK (except in Scotland) is currently patchy and frequent changes to regulations and financial support are hard for individuals to keep abreast of.

Extend the EPC database to cover Scotland. Currently the English EPC database provides a means of sharing and accessing EPC data which has multiple benefits for

¹⁰ The LEAF project created an [EPC tool](#) which assimilates individual EPCs into a whole-building EPC.

consumers, the supply chain, information providers and decision makers. Extending it to Scotland would help to facilitate planning for low carbon retrofit.

Demand side

Improve building management structures. Making contact with decision-makers proved very challenging across all the LEAF case study sites. There were particular problems in England and Scotland in privately rented dwellings with obtaining contact details of the landlords and communicating with tenants. In many cases there is no formal management structure which means that no framework exists for communicating with residents or decision-making. We therefore recommend the development of mandatory management structures in multi occupancy buildings (such as factoring organisations or resident associations). Further research and consultation would be required to determine what type of structure would be most appropriate (and what flexibility there may within requirements to choose different structure), and the exact role and responsibilities of the organisation. This can draw on lessons learnt through LEAF, for example, that resident associations need to meet more than once a year (as in France) to be productive.

In addition, LEAF project experience and previous research conducted in Scotland¹¹ show that trust in factoring/management organisations can be low if organisations perform poorly or are perceived as expensive. Regulation of external management companies is therefore important.

Lastly, changes in management structures should be done alongside requirements to have long-term building maintenance plans which include provision for energy saving improvements. Again further research would be required to explore the scope of such a requirement.

Targeted marketing. In multi occupancy buildings, marketing of opportunities to improve the building should be designed to reach, and to be of interest to, residents (either through direct marketing campaigns or by working with stakeholders that can target marketing at residents of that particular building) to avoid marginalisation.

Mortgage lenders to factor EPC energy cost data into lending calculations. This would improve mortgage affordability calculations (thereby lowering risks for lenders) and improve understanding by purchasers of the energy performance of properties. This in turn would help to raise the profile of EPCs and lead to a closer relationship between the energy performance and the value of homes, making low energy homes more desirable and stimulating demand for low carbon improvements. This concept is explained more fully in a recent report from the UK Green Building Council¹².

Supply chain

¹¹ http://www.changeworks.org.uk/sites/default/files/Communal_improvements.pdf

¹² The role of energy bill modelling in mortgage affordability calculations, 2015. Richard Griffiths, UK-GBC and Ian Hamilton & Gesche Huebner, UCL Energy Institute
<http://www.ukgbc.org/resources/publication/role-energy-bill-modelling-mortgage-affordability-calculations>

Support training programmes and establish local installer networks. Lack of quality, trustworthy installers (particularly with more innovative and less mainstream measures) affects take up of measures and is a crucial but often overlooked step between information provision and the decision to install improvements.

Quantify the opportunity. By presenting better information on the opportunities in multi occupancy retrofit specifically for the supply chain, installers and others in the supply chain will be better able to develop offers and structures that appeal to this market.

Funding and finance

Maintain subsidies for low carbon improvements. The UK has a legacy of relatively stable and consistent funding for energy efficiency measures prior to 2013. As a result, there is a lingering perception that support is and will continue to be available, and indeed is almost expected: case study residents would not proceed with any measures in the absence of any funding (also due in part to personal financial circumstances). In most cases stability and consistency of funding is seen to be more valuable than subsidies which cover the whole cost of improvements.

Ensure funding is long term, criteria do not regularly change and schemes are easy to understand. In England (and Scotland, though to a lesser extent), at the time of the case study work, the focus of the UK Government's energy efficiency scheme (the Energy Company Obligation) changed and whilst some small pots of funding offered some generous grants (the Green Deal Home Improvement Fund) these offers were unreliably brief (opening and closing to applicants within a matter of days). As a result, it was very difficult to present a proposal for work to the case study sites with any confidence of funding support. The complexity of funding streams (too many; different routes to support with different criteria; frequent changes) makes it difficult for householders to understand and undermines confidence in the supply chain. Time-limited offers can also result in rushed jobs, problems with poor quality installations, unmanageable demand on the supply chain and poor customer service. The same challenge is faced by social landlords whereby a changing funding landscape can create uncertainty and difficulties with planning/implementing projects (especially with mixed tenure blocks which require tenant and private owner engagement).

