Communal improvements

Energy efficiency in tenements in Scotland

Consumer Futures

Consumer Futures

Consumer Futures represents the interests of consumers across essential, regulated markets. We use compelling evidence, expert analysis and strong argument to put consumer interests at the heart of policy-making and market behaviour.

Consumer Futures is the statutory representative for consumers of postal services across the United Kingdom, for energy consumers across Great Britain and for water consumers in Scotland. It maintains the powers, responsibilities and duties of Consumer Focus.

In April 2014 Consumer Futures will become part of the Citizens Advice service.

Acknowledgements

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Photo courtesy of Energy Savings Trust

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Executive summary

There is clear evidence that rising energy prices are putting increasing pressure on consumers in Scotland.[1] There is widespread and growing recognition that a stronger approach to energy efficiency is needed to safeguard consumers against increasing bills in the longer term, while at the same time helping reduce climate change emissions.

Until recently, energy efficiency programmes covering both Great Britain and Scotland have concentrated largely on delivery of loft and cavity wall insulation. The Scottish House Condition Survey[2] shows that these low-cost energy efficiency measures can and have been installed in many homes in Scotland, and that levels of fuel poverty are measurably lower than they would otherwise have been as a result.

However, the same report also shows that 35 per cent of households in Scotland live in tenements or other flats where these measures may not be suitable. The majority of these, 28.5 per cent of all homes in Scotland, were built before 1982, and so would not have had insulation installed at the time of construction. The report also notes that flats are, on average, more energy efficient than houses by the nature of their construction, as heat loss is greatest through external walls, floors and roofs. Rates of fuel poverty among consumers living in tenements are, at 25 per cent, lower than the Scottish average of 29 per cent. However, these figures are in part influenced by the lower rates of fuel poverty among those living in more modern, energy efficient flats and houses. Fuel poverty rates in older houses of all types are consistently higher.

Two barriers to improving energy efficiency are frequently highlighted for consumers living in tenements:

- Firstly, different energy efficiency measures may be needed. While loft insulation is suitable for almost all types of tenements, different approaches to wall insulation are needed, particularly for traditional pre-1919 tenements, for more modern flats built without cavity walls, and for blocks of flats higher than three storeys.
- Secondly, there are administrative barriers. Even where low-cost measures are technically suitable, their installation in tenements requires the agreement, depending on the title deeds of the property, of a majority or all of the individual owners.

Although these examples are specific to Scotland, we would anticipate that many of the issues will also affect consumers in other GB countries.

[1] For example, http://bit.ly/UTczuf
[2] http://bit.ly/UK6egY

New energy efficiency programmes – the Green Deal[3] and Energy Company Obligation (ECO)[4] – have recently been launched at GB level. These programmes are able to support a much wider range of measures than has been the case in the past, including heating systems, solid wall insulation, glazing improvements and hard-to-fill cavity wall insulation, in addition to lower-cost measures. At the same time, the Scottish Government has developed proposals for new, publicly funded energy efficiency programmes[5] which will integrate with and add value to ECO in particular, by helping simplify the energy efficiency journey for consumers.

Past Scottish Government energy efficiency programmes provided resources to work with residents to achieve necessary consensus, and local authorities have also carried out similar work in some areas. Consumer Futures recognises that these new programmes could offer significant opportunities to build on past work to address energy efficiency in tenements more widely in future. We therefore commissioned Changeworks[6] to carry out research on energy efficiency in tenements.

This report provides a detailed summary of the research. Our overall aim is to inform the detailed delivery of new energy efficiency programmes, so that they are better able to meet the needs of consumers living in different types of tenements.

We therefore include a number of detailed recommendations which identify ways in which energy efficiency programmes can better deliver measures for consumers living in tenements in the short term. We also highlight recommendations which, in the longer term, will help clarify understanding of both the use of specific energy efficiency measures in different building types, and also of the appropriate use of the Tenements Act to support take-up of measures which need communal agreement.

[3] http://bit.ly/15vLUMm
[4] http://bit.ly/149S7ZM
[5] http://bit.ly/12iQ19R
[6] http://www.changeworks.org.uk/

Research findings

Our modelling has confirmed that different types of tenement require different measures to improve their energy efficiency. However, it is clear that the effectiveness of different measures varies depending on what else is already in place, or can be installed at the same time. The modelling also shows that the range of measures needed, and their relative effectiveness, can vary significantly between flats with different positions within the same tenement block. Further, the costs and benefits of measures differ significantly between all types of tenements and the 'standard' three-bedroom semi-detached house which is used as the basis for most energy modelling.

Overall, however, the modelling confirms that well understood measures like loft and cavity wall insulation and boiler upgrades can and do provide benefits for consumers, with payback periods[7] in the short to medium term. Solid wall insulation also provides significant benefits, but the high cost of installation means that payback periods are much longer.

In most types of tenement, glazing improvements deliver only limited benefits. The exceptions to this, to some extent, are pre-1919 tenement flats, which tend to have larger windows, and in which higher savings with relatively low payback times can be achieved.

Our research has also included some simple modelling exploring the extent to which the Green Deal and ECO are likely to be effective in providing financial support for different measures. These initial findings raise clear concerns. Only low-cost measures like loft and cavity wall insulation will meet the Green Deal Golden Rule in most tenements at present, and the success of recent energy efficiency programmes which focused on these measures may, paradoxically, undermine the potential for Green Deal take-up.

More complex and expensive measures, such as solid wall insulation, would either require higher levels of subsidy through ECO than would be likely to be available under the current Department of Energy and Climate Change (DECC) modelling. Alternatively, additional funding to bridge the gap would be required from either consumers or a third party, such as the Scottish Government.

While some of the modelled measures can be installed by individual consumers, others such as loft, cavity wall and external wall insulation are communal measures which require at least a majority of consumers to agree before they can be installed. Findings from the focus groups suggest that the levels of consumer interest in installing energy efficiency measures remain low.

[7] Payback period is the time, in years, for the savings from an energy efficiency measure to equal the cost of initial installation.

Many consumers reported that they absorb energy cost increases or reduce their use of energy rather than seeking to improve the energy efficiency of their properties. There remains a lack of understanding of both the possible savings and the possible improvements that could be installed.

In addition, residents are unlikely to proactively push for communal measures – even those that are free – due to the perceived challenges in relation to generating consensus or upsetting neighbours.

The findings suggest, therefore, that in the absence of external support, energy efficiency improvements in flats and tenements are most likely to occur in individual properties. To support take-up, consumers appear to continue to need information about appropriate energy efficiency measures, what they are (especially unusual measures such as floor or solid wall insulation), what the installation could involve, and clearer demonstration of the benefits.

The expense of measures is clearly a barrier and particularly for communal measures, only free or low-cost measures are likely to get installed. The introduction of the Green Deal, and the consequent removal of up-front costs, could therefore provide some incentives for more households to take up measures for their own homes.[8]

However, consumers' perceptions of the benefits of measures are not always consistent with the benefits identified in the modelling. In particular, many consumers express a preference for double glazing and for new heating systems, as these are clearly recognisable measures, which are also reflected positively in housing valuations.

Overall, the research has confirmed and added depth to existing stakeholder perceptions about the issues involved in promoting energy efficiency in tenements. More positively, however, the modelling and discussions have also identified both existing good practice, and a range of actions which will support consumers living in tenements to take both individual and collective action to improve the energy efficiency of their flats.

A summary of the recommendations which emerge from the research are divided into three broad areas, and set out below.