Support funding schemes that are designed to target multi-occupancy buildings and include funding for engagement. In Scotland the HEEPS:ABS programme is delivered by local authorities who identify areas and properties to target for funding. Local authorities with areas where multi-occupancy buildings are prevalent have been able to direct funding specifically at these properties: the HEEPS:ABS funding is used to fund measures in private housing whilst social landlords pay for improvements in their own stock. These are otherwise blocks in which social landlords may struggle to improve. Similar devolved powers to local authorities or regional agencies across the whole of the UK would help to target public funding where it is most needed. In addition the HEEPS:ABS funding has provided additional funding to help with engagement work in these areas to facilitate the uptake of measures. This is also a recommended feature for funding programmes in other parts of the UK.

Reinstate reduced levels of VAT on energy efficient products and services. This would provide a financial incentive for consumers and also help to support the supply chain.

Recognise the complexity of multi occupancy dwellings within energy efficiency improvement funding programmes and legislation. There is additional cost in managing the complexity involved in multi occupancy buildings (particularly where a package of different improvements are being made or where financial contributions from residents are required). This needs to be built into the funding structure of legislation so that improvements can be targeted where there is greatest need.

Legal and regulatory

Whole building EPCs¹³: A new EPC methodology is needed so that EPCs can be carried out for whole buildings (not just for individual apartments within multi occupancy buildings). This addresses four key issues, summarised below. In the short term the LEAF project has developed a workaround as part of its technical toolkit.

- Identifying opportunities. Communal areas are not included within EPC assessments. This means that recommendations regarding measures such as lighting and stairwell insulation would not be included in the EPC, leading to missed opportunities to achieve improvements to the energy performance of the building in question.
- Cost effectiveness of whole building approach. A whole building EPC would make it easier to compare costs and impact of making improvements across a multi occupancy building against making improvements to individual units.
- Engagement of residents and stakeholders. With a single EPC covering the whole building, engaging relevant parties in planning and implementing improvements is easier. Currently, getting permissions for, and carrying out EPCs on individual dwellings within a shared building, before decisions on making improvements can be made, acts as a barrier¹⁴.
- Reporting on performance. Quantifying potential for improvements and achievements in installing low carbon measures, as well as making comparisons with other European countries, would be easier with a methodology in place for carrying out whole building EPCs.

Improve building management arrangements and decision making processes.

Difficulties with identifying stakeholders (particularly where properties are privately rented), and not having defined processes for making decisions, means that agreeing and installing improvements can be extremely time consuming. One aspect of this is that for more expensive improvements, unanimous agreement is needed following a formal consultation, but statutory requirements for carrying out consultations are unclear, and decision making is made more difficult by the complexities of the leasehold and freehold system (specifically in identifying who has responsibility for making improvements to a shared building). Mandatory requirements for management structures which include means of communicating with and between stakeholders, and rules for making decisions, should be a priority.

¹³ The LEAF project created an [EPC tool](#) which assimilates individual EPCs into a whole-building EPC. Stakeholder feedback suggests that this is a useful tool in the UK as it enables a whole block approach.

¹⁴ The exact process for creating a whole building EPC would need to be explored; for example whether the engagement of all residents is necessary or whether a 'light touch' EPC can be created with the engagement of only some residents.

Widen awareness of recent changes to decision making for insulation in tenements. In Scotland the Climate Change Act logs insulation as a maintenance measure rather than an ‘improvement’, which means that agreement to install insulation in multi occupancy (tenement) buildings can be approved via a majority rather than unanimously (in buildings in which it applies).

Review freehold-leasehold law in England and Wales. Changes are needed in order to allow owners of units within a building to proceed with improvements where appropriate. Currently, where ownership is on a leasehold (rather than freehold) basis, there may be restrictions on the improvements (including low carbon retrofit) which can be made.

Review regulations and improve guidance on low carbon improvements in heritage buildings. The sensitive retrofitting of energy efficiency measures and the appropriate use of micro-renewables in historic buildings should be encouraged, including retrofitting of listed buildings, buildings of solid wall or traditional construction and buildings in conservation areas, whilst safeguarding the special characteristics of these heritage assets for the future.

One of the English LEAF case studies was (technically at least) a perfect candidate for external solid wall insulation, but the building’s heritage designation prevented it from being installed. We recommend a review of current policy and regulations to encourage sensitive retrofitting of more low carbon improvements, together with improved information provision and clear guidance (for planning officers as well as building professionals and residents) on the types of improvements which are allowable¹⁵. An example of a strong policy on sensitive retrofit can be seen in the Bath and North East Somerset core strategy¹⁶.

Landlord obligations for making energy efficiency improvements. Within the UK nations there are currently different regulations for private and social housing (for example, social landlords in Scotland have to meet the Energy Efficiency Standard for Social Housing and in England private landlords have to meet minimum EPC ratings). Where minimum standards to do not exist we recommend that these are put in force. The exact requirements will be dependent on the circumstance and requires further consultation. This may include minimum EPC requirements and obligation for landlords to install energy saving improvements at the request of tenants where finance is available.

However this needs to take in to account the methodology for calculating energy efficiency ratings since simple EPC ratings may negate impact within multi occupancy buildings (and in middle floor flats in particular).

Improve integration between regulatory frameworks. The overall regulatory framework across the UK is very complicated, involving national and local policies, regulations, subsidies and support across different sectors (for example building control, housing, energy, environment and fuel poverty) which overlap considerably and often contradict each other. It is hard for professionals, let alone householders, to navigate the system. This needs

¹⁵ It is however recognised that good guidance exists in some places and the bigger barrier is often the expense of measures deemed to be suitable.

¹⁶ BANES core strategy: <http://www.bathnes.gov.uk/services/planning-and-building-control/planning-policy/core-strategy-examination#two> and relevant supplementary planning documents: <http://www.bathnes.gov.uk/services/planning-and-building-control/planning-policy/supplementary-planning-documents-spds/sustain>

to be addressed by national and local policy makers, and supported with training for professionals in the different sectors.

Minimum standards for energy efficiency when renovation & maintenance work is carried out. In the case of renovation work, this is a recommendation in Scotland (England's Building Regulations framework establishes minimum energy efficiency standards when renovation is carried out). In the case of maintenance work, this is a recommendation for both Scotland and England (for example, in France, from 2017 onwards, there will be an obligation for energy efficiency work to be addressed at the same time as maintenance work on a building). Both recommendations would: engage with the notable barrier of 'hassle factor' (where residents are resistant to disruption created from building work); introduce efficiencies from having work carried out simultaneously; and ensure retrofit is done more holistically.

8 Recommendations for further research

The LEAF project, and in particular project partner experiences of working with multi-occupancy buildings attempting to undertake energy efficiency refurbishment, raised various issues and questions for further consideration.

Data

- Further data is required specifically on multi occupancy buildings – their number, the number of occupants, tenure type, energy performance, and opportunities to improve energy efficiency and install renewable energy technologies. Although potential of this segment of the building stock is huge, its scope and complexities are not fully understood, and more accurate data will help with the development and realisation of retrofit programmes.
- In some countries (e.g. France, Netherlands) it is recognised that a good energy rating is associated with properties attracting greater sale and rental prices and as such the EPC itself can be a driver for energy efficiency improvements. Further data is needed in all countries for research to establish conclusively whether or not there is a direct link between energy performance ratings and market value. If there is strong evidence it can be used to stimulate retrofit and improve public understanding of EPCs.
- There is a need for professional and impartial advice services to be mapped so that gaps can be identified and support provided to help fill those gaps.

Motivations and engagement

- Engagement of residents and stakeholders is essential to stimulate demand for energy efficient retrofit, but the factors affecting the level of priority residents of different countries place on energy efficiency and low carbon retrofit are little understood. More work is needed in this area.
- The level of (perceived) success of the EPC system varies in different countries. For example, Germany considers the EPC system to be working effectively, whereas Hungary's experience is to the contrary, experiencing a number of challenges (including the issuing of EPCs issued without a site visit). Critically analysing and understanding reasons behind these varying levels of success with implementation should remain a priority, to ensure learning is shared effectively.
- More research is also needed on buyer / tenant understanding of EPCs, and the extent to which this affects sale/rental value and the buyer / renter's choice of property.

Funding and finance

- Acceptable levels of contribution from the State is subjective, and differs from one country to the next; within countries; and between individual buildings. Research into a 'minimal level of support' that appears sufficient to stimulate and ensure measures are taken up would aid the development and targeting of funding schemes.