[8] Consumer Focus published a range of research exploring consumer attitudes to energy efficiency in general, and to the Green Deal in particular. All are available at: http://bit.ly/xzGUWS

Ensuring energy efficiency programmes deliver measures and support for tenements

- Local authorities and the Scottish Government should develop 'tenement action areas' to prioritise the funding of cavity wall and loft insulation in tenements through new energy efficiency programmes, levering in ECO funding where possible.
- Building on existing good practice, Scottish Government energy efficiency programmes should continue to combine access to appropriate energy efficiency measures with advice and support for residents.
- Innovative approaches towards the engagement of consumers in tenements could also be encouraged from community groups and housing associations through the Climate Challenge Fund.

Improving and promoting understanding of energy efficiency measures and delivery in tenements

- The Scottish Government should work with local authorities, housing associations and Historic Scotland to ensure that a range of detailed and accessible case studies are available, which describe the costs and benefits of improving energy efficiency in different types of tenement.
- DECC should ensure that the learning from both current experience and future research is reflected throughout all appropriate aspects of the Green Deal and ECO processes and, in particular, that emerging issues are included in training courses for Green Deal advisers.
- The Scottish Government should discuss with DECC issues around the way communal properties are considered under the Green Deal and ECO.

Clarifying approaches to communal measures in practice

- The Scottish Government should promote and support the practical use of the Tenements Management (Scotland) Act.
- The Scottish Government should investigate the extent to which improvements to the energy efficiency of flats in social housing are limited by lack of communal agreement.

Introduction

There is clear evidence that rising energy prices are putting increasing pressure on consumers in Scotland.[9] In response, there is widespread recognition that a stronger approach to energy efficiency is needed to safeguard consumers against increasing bills in the longer term, while at the same time helping reduce climate change emissions.

Until recently, both GB and Scottish energy efficiency programmes have concentrated largely on delivery of loft and cavity wall insulation. Scottish Government data shows that these low-cost energy efficiency measures can and have been installed in many homes in Scotland, and that levels of fuel poverty are measurably lower than they would otherwise have been as a result.

Until recently, energy efficiency programmes covering both Great Britain and Scotland have concentrated largely on delivery of loft and cavity wall insulation. The Scottish House Condition Survey[10] shows that these low-cost energy efficiency measures can and have been installed in many homes in Scotland, and that levels of fuel poverty are measurably lower than they would otherwise have been as a result.

The same report also shows that 35 per cent of households in Scotland live in tenements or other flats where these measures may not be suitable. The majority of these, 28.5 per cent of all homes in Scotland, were built before 1982, and so would not have had insulation installed at the time of construction. The report also notes that flats are, on average, more energy efficient than houses by the nature of their construction, as heat loss is greatest through external walls, floors and roofs. Rates of fuel poverty among consumers living in tenements are, at 25 per cent, lower than the Scottish average of 29 per cent. However, these figures are in part influenced by the lower rates of fuel poverty among those living in more modern, energy efficient flats and houses. Fuel poverty rates in older houses of all types are consistently higher.

Two barriers to improving energy efficiency are frequently highlighted for consumers living in tenements:

- Firstly, different energy efficiency measures may be needed. While loft insulation is suitable for almost all types of tenements, different approaches to wall insulation are needed, particularly for traditional pre-1919 tenements, for more modern flats built without cavity walls, and for blocks of flats higher than three storeys.

[9] For example, http://bit.ly/UTczuf
[10] http://bit.ly/UK6egY

- Secondly, there are administrative barriers. Even where low-cost measures are technically suitable, their installation in tenements requires the agreement, depending on the title deeds of the property, of a majority or all of the individual owners.

Although these examples are specific to Scotland, we would anticipate that many of the issues will also affect consumers in other GB countries.

New energy efficiency programmes – the Green Deal[11] and Energy Company Obligation (ECO)[12] – have recently been launched at GB level. These programmes are able to support a much wider range of measures than has been the case in the past, including heating systems, solid wall insulation, glazing improvements and hard-to-fill cavity wall insulation, in addition to lower-cost measures. At the same time, the Scottish Government has developed proposals for new, publicly funded energy efficiency programmes[13] which will integrate with and add value to ECO in particular, by helping simplify the energy efficiency journey for consumers.

Past Scottish Government energy efficiency programmes provided resources to work with residents to achieve necessary consensus, and local authorities have also carried out similar work in some areas. Consumer Futures recognises that these new programmes could offer significant opportunities to build on past work and address energy efficiency in tenements. We therefore commissioned Changeworks[14] to carry out research on energy efficiency in tenements. This report summarises the findings from the research; the full report is available on request from Consumer Futures, and also on the Changeworks website. This report provides a detailed summary of the research. Our overall aim is to inform the detailed delivery of new energy efficiency programmes, so that they are better able to meet the needs of consumers living in different types of tenements.

To reflect the barriers identified above, our research included three linked elements:

- Modelling of the running costs and potential savings from energy efficiency measures was carried out, looking in detail at the most common types of tenement found in Scotland. Modelling also considered measures in relation to the detailed working of the Green Deal and ECO.

[11] http://bit.ly/15vLUMm
[12] http://bit.ly/149S7ZM
[13] http://bit.ly/12iQ19R
[14] http://www.changeworks.org.uk/

- A range of stakeholders were involved throughout the research, including local authority, Scottish Government and non government organisations (NGOs) representatives with detailed experience of the issues involved in managing housing with communal areas. Early interviews and a workshop presentation at a local authority event helped describe the current position and frame the questions explored in the research. More detailed interviews explored experiences and lessons in relation to maintenance and energy efficiency in flats and tenements, and also covered social, legal and technical issues. Finally, emerging findings and draft recommendations were presented and discussed at a local authority energy efficiency meeting, and at a group including a range of Scottish Government officials for whom the research is relevant. In addition, both the Scottish Government and the Scottish Federation of Housing Associations were represented on the steering group we established to oversee the research.
- A total of six focus groups (two in each of Glasgow, Edinburgh and Dundee) were held to explore the experience and attitudes of consumers living in different types of tenements. Discussion covered issues around both communal measures and costs in general, and in relation to energy efficiency measures more specifically.

The remaining chapters of this report present:

1. The costs and benefits of energy efficiency measures in different types of tenements commonly found in Scotland, including the extent to which measures might be eligible for Green Deal or ECO funding.
2. A summary of the issues explored in consultation with stakeholders, covering in particular barriers and solutions to achieving consensus among consumers living in tenements.
3. The results of focus group research, undertaken to explore their attitudes to the management of tenements and to both individual and communal energy efficiency actions.
4. Conclusions and recommendations.

1 Costs and benefits of measures to improve energy efficiency in tenements

Scoping research

To make the research as widely useful as possible, the scoping stage covered three areas: a review of existing literature, selection of different types of tenements to be discussed in detail, and interviews with stakeholders to ensure the research reflected their understanding and questions. Each of these are outlined below.

A literature review was carried out into the energy efficiency options available to retrofitting tenements in Scotland.[15] The table below provides a summary of both measures which can be fitted into individual flats and those which are fitted into communal areas.

Measures in normal text have been included in the energy modelling, while those in italics were not. This was due, in some cases, to the modelling software not being able to model these measures, specifically:

- Shutters cannot be modelled in the National Home Energy Rating (NHER) system, although Historic Scotland research shows that they can be effective at reducing heat loss in traditional tenements.[16]
- Draught-lobby doors also cannot be modelled in NHER, but can be effective in reducing heat loss in stairwells. However, there is only limited evidence of their energy savings in individual properties.[17]

Following discussion, other measures such as communal heating were not modelled as it is unlikely that they would, as yet, be installed either as part of mainstream programmes or by individual consumers.

Photo courtesy of Eaga

[15] A full analysis is available in Appendix C of the full report.