- Payback periods were identified by LEAF partners as a factor affecting decision making. If public funding is used to help pay for improvements, and if the level of funding is linked to payback, there are questions about how payback is calculated. If it is incorrectly assessed the occupant risks being worse off financially. Research into real life examples, modelling of different funding models, and perceptions of acceptable payback level in different countries would again help to set optimal funding levels.
- Similarly, different levels of affluence of occupants within one property can mean some residents are able and willing to pay for measures, but are others not and as a result work cannot go ahead (i.e. the latter overrules the former). Is there a financing mechanism that could be designed to specifically address this issue for multi-occupied buildings, for example loans (currently in use in Scotland and France)? Is there more that could be done at the macro-level, for example lower rate VAT on energy efficiency measures; tax incentives; energy efficiency-linked stamp duty rates and other fees associated with buying/selling? Both of these questions bear further investigation.
- The role of EPCs as a mechanism for leveraging financial support for improvement measures is still evolving, with many schemes making no formal or direct link to EPCs. Two of the LEAF partner countries have implemented schemes that make this association explicit: the French PTZ+ loan scheme and the UK's Green Deal programme. The most common role of the EPC is to verify the energy savings expected from installing specific measures. This suggests the full potential of EPCs to influence energy efficiency retrofits is yet to be realised and there is work to do in most MS in making this link.

Regulatory and property factors

- Little work has been done to explore the effectiveness of enforced implementation of energy efficiency improvements. For example if a property is below a certain standard of energy efficiency and improvement measures identified are deemed cost-effective, should the building owners be required to undertake the work? (This then raises the question of what is deemed cost-effective and how this is calculated; and how the work is paid for – the resident may simply not have the capital to pay for it which means there needs to be an accessible and low/zero-interest loan system in place). The Scottish government is considering this as part of their private housing standard regulations (still to be announced). They may expect minimum EPC ratings and/or they may expect particular measures to have been installed
- Protected building status may restrict certain energy efficiency solutions, but this is not a bad thing – it is important that the aesthetic, heritage and cultural value of buildings is recognised. However, is there a need in some countries to review certain legislation given the need to drastically reduce household energy consumption in order to meet emissions targets and reduce fuel poverty? For example:
 - Are there some aspects of protected building regulations that are unnecessarily rigid?
 - If so, how could these be amended to ensure buildings are still suitably protected, but not an unnecessary barrier to energy efficiency improvements? (For an

example of an extensive research study in this area see:

http://www.cse.org.uk/downloads/file/warmer_bath_june2011.pdf)

- Can better information and guidance be presented on sensitive retrofit which achieves energy efficiency improvements but is not to the detriment of other special characteristics of the building?
- One of the recommendations made in this report is about setting a requirement for management structures in multi occupancy buildings so that there is a means to communicate with stakeholders and to reach decisions on energy efficiency retrofit. However this is an area which needs more research so that all issues are addressed, including complexities about freehold/leasehold ownership, consensus decision making, consultations on retrofit plans, regularity of resident meetings, ensuring a building maintenance plan is in place and adhered to, and ensuring adequate regulation of external management companies.
 - Critically important is research into what sort of management structures are most effective and what are the success factors.
 - In the UK it would be extremely important to know whether – for example – factoring organisations work and if that is something we should be applied.

Annex 1: Implementation of the EPBD in each partner country

Much of the information presented below references the Concerted Action (CA) EPDB 2013 report¹⁷. The CA is a forum for representatives from Member States to meet to discuss the implementation of the EPBD in their respective countries/regions. Topics discussed include (amongst others):

- progress on implementation of the Directive and any issues encountered;
- improving the energy efficiency of the existing building stock;
- building regulations and calculation tools;
- national approaches to 'nearly zero-energy buildings' (NZEB)¹⁸;
- approaches to meeting 'cost-optimal' requirements.

Progress with implementation in each LEAF partner country only has been summarised here, to provide background and context for formulating policy recommendations. Information is sourced principally from the CA EPBD progress report for each country (covering implementation to the end of 2012)¹⁹.

Austria²⁰

Background

Responsibility for building regulations in Austria rests with each of the nine Länder (provinces or states). As a result, prior to the introduction of the EPBD, requirements and approaches to certification varied. Whilst EPCs had been issued (in some capacity) in some of the Federal States since 1998, coverage was impartial and inconsistent. It was not until the EPBD was first introduced in 2002 (Directive 2002/91/EC) that EPCs became a nationwide requirement.

The EPBD presented an opportunity for Austria to harmonise its approach to certification and building requirements. The legacy of the previously decentralised approach to building regulations was an uneven playing field of standards and inspection practices. The introduction of the EPBD therefore saw the establishment of a working group composed of representatives from each province to develop agreed and coherent methods and guidelines for implementing the requirements of the Directive.

Energy performance requirements

Regulations based on these guidelines were adopted in 2008. These apply to residential and non-residential and new and existing buildings (renovations) and are principally concerned with imposing tighter restrictions on space heating and domestic hot water energy demand; and maximum U-values.

¹⁷ Concerted Action Energy Performance of Buildings, (2013). Implementing the Energy Performance of Buildings Directive (EPBD) <http://www.epbd-ca.eu/>

¹⁸ The Directive requires Member States to ensure that by 2021 all new buildings are so-called 'nearly zero-energy buildings'.

¹⁹ <http://www.epbd-ca.eu/countries/country-information>

²⁰ <http://www.buildup.eu/sites/default/files/content/CA3-National-2012-Austria-ei.pdf>

Austria may be considered somewhat ahead of the game, with its history of issuing EPCs and subsidies for low to zero energy buildings pre-dating the EPBD. Whilst the near-zero energy building (NZEB) is a new specific requirement of the EPBD, PassivHaus, which closely aligns with the NZEB concept is not new to Austria. As far back as 2008 some 12-13% of Austria's new domestic builds were PassivHaus.

Energy Performance Certificates

The EPBD requirement for EPCs has been upheld in Austria with new civil laws to enforce the submission and provision of an EPC at the point of sale or lease of a building. Efforts are also being made to establish a central national database where all EPC data will be registered, to replace the current mix of approaches and systems adopted by different Länder. Overall the situation in Austria is moving towards a more coherent national approach to ensuring improvements in the energy performance of buildings, as opposed to the legacy of having different codes and standards in individual provinces.

Support for energy efficiency improvements

Support for energy efficiency measures in Austria is available through state funding and (partly) from the nine provinces in the form of subsidies; public low cost loans and annuity grants; and specific grants for demonstration projects within R&D programs, low-energy and passive-house retrofits.

This provides a relatively strong incentive to retrofit, with householders able to access a generous package of support. For example, an extensive refurbishment project may be able to benefit from a public loan for up to one third of the costs of improvement works, with an additional €5,000 – €7,000 per dwelling from federal state.

Maintenance funds in multi-occupancy buildings are however typically too low to extend to energy efficiency retrofit.

France²¹

Background

Responsibility for the EPBD in France rests with the Ministry of Housing. Adoption of the 2010 Directive involved an overhaul of French legislation to formally incorporate the new requirements and improve the EPC process.

Energy Performance Requirements

Regulations governing the thermal performance of buildings – specifically insulation requirements - in France dates back to 1974. Since then legislation has developed to address all aspects of energy performance, from the building fabric to heating and cooling, lighting and renewables.

Since 2007 new buildings have been the main area of focus and priority for France in implementing the EPBD, culminating in new building regulations (RT2012) adopted at the start of 2013. The regulations are ambitious – pre-empting and working towards the requirements for all new construction to be NZEB by 2020. It translates into a requirement

²¹ <http://www.buildup.eu/sites/default/files/content/CA3-National-2012-France-ei.pdf>

for all new residential buildings to achieve a 'primary energy'²² consumption target of 50kWh/m²/year– a third of the previous legislative target of 150kWh/m²/year.

Whilst the focus has initially been on establishing energy performance for new buildings in France, it has a commitment to reduce the consumption of existing residential buildings by at least 38% by 2020 and undertake renovation of 800,000 social housing units. Regulation addressing the requirements of the EPBD for existing buildings sets out minimum requirements for specific component parts that may apply in the renovation or extension of existing buildings, including: boilers and electric heating systems, air conditioning and ventilation systems, domestic hot water, windows, renewable energy measures, wall insulation and lighting.

Regulating individual, specific components in this way offers a relatively simple and transparent approach and has successfully resulted in the widespread adoption of high energy performance technology. However, as it does not require quantification of the overall impact on energy consumption (unless the building exceeds 1,000m²), it is difficult to assess the benefits.