[16] Changeworks (2008) http://bit.ly/15TQ8x7; Historic Scotland (2012) http://bit.ly/15TQeop; Historic Scotland (2012) http://bit.ly/10wV8jAt; Historic Scotland (2010) http://bit.ly/13mo0iN; Historic Scotland (2008) http://bit.ly/149Y0pM

[17] Changeworks (formerly Lothian and Edinburgh Environmental Partnership) (2004) http://bit.ly/10fSOAq

Summary of possible energy efficiency measures in tenement flats

Individual		Communal	
Modelled	Not modelled	Modelled	Not modelled
Double glazing	Shutters (in traditional properties)	Loft insulation	Draught-lobby door
Secondary glazing	Lighting	Cavity wall insulation	Draught-proofing communal areas
Internal solid wall insulation	Radiator panels	Solid wall insulation (external)	Solar panels
Floor insulation	Electrical appliances		Communal lighting (new blocks)
Replace/improve heating system			Connection to the gas network
Heating controls			Communal or district heating
Draught-proofing			Heat recovery system
Hot water tank and pipe insulation			

Secondly, the range of tenement flats to be modelled was discussed. Four types were selected:

- **Pre-1919 sandstone tenements:** pre-1919 tenements account for around 23 per cent[18] of tenements and flats in Scotland (including sandstone and other solid stone construction). They usually have large sash and case windows and, as a result, smaller proportions of wall area compared to other flat types.
- **Pre-war four-in-a-block:** these properties, built in the late 1920s to 1940s by councils, account for 13 per cent of tenements and flats in Scotland. They are usually cavity wall construction with an internal stair for the top flat.
- **Post-war tenement flat:** these properties, built in the 1950s to 1970s, account for 13 per cent of tenements and flats in Scotland. These are usually concrete construction, have a common stair and may have flat roofs.
- **1960s cavity wall tenement:** these properties account for 19 per cent of flats in Scotland. They have cavity wall construction and some have flat roofs.

[18] All proportions of housing stock were calculated from: Scottish House Condition Survey (2002). Although there are more up-to-date datasets available from the SHCS, the 2002 survey was the last to include a detailed analysis of the age/type of flats and tenements in Scotland. As a result, this is the dataset that we have used to assess proportion types.

In total, these four types account for 68 per cent of tenements (and 40 per cent of all properties) in Scotland.[19] According to the 2011 SHCS,[20] 128,000 tenements were built post-1982, which can be assumed to have relatively high energy efficiency standards and were therefore not included in the analysis.

We also considered, but did not include, tower blocks and flat conversions. High-rise flats were not covered because the vast majority of these are social housing, rather than under private ownership, with few right-to-buy schemes having operated in these properties. Therefore, councils and housing associations are likely to take forward projects to retrofit whole blocks of high-rise flats, and the need to analyse individual measures is less appropriate. The modelling did not include flats converted from larger houses because these are generally bespoke conversions. It was therefore not possible to identify a typical example.

In addition to the four tenement types described, a 'standard' three-bedroom semi-detached was also modelled. This is often the property type used when calculating average savings from energy efficiency measures – for example, by the Energy Saving Trust (EST) and is therefore a well-understood reference. Modelling this property type has allowed for comparisons between 'typical' savings of energy efficiency measures when compared to those made in tenements.

In each case, detailed data on the size and building fabric of an archetype of the property was gathered at either a site survey for each property or from site drawings, and the information used to assess the baseline energy efficiency of the dwelling. A range of assumptions were made for the baseline in all the property types; using the same assumptions in each also enabled comparisons across the property types:

- All external walls and ground floors were of an 'as-built' construction and had not been retro-treated by insulation.
- All lofts and roofs had 50 mm (2 inches) of insulation, with the exception of the pre-1919 tenements where a virgin loft was modelled.
- All windows were standard double glazing, installed before 2003, with the exception of pre-1919 tenements where single glazing was modelled.
- All were gas heated with a 12-year-old boiler and radiator system installed with an average seasonal efficiency of 73 per cent. The systems were controlled by thermostatic radiator valves (TRVs) and programmers. All hot water was provided by the central heating system, with an insulated hot water tank providing storage.
- 40 per cent of the fixed lighting outlets were low energy.

[19] A full description of the property types can be found in Appendix B of the full report.
[20] http://bit.ly/179qpAu

Energy rating software[21] was used to calculate energy use, based on a standard heating regime during the heating season of 9 hours a day during the week and 16 hours a day at the weekend, with the main living space reaching 21°C and the rest of the dwelling 18°C. Energy usage was then converted to CO_2 emissions and annual running costs. For this modelling, the annual running costs are based on average fuel tariffs for Scotland, as provided in the Sutherland tables.[22] Current DECC/Ofgem 'in-use' factors[23] were applied to the calculated savings.

Appropriate energy efficiency measures were then modelled on each archetype, as set out in the table below.

Overview of measures modelled

Measure	Pre-1919 sandstone tenement	Pre-war four-in-a-block	Post-war non-trad. tenement	1960s cavity tenement	Three-bed semi
Boiler/controls upgrade*	x	x	x	x	x
Cavity wall insulation		x		x	x
Internal wall insulation	x	x	x	x	
External wall insulation			x	x	
Floor insulation on the ground floor flat	x	x	x	x	x
Loft insulation on the top floor flat**	x	x	x	x	x
Draught-proofing (single glazed windows)	x				
Double glazing (from single)	x	x	x	x	x
Secondary glazing	x				
Double glazing upgraded		x	x	x	x
Hot water and pipe insulation	x	x	x	x	x

* Replacing a 73 per cent efficient boiler to a condensing combi boiler with an efficiency of 89 per cent.
** Both virgin loft insulation (to 270mm) and a top-up to 270mm from 50mm were modelled.

[21] NHER Plan Assessor - http://bit.ly/YKn609
[22] http://www.sutherlandtables.co.uk/
[23] http://bit.ly/16m7vq3

Estimated annual fuel cost and CO_2 savings were then provided for each of the measures against the baseline data. Payback periods can be calculated against the estimated installation costs. Installation costs were sourced from: actual costs of installations carried out on each of the measures, as reported in the literature; costs provided by installers; or costs provided by architects. Additional costs for enabling and restoration measures, such as scaffolding or redecorating, have also been included.

Modelling, variations and limitations

It is important to note that these properties are actual properties and are not 'hypothetical' standards. As a result they comprise flats with different numbers of bedrooms (including flats in the same block). This results in differences in outputs that are not directly comparable across properties. For example, the costs for upgrading items such as glazing differ both due to differences in window sizes and number of windows. These variations highlight the importance of energy efficiency programmes using appropriate data for individual households, rather than relying on assumed data.

It is also important to note that running costs and savings are fundamentally dependent upon the condition of the property to start with. For example, installing a new boiler in a property with no loft insulation will realise different savings to installing the same boiler in the same property with 270mm of loft insulation. This is because the insulation will reduce the need for heating, so the gains from a more efficient boiler will lower. To help take account of this, the analysis includes an exploration of the impacts of 'packages of measures' on payback times and savings, in addition to simply exploring individual measures, because the combined savings generally differ from the sum of benefits of individual measures. The benefit of this approach is that it enables the homeowner to maximise the benefits of each measure; it also fits with the approach to be taken under the Green Deal and ECO.

The Green Deal and ECO

The Green Deal is the UK Government's flagship energy efficiency policy, which is intended to drive the take-up of installations of energy efficiency measures. Households will not need to pay up-front for the costs of measures. Instead, up-front costs will be met by a third party, such as an energy or construction company, with costs being recouped from charges on energy bills.

To ensure consumers benefit, and to encourage take-up of the scheme, the UK Government has specified the Golden Rule. This ensures that only investments which provide savings over a specified time period (up to 25 years or the lifetime of the measure) can be installed by Green Deal providers.

Interest rates on payments are expected to be around 7.5 per cent, and the finance and overall process will be managed by a Green Deal Provider. A 7.5 per cent annual interest rate roughly doubles the cost of measures over a 20-year period (although users may choose to take up a loan over a shorter period, reducing the overall costs).