Current legislation stipulates a minimum target of 150kWh/m²/year for existing buildings subject to renovation, which is considered relatively high. In a bid encourage refurbishments beyond this threshold, the French Government has also introduced a 'Low Energy Consumption Renovation quality label', awarded to properties achieving 80kWh/m²/year.

Energy Performance Certificates

EPCs²³ were introduced in France in 2006 looks at consumption and emissions. They are issued by a Qualified Expert (QE), valid for 10 years and include recommendations for measures to improve the energy performance of the dwelling. In the case of new builds, the QE must certify that what was planned has been implemented.

Following an overhaul of the regulation in 2010, steps were taken to improve the quality and reliability of EPCs. All EPCs must now be registered on a central database and more stringent accreditation, certification and licensing requirements for EPC-issuing experts are in place.

Support for energy efficiency improvements

Two key finance measures have been introduced in France to encourage the adoption of higher standards of energy performance in the domestic sector: 'eco-loans' and a 'sustainable development tax credit'.

Eco-loans to help finance measures are offered at a rate of 0%. These are available for high thermal performance roof, wall, window and door insulation; high performance boiler, heating and hot water system replacements; or on the condition that the refurbishment will achieve a minimum building energy demand of between 80 and 150kWh/m²/year. Between 2009 and 2012 200,000 eco-loans were granted, at an average value of €20,000 per renovation and at a cost to the state of €200m.

²² This includes heating, cooling, domestic hot water, lighting and 'auxiliaries' (pumps and fans). It is a calculated measure of energy demand rather than actual energy consumption and is therefore unaffected by occupancy characteristics and behaviour.

²³ Known as 'DPE' in France ('Diagnostic de Performance Energetique').

Additional financial support is available in the form of a 'Sustainable Development' Tax Credit. This offers an income tax reduction to householders undertaking renovations to their primary residence to improve the energy performance. The tax credit can be up to €16,000 (depending on the measures installed). From 2005 to 2010 nearly 8 million renovations qualified for this tax credit, at a cost to the government of €12 billion.

Germany²⁴

Implementation of the EPBD in Germany is the joint responsibility of the Ministry of Transport, Building and Urban Development and the Ministry of Economics and Technology. The requirements of the EPBD are addressed in an amendment to its existing Energy Saving Ordinance (EnEV). The German Government has strong aspirations for a substantial national shift towards renewable energy and energy efficiency²⁵. To reflect these aspirations, additional requirements have been drafted into the amendment, which resulted in a delay in implementation.

Energy Performance Requirements

Germany has an established history for implementing requirements on the energy performance of buildings. Regulations on thermal insulation requirements and boiler checks have been in place since 1977 and 1978 respectively. Such requirements have been, and continue to be steadily strengthened in the 35 years since.

For existing buildings, two different types of requirement exist: those that apply to renovations only (e.g. replacing roof tiles, replastering of (>10% of) outer walls and replacement of windows); and those that are mandatory regardless of whether renovation is being undertaken.

All retrofitting (energy performance) obligations are subject to cost-effectiveness criteria, thereby only encompassing measures with a short (defined as shorter than the lifetime of the measure) pay-back period.

For new buildings, whilst energy performance requirements are defined on an individual basis (taking account of the physical property characteristics and conditions of use) there are minimum requirements for the energy efficiency of the building fabric and renewable energy used for heating and hot water (the latter being governed by the Renewable Energy Heat Act, 2009).

The NZEBs requirements of the EPBD are addressed through the Energy Saving Act 2012. To ensure NZEBs is achieved by 2020 the German Government has devised a three pronged strategy to include: legal requirements; financial incentives; and information campaigns to promote energy efficiency in buildings.

Energy Performance Certificates

The EPC was introduced to Germany in 2002. In addition to the requirements set out in the EPBD, the German EPC includes additional information to evidence compliance with the Renewable Heat Act and use of renewable energy sources.

²⁴ <http://www.buildup.eu/sites/default/files/content/CA3-National-2012-Germany-ei.pdf>

²⁵ Known in German as the 'Energiewende und Energiekonzept der Bundesregierung'.

There are two types of EPC in Germany, differentiated by the method used in assessing energy demand and whether this uses calculated or actual metered consumption. The former is the approach used for all new developments and major renovations. The latter only applies in special circumstances for residential buildings (buildings with at least 5 apartments where individual behaviour is a key influencing factor and smaller buildings that conform to the first thermal insulation regulation of 1977).