Based on an interest rate of between 7.67 per cent and 7.96 per cent, including an up-front charge of £63 and a £20 annual charge,[24] paid over 20 years, homeowners can expect half their Green Deal payment to cover the interest payment. In effect, this doubles the payback period of measures, although the impact is less for loans taken out over shorter periods of 10 or 12 years where the Golden Rule can still be met.

ECO funding may be available to provide a subsidy, either to support solid wall insulation where the Golden Rule cannot be met, or to support the installation of energy efficiency measures for consumers at risk of fuel poverty. The details of ECO are complex, and some aspects of exactly how it will work in practice were not clear at the time of this research. However, based on the modelling feedback, we have sought to explore how modelled savings may relate to Green Deal and ECO offerings for each type of tenement property.

Pre-1919 sandstone tenement

This property type accounts for 23 per cent of all flats and 14 per cent of all properties in Scotland.[25] Modelled total running costs (including appliances) ranged from approximately £1,800 for a middle floor flat to £2,600 for a top or ground floor flat.

The following was assumed for this property type:

- 600 mm sandstone wall
- single glazing throughout
- no loft insulation in the top flat
- solid concrete floors in the ground floor flat
- a post-1998 mains gas non-condensing conventional boiler with hot water cylinder providing domestic hot water.

Three flats were modelled from this block, with associated baseline running costs:

- ground floor (two bedroom, £2,621)
- middle floor (three bedroom, £1,788)
- top floor (three bedroom, £2,608).

[24] Green Deal Finance Company Press Release 25/1/2013: Green Deal Finance Company launches competitively priced finance open to all.

[25] Based on the 2002 Scottish House Condition Survey.

The table on page 19 shows the results of the modelling. The data shows that both the original running costs and potential savings from the different measures vary greatly, depending on flat position. Middle floor flats have much lower baseline running costs; whereas the ground floor flat loses heat to an un-insulated floor and the top floor flat loses heat through an un-insulated roof, the middle floor has heated properties below and above and so loses heat mainly through walls and windows.

The greatest savings for the ground and top floor flats can be made by installing floor insulation and virgin loft insulation respectively. Given the low cost of installation, the payback for virgin loft insulation is very short (2.5 years). However, the payback for floor insulation is much longer due to the higher costs of installation (£9,434). Insulation costs would be significantly cheaper for a suspended timber floor (approximately £2,600) rather than for a solid concrete floor.

The default U-values[26] provided for solid concrete floors differ hugely from those measured in this case. This in turn affects the outcomes from insulation: using the default values gives a saving of only £35, whereas insulation using the measured value gives a saving of £656.

Savings from internal wall insulation are much larger in the middle flat (8.6 per cent compared to 3.7 per cent or 4.5 per cent in the ground and top floor flats). Similarly, savings from double glazing are also higher (5.5 per cent compared to 1.5 per cent ground and 2.7 per cent top floor). In contrast, the savings from boiler replacement are lower (8.4 per cent compared to 11.7 per cent ground and 11.3 per cent top floor), because the middle floor flat has lower baseline energy costs.

The data for the middle flat also provides an indication of the situation that would occur in a top or bottom flat after loft or floor insulation had been installed. This is important, because it affects the savings and payback times of other measures. In the case of the boiler upgrades above, for example, savings in ground and top floor flats will be lower once improvements are made to floors and lofts.

The differing costs and benefits of installing these measures result in significantly different payback times. A boiler pays back in just under 14 years,[27] compared to internal wall insulation, including installation costs, which has a minimum payback of 37 years. Secondary glazing pays back in just under 12 years, compared to nearly 30 years for double glazing.

[26] U-values measure how quickly heat is lost from one (internal) side of a material to the outside environment. Higher U-values mean heat is transmitted more quickly. The effectiveness of an energy efficiency measure such as wall or floor insulation can be judged by comparing the U-value before and after application.

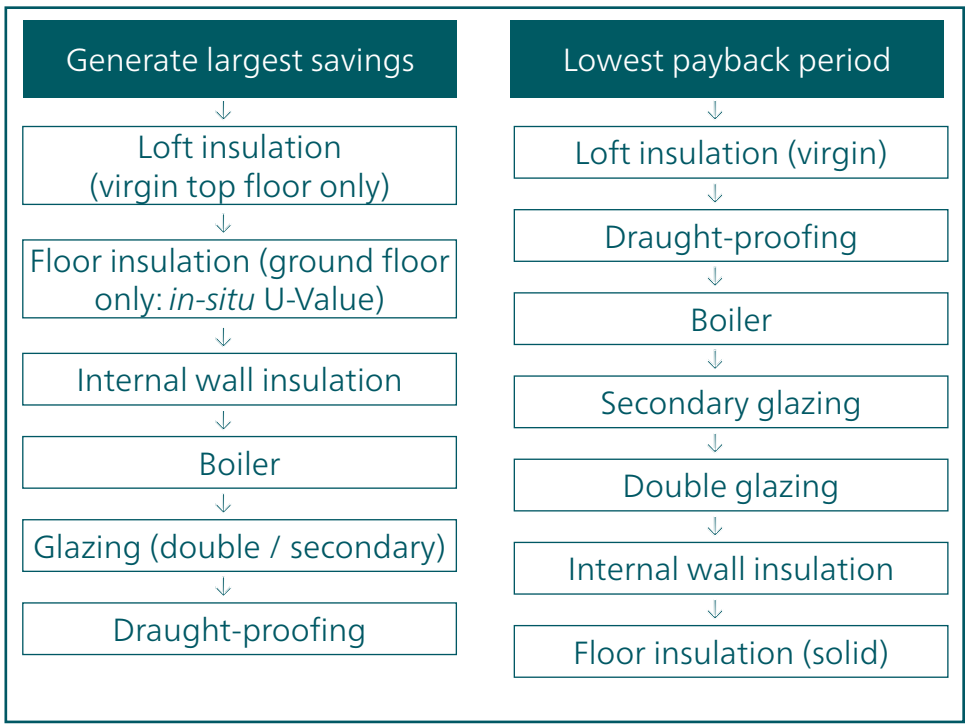
[27] Although it is important to note that both Ofgem (2012) http://bit.ly/ZUg6cb and DECC (2012) http://bit.ly/12oLP assume boilers to have a lifetime of 12 years

	Measure	Installation cost range (£)	Savings per annum range (£)	Payback period range (years)	Comments
Wall	Internal wall insulation (IWI)	2,418 - 2,932	98 - 154	19.0 - 24.8	Higher savings in middle floor flats
	IWI additional costs (to return property to original state)	4,669 - 5,660	98 - 154	36.7 - 47.8	Includes the cost of insulation and making good
Heating and hot water	Boiler and controls upgrade	2,200 - 2,200	151- 306	7.2 -14.6	Higher savings in ground and top floor flats
	Hot water tank insulation	14 - 14	6 - 6	2.1 - 2.2	
Glazing	Single glazing to double glazing	2,200 - 3,300	40 - 99	33.5 - 55.2	Higher savings in middle floor flats
	Double glazing (existing sashes re-glazed with slim-profile double glazed units)	1,920 - £2,880	40 - £99	29.2 - 48.2	
	Double glazing (new timber double glazed sashes fitted)	3,840 - 5,760	40 - 99	58.5 - 96.3	
	Secondary glazing	514 - 1,038	36 - 88	11.8 -15.4	
	Draught-proofing	50 - 75	14 - 27	2.8 - 3.7	
	Draught-proofing (professional)	1,440 - 2,160	14 - 27	80.1 - 106.6	
Loft	Loft insulation (50–300 mm)	[top floor only] 630	[top floor only] 127	[top floor only] 5.0	Top-up insulation, assuming 50 mm in situ
	Virgin loft insulation (0–300 mm)	[top floor only] 630	[top floor only] 464	[top floor only] 1.4	
	Virgin pitched/flat roof insulation	[top floor only] 1,397	[top floor only] 559	[top floor only] 2.5	
Floor	In situ solid floor insulation	[ground floor only] 9,434	[ground floor only] 656	[ground floor only] 14.4	Real world – based on in situ tested U-values
	Solid floor insulation	[ground floor only] 9,434	[ground floor only] 35	[ground floor only] 272.5	Modelled – based on default U-values
	Timber floor insulation	[ground floor only] 2,617	[ground floor only] 52	[ground floor only] 50.6	