A system for authorising who issues EPCs was introduced in 2007. Whilst there is no official approval system, individuals are responsible for verifying that their particular qualifications/experience meet with the criteria outlined in the Energy Saving Ordinance. Anyone illegally issuing an EPC is subject to a fine. Similarly there is no official software for EPC data with developers operating in a free market to keep costs low. Data privacy is a big issue in Germany and EPC data is not held centrally, although there is an EPC register detailing type and location of the building. This is administered by an authorised body which facilitates random quality checks.

Support for energy efficiency improvements

Financial support for measures to improve the energy performance of buildings is available in the form of low interest loans and subsidies through the state-owned national bank 'KfW'. The KfW energy efficiency programme of support focuses on new buildings and/or measures that are considered 'better than legally required' in refurbishment projects. The emphasis on developing NZEB buildings in Germany has resulted in around half of new developments qualifying for funding from KfW.

Hungary²⁶

Progress with the implementation of the EPBD (2002 original and 2010 recast) in Hungary has been slow in places, with certification of existing buildings not becoming compulsory until 2012 for example. The latest EPBD from 2010 is still being considered so currently the older version from 2002 is the working version in Hungary.

In 2016 new methodology of energy rating of buildings comes in to operation. Performing an EPC is mandatory for new buildings and in the case of selling or leasing a property.

Energy Performance Requirements

In 2012 the energy efficiency requirements of retrofitted buildings were amended in Hungary. Under the new legislation, to receive financial support from the state, buildings have to meet upgraded energy performance elements, for example lower U-values than current requirements and meet the 'cost optimal' requirements (e.g. current U-value requirement of walls is 0,45 W/m² K, new requirement is 0,27 W/m² K). It means in practice thicker insulation, and low-energy double or triple glazing. From 2018 every retrofit and new building has to perform the new requirements. From 31st December 2020 every new building also has to meet the Nearly Zero Building requirements. The detailed planning methodology is set out in the revised Decree of Government 176/2008.

²⁶ <http://www.buildup.eu/sites/default/files/content/CA3-National-2012-Hungary-ei.pdf>

There are requirements regarding heating, ventilation and air conditioning systems, although not all aspects are mandatory. Attempts have been made to ensure proper checks of boilers and air conditioning units since 2008 but this has not translated into established, routine practice. There is no minimum energy performance requirement for existing buildings, only for retrofitted buildings.

Energy Performance Certificates

A decree regarding EPCs was passed in 2008 but it was not until the start of 2012 that EPCs became mandatory on the sale and leasing/rent of residential buildings. Engineers and architects can issue EPCs following training courses provided they attain passing grades. Solicitors are required by law to include the EPC registration code as part of a sale process. For new developments, owners are subject to a fine if the EPC is not in place prior to occupancy.

Since 2013 an electron registration system has been in place to log all EPC data. This includes a quality control check on the expert lodging the certificate and on any unrealistic figures. The EPC is only considered 'official' when it has been uploaded to this system. Access to this system is currently limited to the Hungarian Chamber of Engineers and other construction authorities.

Support for energy efficiency improvements

The EPC certification scheme, particularly the inclusion of recommended improvement measures on the EPC, aims to encourage home owners to make energy efficiency improvements but with minimum requirements only in place for new buildings and renovations at present, progress is limited. New developments and renovations account for only a small proportion of Hungary's housing stock (around 4.3 million dwellings) and the number of new flats has decreased in recent years (falling from 35,000 in 2008 to 10,000 in 2012, and 8000 in 2014).

Furthermore, the current economic climate represents a major barrier to energy efficiency improvements in the domestic sector in Hungary. Home owners lack the financial means and government subsidies are very few and far between.

Sweden²⁷

The responsibility for implementing the EPBD in Sweden resides with two government bodies: the National Board of Housing, Building and Planning and the Swedish Energy Agency.

Minimum Energy Performance

Regulations for energy management in new and renovated dwellings have existed in Sweden since 1948 with increased interest in energy efficiency since the oil crisis in the 1970s. Since the 1990s Sweden has had an environmental target to be fossil fuel free which includes phasing out boilers and so far it is on track to achieve this. The standard of many Swedish properties is therefore already quite high.