The flats used in this model (as shown in the photo) have fewer windows than some others of a similar age. Larger or greater numbers of windows would change the balance between different energy efficiency measures, because glazing would form a higher proportion of the total external surface area, potentially making glazing upgrades more attractive, and solid wall insulation less attractive. South Seeds, a south Glasgow community group, has carried out baseline research on the energy performance tenements in their local area, using thermal imagery.[28] The imaging work shows very clearly that far more heat is lost through windows than through walls.

It is also important to note that loft insulation is the only communal measure among those discussed above, depending on the title deeds. This could create a barrier for consumers, since the modelled savings benefit only the top floor flat.

It is possible to create hierarchies of measures, as shown below, to prioritise energy efficiency measures in tenements. The hierarchies differ depending on whether the priority is to reduce running costs to the largest extent, regardless of the up-front cost or disruption, or to concentrate on those measures which have the shortest payback period.



[28] http://southseeds.org/

Packages of measures

The discussion above shows the importance of considering measures in conjunction with each other – an approach which will be promoted through the Green Deal and ECO. Comprehensive data on a range of different packages for each flat is included in Appendix D of the full report. The tables below present two examples of these packages for a middle floor and top floor flat.

Pre-1919 Middle floor flat – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Boiler/control upgrade	2,200	151	8	14.6	0.8	11
Double glazing	3,300	99	6	33.5	0.5	7
Cumulative measures	**5,500**	**227**	**13**	**24.3**	**1.1**	**17**

Pre-1919 top floor flat – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Virgin loft insulation	630	464	18	1.4	2.3	22
Boiler/control upgrade	2,200	296	11	7.4	1.5	14
Draught-proofing (DIY)	75	21	1	3.5	0.1	1
Totals	**2,905**	**663**	**25**	**4.4**	**3.3**	**31**

Green Deal and ECO analysis

For the middle floor flat, the modelling demonstrates that installing double glazing at the same time as a boiler upgrade will result in a total payback of 24.3 years, compared to a payback of 33.5 years for double glazing if installed separately. However, the modelling suggests that no substantive measures will meet the Green Deal's 'Golden Rule' for middle floor flats – payback times either exceed the maximum Green Deal contract period or, in the case of the boiler, the expected lifespan of the equipment.

The picture is more positive for the top floor flat, both initially and when measures are combined. In that case, the addition of approximately £700 of loft insulation and draught-proofing to a boiler upgrade results in the measures being paid back in 4.4 years, compared to 7.4 years for the boiler alone.

This shows that, where low-cost measures such as loft insulation are available, the potential for Green Deal finance is greatly improved – a situation which recurs across other tenement types. When interest is applied this package would meet the Golden Rule within the minimum term for a Green Deal loan, although the owner would see only a small amount of the benefit over that period. On its own, without cross-subsidised savings from loft insulation, it is uncertain whether the boiler would meet the Golden Rule within the 12-year payback period.

All other measures would require either ECO funding (where possible) or subsidy from the owner. The carbon saving stream of ECO has the broadest application, and in theory offers subsidy for solid wall insulation; other more basic measures are only subsidised when part of a package. However, the rubble masonry walls typically found in pre-1919 properties present a challenge in meeting the ECO eligibility. The literature review looked at the experience of internal solid wall insulation products recommended by Historic Scotland which maintained the breathability of solid walls. None of the products installed met the minimum requirements for ECO[29] (a U-value of 0.3).[30]

In theory, it would be possible to specify a product that meets this U-value; whether or how this could be achieved in practice while meeting consumers' needs is not yet clear. It has been assumed that this is possible for the calculations on the savings quoted above, but lack of experience means that it is not possible to model the subsidy from ECO, which would be required to deliver an acceptable payback time and make the Golden Rule viable within the maximum Green Deal term of 25 years.

[29] See Historic Scotland Technical Paper: The Green Deal, ECO and Traditional Buildings (2013, pending publication).

[30] See http://bit.ly/13TyqFQ

ECO funding targeted at disadvantaged consumers or those in vulnerable positions may also be available, depending on their particular location and circumstances. This funding may support basic measures such as loft insulation, either in areas designated in the lowest 15 per cent of the Scottish Index of Multiple Deprivation (SIMD) or in neighbouring areas to these zones.[31] In addition, some households on qualifying benefits with an income below £15,000 could also receive support through ECO.

Funding for these measures will come from consumers' bills via energy companies; the structure of the obligation is such that companies are incentivised to meet their targets at the lowest possible cost, in order to minimise the levy placed on bills. Therefore, modelling which suggests that a combined Green Deal/ECO package would make financial sense in theory is not a guarantee of funding.

Pre-war four-in-a-block

This property type accounts for 13 per cent of all flats and 8 per cent of all properties in Scotland (based on the 2002 SHCS).[32] The modelling demonstrated that total running costs (including appliances) for the modelled properties were £1,250 for a top floor flat and £1,300 for a ground floor flat.

The following was assumed for this property type:

- cavity wall construction with no insulation (50 mm cavities)
- standard double glazing throughout
- 50 mm (2 inches) of loft insulation in the top flat
- a post-1998 mains gas non-condensing conventional boiler with hot water cylinder providing domestic hot water.

Two archetypes were used in this analysis, with baseline running costs:

- ground floor (one bedroom, £1,300)
- top floor (one bedroom, £1,250).

Photo courtesy of Changeworks

[31] 80 per cent of effort must be delivered in the eligible SIMD data zones

[32] See footnote 2.

Costs, savings and payback for energy efficiency measures in a pre-war four-in-a-block tenement

	Measure	Installation cost (£)		Savings per annum (£)		Payback period (years)		Comments
		ground	top	ground	top	ground	top	
Wall	Cavity wall insulation	161	149	68	62	2.4	2.4	
	Internal wall insulation (IWI)	2,602	2,377	74	68	35.1	35.2	
	IWI additional costs (to return property to original state	5,023	4,590	74	68	67.7	67.9	Additional costs include the insulation costs
Heating and hot water	Boiler and controls upgrade	2,200	2,200	126	121	17.5	18.2	
	Hot water tank insulation	14	14	9	11	1.4	1.2	
	Pipe insulation	27	27	9	9	3.0	3.0	
Glazing	Double glazing upgrade	2,750	2,750	7	8	383.7	346.0	
	Single to double glazing	2,750	2,750	26	29	107.7	95.7	
Loft	Loft insulation (50-300mm)	n/a	225	n/a	48	n/a	4.7	Top-up insulation assuming 50mm in situ
	Virgin loft insulation (0-300mm)	n/a	225	n/a	185	n/a	1.2	
Floor	Timber floor insulation	1,237	n/a	47	n/a	26.1	0.0	

The modelling shows that savings for measures in both ground and upper flats are very similar. Upgrading the boiler and heating controls makes the largest saving in both cases, paying back at an annual rate of 9.6–9.7 per cent / £121–£266 per year, and giving a payback time of 18 years.

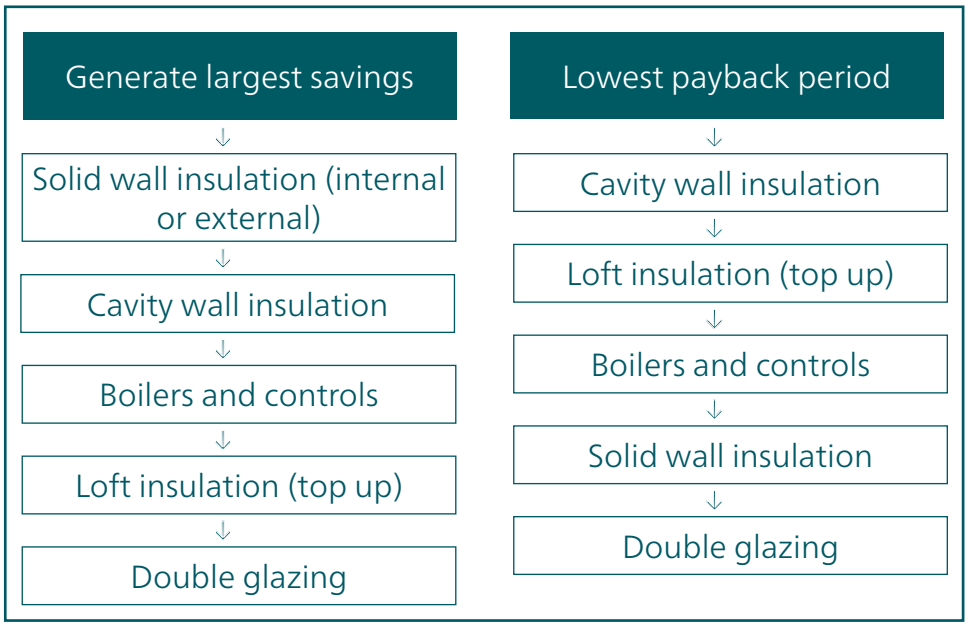
Wall insulation has the second-largest savings, although those from internal wall insulation are marginally higher than those from cavity wall insulation. However, since internal wall insulation costs are much higher than those for cavity wall insulation, the payback is also much greater, at 67–68 years compared to 2.4 years. This means that cavity wall insulation has the lowest payback of all the measures for this property.

In the top floor flat, top-up loft insulation makes a smaller saving (3.9 per cent / £48) than wall insulation (5.4 per cent), but due to its low cost has a payback period of 4.7 years; virgin loft insulation would create savings of 12.7 per cent or £225.

Upgrading the double glazing from older standard double glazing makes low savings (0.5–0.6 per cent / £7–8) and consequently has a payback period of over 340 years.

The diagram below presents an indicative overview of the relative impacts and payback period from measures in this flat type.

Indicative hierarchy of savings vs. payback periods for pre-war four-in-a-block



Packages of measures

The tables below present two examples of these packages for a ground floor and top floor flat.[33] As with pre-1919 flats, these packages show the enhanced payback that can be achieved through installing packages of measures that include cheap insulation options. The inclusion of loft insulation and cavity wall insulation in the top floor flat, alongside a boiler, brings the payback down 18.2 years to 12.6 years for the boiler alone.

Pre-war four-in-a-block ground floor flat – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Boiler/control upgrade	2,200	126	10	17.5	0.6	14
Cavity wall insulation	161	68	5	2.4	0.3	8
Cumulative measures	**2,361**	**176**	**13**	**13.4**	**0.9**	**20**

Pre-war four-in-a-block top floor flat – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Boiler/control upgrade	2,200	121	10	18.2	0.6	14
Loft insulation (top-up)	225	48	4	4.7	0.2	6
Cavity wall insulation	149	62	5	2.4	0.3	7
Totals	**2,574**	**204**	**16**	**12.6**	**1.1**	**25**

Green Deal analysis

The need to meet the Golden Rule again limits eligibility to lower-cost measures. With a maximum Green Deal finance term of 12 years to reflect boiler lifespan, boiler replacement would not meet the Golden Rule in either property.

[33] Full data on a range of different packages for each flat is presented in Appendix D of the full report.

ECO from the Carbon Saving Obligation is not applicable to this property as solid wall insulation would not be applied. Support from other strands of ECO which aim to reduce fuel poverty would only be available either if the individual owners or tenants qualify, or if the property is located in (or is treated under a programme mainly targeted at) one of the lowest 15 per cent SIMD areas.

Post-war tenement flat


Photo courtesy of Changeworks

Post-war tenements account for 13 per cent of all flats and 8 per cent of all properties in Scotland.[34] The modelling demonstrated that total running costs (including appliances) for the modelled properties is highest in the top and ground floor flats at approximately £1,450, and lowest in the middle floor flat at £1,300.

This archetype is a gable-ended three-storey six-in-a-block. The following was assumed for this property type:

- 305mm no-fines concrete wall construction with no insulation
- standard double glazing throughout
- 50mm (2 inches) of loft insulation in the top flat
- a post-1998 mains gas non-condensing conventional boiler with hot water cylinder providing domestic hot water.

Three archetypes were used in this analysis:

- ground floor (two bedroom, £1,450)
- middle floor (two bedroom, £1,300)
- top floor (two bedroom, £1,450).

The highest savings on annual bills can be achieved in this property type by installing internal or external wall insulation. This creates annual savings of 9.5–11.5 per cent, or around £149, with savings being highest in the middle floor flat. This is closely followed by the savings made from upgrading the boiler and heating controls (7.6–9.0 per cent / £99–127). Savings from boiler replacement are lowest in the middle floor flat.

Top-up loft insulation creates a saving of 4.3 per cent / £61 for the top floor flat only; virgin loft insulation would give a much higher saving. Upgrading the double glazing from existing double glazing has negligible savings of less than 1 per cent / £10–12 each year. If the original windows were single glazed, the savings by upgrading would be larger but still very limited at around 2.5 and 3.2 per cent.

[34] Based on the 2002 Scottish House Condition Survey.

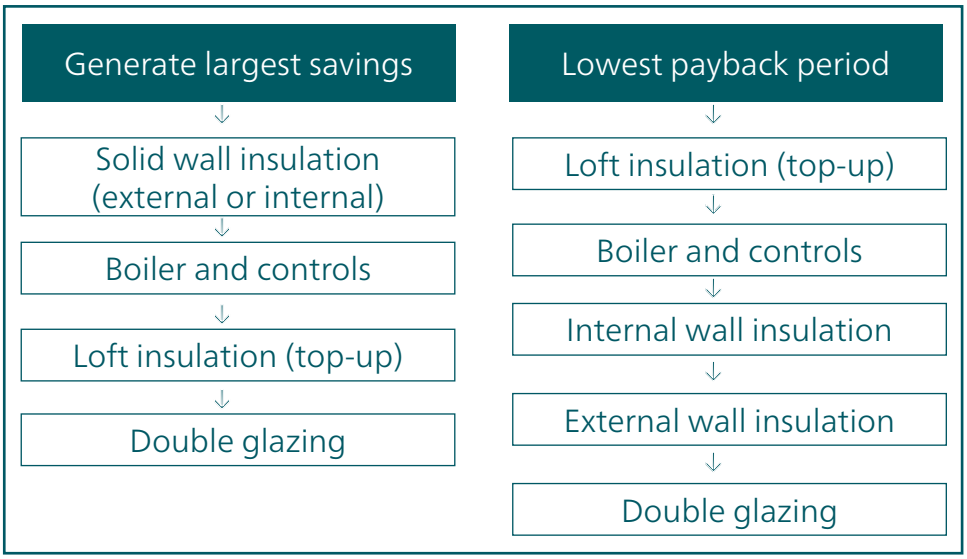
While solid wall insulation delivers the highest savings, its high installation costs mean that payback periods are between 43 and 56 years. External wall insulation is more expensive than internal wall insulation, and thus has a higher payback. As a communal measure, external insulation also requires consent from all parties.