²⁷ <http://www.buildup.eu/sites/default/files/content/CA3-National-2012-Sweden-ei.pdf>

Swedish building regulations monitor energy performance on actual energy consumption, rather than a calculated energy demand like the rest of Europe. Maximum energy consumption figures (kWh/m²) and U-values have been defined for different heating types and different climatic zones (for this purpose the country is split into three zones, North, Middle and South).

With regard to NZEBs, a review of the requirements in place concluded that standards are as stringent as they could be, allowing for current economic and technical circumstances.

In accordance with EPBD, boiler inspection has been prioritised through an information campaign in addition to air conditioning and ventilation checks. This is an important issue in Sweden as following mass insulation efforts in the 1970s insufficient ventilation resulted in mould problems for many people.

Energy Performance Certificates

EPC regulations (known as the 'energy declaration' in Sweden) came into force in 2006 with the first EPC lodged in 2007, since when some 420,000 EPCs have been registered. Revisions to the regulations were adopted in 2012 to reflect the changes to the EPBD (2010).

EPCs apply to all buildings, residential and non-residential, new and renovations. EPC data is stored in a central register. Compliance with the EPC regulations is high in the case of sale properties (90-95% of cases presenting an EPC at the point of sale is required by the regulations), but much lower for the rental market, with an estimated 35% of rented properties still without a certificate, despite this being mandatory since 2009.

Unlike the rest of Europe, Sweden's EPCs are based on measured actual energy consumption rather than a calculated energy demand. The display used to illustrate the rating on Swedish EPCs also initially differed from the more widespread A to G and colour system used elsewhere, but this has since changed to align with European partners.

Support for energy efficiency improvements

The 290 municipalities of Sweden all have a mandatory energy advisor in their staff in to inform public and private players about energy issues.

UK²⁸

Implementation of the EPBD in the UK is a devolved issue, administered through various government departments and regulations as shown in Table 0-1 below.

Table 0-1. Responsibility for implementation of the EPBD in the UK

Nation	Department	Relevant regulations
England	Department for Communities and Local Government (CLG)	Building Regulations Energy Performance of Buildings regulations (England and Wales)
Wales	Department for Communities and	Energy Performance of Buildings

²⁸ <http://www.buildup.eu/sites/default/files/content/CA3-National-2012-UK-ei.pdf>

	Local Government (CLG)	regulations (England and Wales)
	Welsh Government	Welsh Building Regulations
Scotland	Scottish Building Standards Division	Building (Scotland) Act Building (Scotland) Regulations Building (Procedure) (Scotland) Regulations Energy Performance of Buildings (Scotland) Regulations
Northern Ireland	Department of Finance and Personnel (DFPNI)	Building Regulations (Northern Ireland) Energy Performance of Buildings (Certificates and Inspections) Regulations

Energy Performance Requirements

Energy performance requirements for all new and existing buildings are set out in the Building Regulations, with each nation having its own variation of these.

Energy performance of residential buildings is calculated using the Standard Assessment Procedure (SAP), which assesses the energy requirements of the building, based on a standard occupancy (i.e. using modelled energy demand rather than actual consumption).

The action plan for NZEBs covers the whole of the UK and aligns with its commitment and legally binding target under the Climate Change Act 2008 to achieve greenhouse gas emission reductions of at least 34% by 2020 and 80% by 2050.

The Act specifies that these targets will partly be achieved through reducing energy demand of buildings through improved energy efficiency and decarbonising heating and cooling supply. England has a target for all new homes to be zero carbon from 2016; Wales by 2020; Northern Ireland by 2017.

Energy Performance Certificates

EPCs are required on the construction, sale or rent of a residential building. The EPC becomes legally valid after it has been lodged on the national register and is valid for up to 10 years. There are currently 7 million logged with approximately 1 million added every year. EPC assessors are accredited through government licensed accreditation schemes to ensure minimum quality standards.

The Government department responsible for EPCs in England and Wales issued a consultation on 'Making better use of Energy Performance Certificates and data' in 2010. A positive outcome of the consultation included the decision to make EPC data more accessible. Local authorities are now able to request address level data in bulk, which should facilitate better targeting of energy efficiency programmes at the most inefficient properties. Access to EPCs is open to all in England and Wales, through an online search facility, but this is on a property-by-property basis, rather than in bulk.