Given the low installation costs of loft insulation, this has the lowest payback period of 5.2 years (for top floor only). The boiler and heating controls upgrade have a payback period of 17–18 years in the ground and top floor flat, and 22 years in the middle floor flat. Upgrading existing double glazing would have a payback period in excess of 230 years.

Costs, savings and payback for energy efficiency measures in a post-war tenement flat

	Measure	Installation cost range(£)	Savings per annum range (£)	Payback period range (years)	Comments
Wall	Internal wall insulation (IWI)	3,276 - 3,556	137 - 149	22.1 - 24.1	
	Additional costs of IWI	6,325 - 6,865	137 - 149	42.6 - 46.5	Additional costs include the cost insulation
	External wall insulation	7,644 - 8,259	137 - 149	51.5 - 55.9	Same installation cost for all flat positions
Heating and hot water	Boiler and controls upgrade	2,200 - 2,200	99 - 127	17.3 - 22.3	
	Hot water tank insulation	14 - 14	6 - 7	2.0 - 2.1	
Glazing	Double glazing upgrade	2,750 - 2,750	10 - 12	234.1 - 265.7	
	Single to double glazing	2,750 - 2,750	37 - 52	52.7 - 75.3	
Loft	Loft insulation (50-300mm)	(top floor only) 318	(top floor only) 61	(top floor only) 5.2	Top-up insulation assuming 50mm in situ
	Virgin loft insulation (0-300mm)	(top floor only) 318	(top floor only) 231	(top floor only) 1.4	
Floor	Solid floor insulation	(ground floor only) 5,579	(ground floor only) 58	(ground floor only) 95.4	

Indicative hierarchy of savings vs. payback periods for post-war tenement flat



Packages of measures

The tables below present two examples of these packages for a middle floor and top floor flat.[35] These packages highlight the impacts that can be made when packages of measures are installed to properties – bringing 17 per cent annual savings to the middle floor flat through boiler and double glazing upgrades and internal wall insulation.

Post-war tenement middle floor flat – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Boiler/control upgrade	2,200	99	8	22.3	0.5	11
Double glazing	2,750	12	1	234.1	0.1	1
Internal wall insulation	6,325	149	11	42.6	0.8	18
Cumulative measures	**11,275**	**220**	**17**	**51.3**	**1.2**	**26**

[35] Full data on a range of different packages for each flat is presented in Appendix D of the full report.

Post-war tenement top floor flat – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Boiler/control upgrade	2,200	125	9	17.6	0.6	12
Double glazing	2,750	10	1	263.3	0.1	1
Loft insulation	318	61	4	5.2	0.3	6
Cumulative measures	**5,268**	**179**	**12**	**29.5**	**0.9**	**18**

Green Deal and ECO analysis

In this case, solid wall insulation to reach the standard required for ECO could be applied. This would mean ECO from the carbon saving stream could fund other measures that form part of the package. This is illustrated below based on a carbon price of £77 per tonne. That figure is used by DECC's example calculations and to illustrate their Green Deal/ECO impact assessment.[36]

ECO carbon saving: post-war tenement middle floor flat, full retrofit package

	Measure cost (£)	Measure lifetime	Lifetime CO_2 savings (tonnes)	Value of CO_2 (@ £77 per tonne)	Borrowing required	Maximum GD loan	Surplus / deficit
Wall insulation	6,325	36	28.8	2,218	4,107	1,636	-2,471
Boiler/controls update	2,200	12	6.0	462	1,738	1,326	-412
Upgrade double glazing	2,750	20	2.0	154	2,596	132	-2,464
Cumulative package total	**11,275**		**30.2**	**2,323**	**8,952**	**2,627**	**-6,325**

The table above shows that even with ECO funding, the package of measures may not be viable. The main reason for this (in the case above) is the glazing element, which attracts very little ECO and can sustain only a very small Green Deal loan. Modelling without glazing upgrades is demonstrated in the package below.

[36] http://bit.ly/YQvcEy

ECO carbon saving: post-war tenement middle floor flat, package without glazing

	Measure cost (£)	Measure lifetime	Lifetime CO_2 savings (tonnes)	Value of CO_2 (@ £77 per tonne)	Borrowing required	Maximum GD loan	Surplus / deficit
Wall insulation	6,325	35	28.8	2,218	4,107	1,636	-2,471
Boiler/controls update	2,200	12	6.0	462	1,738	1,326	-412
Cumulative package total	**8,525**		**30.0**	**2,313**	**6,212**	**2,498**	**-3,714**

With glazing removed there is still a funding gap that the consumer (or a third party) would have to meet. This relates mainly to the additional costs associated with reinstating the flat after applying the solid wall insulation, which are estimated at £3,049. ECO would need to be valued at £99 a tonne of CO_2 to close the funding gap.

However, if a package for a top floor included top-up loft insulation, it would yield an additional £1,000 ECO and £643 of Green Deal borrowing for a measure costing only £320. Virgin loft would therefore yield even more surplus Green Deal and ECO. This could then allow other measures to be cross subsidised – for example, an upgraded boiler could be installed at no up-front cost.

As with the pre-1919 tenement flats, this analysis shows that the viability of the Green Deal and ECO are highly sensitive to the position within the block and the scope to install low-cost measures. This could present challenges when working with a group of residents (particularly with those in the top floor properties), as each would have to commission their own Green Deal assessment and be offered varying levels of ECO support.

1960s cavity tenement flat

This property type accounts for 19 per cent of all flats and 11 per cent of all properties in Scotland.[37] The modelling demonstrated that total running costs (including appliances) for the modelled properties are highest in the top and ground floor flats (£1,350) and lowest in the middle floor flat (approximately £1,200).

This archetype is a five-storey block built in the 1960s. The following was assumed for this property type:

- cavity wall construction with no insulation
- standard double glazing throughout
- 50 mm (2 inches) of loft insulation in the top flat
- a post-1998 mains gas non-condensing conventional boiler with hot water cylinder providing domestic hot water.

Three archetypes, with baseline modelled running costs, were used in this analysis:

- ground floor (two bedroom, £1,350)
- middle floor (two bedroom, £1,200)
- top floor (two bedroom, £1,350).

The boiler upgrade and controls make the largest saving in all flats in this property type (7.1–8.5 per cent / £86–116). The second-greatest savings for the ground and middle floor flats are from cavity or solid wall insulation (3.8–5.6 per cent / £53–68).

For the top floor, the savings from loft insulation (4.9 per cent or £67) are marginally better than that from solid or cavity wall insulation (4.0–4.6 per cent / £54–62). Due to in-use factors the savings from cavity wall insulation are slightly lower than those from solid wall insulation.

[37] Based on the 2002 Scottish House Condition Survey.

Costs, savings and payback for energy efficiency measures in a 1960s cavity tenement

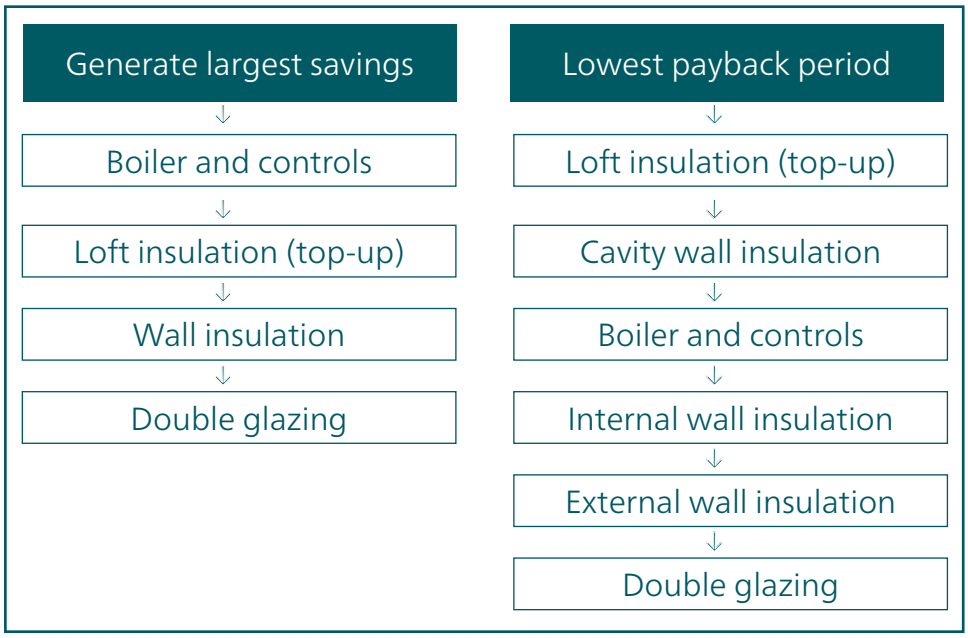
	Measure	Installation cost range (£)	Savings per annum range (£)	Payback period range (years)	Comments
Wall	Cavity wall insulation	744 - 747	53 - 59	12.8 - 14.1	Same installation cost for all flat positions
	Internal wall insulation (IWI)	2,289 - 2,341	61 - 68	34.7 - 37.7	
	IWI additional costs (to return property to original state)	4,419 - 4,520	61 - 68	66.9 - 72.7	Additional costs include cost of insulation
	External wall insulation	5,623 - 5,738	61 - 68	84.9 - 92.5	Same installation cost for all flat positions
Heating and hot water	Boiler and controls upgrade	2,200 - 2,200	86 - 116	18.9 - 25.5	
	Hot water tank insulation	14 - 14	6 - 6	2.1 - 2.1	
	Pipe insulation	27 - 27	9 - 9	3.0 - 3.1	
Glazing	Double glazing upgrade	2,200 - 3,300	9 - 11	209.0 - 245.4	
	Single glazing to double glazing	2,200 - £2,200	38 - 48	46.1 - 57.7	
Loft	Loft insulation (50–300 mm)	[top floor only] 331	[top floor only] 67	[top floor only] 4.9	
	Virgin loft insulation (0–300 mm)	[top floor only] 331	[top floor only] 247	[top floor only] 1.3	
Floor	Solid floor insulation	[ground floor only] 5,810	[ground floor only] 63	[ground floor only] 92.1	

Boiler upgrades have the lowest impact in middle floor flats. This is because the baseline energy consumption is higher in the ground and top floor flats, so the boiler would make a larger saving there.

The best payback period is loft insulation (4.9 years) followed by cavity wall insulation (12–14 years). Upgrading the boiler and heating controls has a payback of 19 years in the ground and top floor and 25.5 years in the middle floor. Due to high installation costs, internal wall insulation has a payback in excess of 65 years (including additional costs) and external wall insulation has a payback in excess of 85 years.

Upgrading the double glazing has low savings (0.7–0.9 per cent / £9–11), and therefore payback is in excess of 200 years. However, upgrading from single glazing would generate higher savings (2.7–3.4 per cent).

Indicative hierarchy of savings vs. payback periods for 1960s cavity tenement



* The saving from wall insulation in the ground and middle floor flat slightly exceeds the saving from loft insulation in the top floor; however, the top floor flat has lower saving for wall insulation so would benefit from loft insulation more.

Packages of measures

The tables below present two examples of these packages for a middle floor and top floor flat.[38]

1960s middle floor flat – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Boiler/control upgrade	2,200	8 6	7	25.5	0.4	11
Double glazing	2,200	11	1	209.0	0.1	1
Cumulative measures	**4,400**	**94**	**8**	**45.7**	**0.5**	**12**

1960s top floor flat – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Boiler/control upgrade	2,200	115	8	19.1	0.6	12
Double glazing	2,200	9	1	245.4	0.0	1
Loft insulation	331	67	5	4.9	0.3	7
Cavity wall insulation	747	54	4	13.8	0.3	6
Cumulative measures	**5,478**	**215**	**16**	**25.5**	**1.1**	**23**

Green Deal and ECO analysis

Being over three storeys and having cavity wall construction means that this property is classed as a hard-to-treat cavity, making it eligible for ECO funding under the Carbon Saving Obligation heading. An analysis of the funding this would generate is shown below.

[38] Full data on a range of different packages for each flat is presented in Appendix D of the full report.

ECO – Carbon Saving: 1960s Middle Floor Flat

	Measure cost (£)	Measure lifetime	Lifetime CO_2 savings (tonnes)	Value of CO_2 (@ £77 per tonne)	Borrowing required	Maximum GD loan	Surplus / deficit
Cavity wall insulation	747	42	12.9	994	-247	643	890
Boiler/controls update	2,200	12	5.4	415	1,738	661	-1,124
Cumulative package total	**2,947**		**16.5**	**1,274**	**1,673**	**1,158**	**-514**

The table above shows that the package of costs, including cavity wall insulation, is viable at close to DECC's ECO-proposed price. This means that, even including some scaffolding costs, the measure could be provided free to residents. If the price of carbon was to rise above DECC's estimate of £77 per tonne to around £110 per tonne, boilers could also be funded at no up-front cost alongside a Green Deal loan.

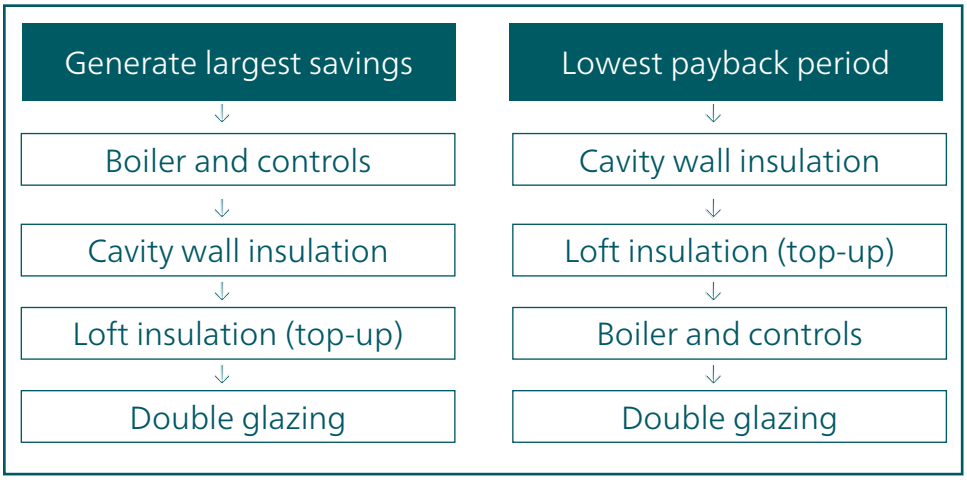
Three-bedroom semi-detached

Analysis for this property type has been carried out for comparison purposes. The modelling demonstrated that total running costs (including appliances) is approximately £1,800.

In this property, the largest saving comes from upgrading the boiler and controls (9.9 per cent / £175), closely followed by cavity wall insulation (9.1 per cent / £162). However, cavity wall insulation has a much lower payback period (1.9 years) compared to upgrading the boiler and heating controls (13 years).

Top-up loft insulation makes a 2.3 per cent saving (£41) which pays back in 11 years, although this would be an 8.1 per cent saving if it had been virgin loft insulation. Upgrading double glazing makes a 1 per cent saving (£18) and would take over 240 years to pay back; this would have been a greater saving of 4.2 per cent if upgrading from single glazed.

Indicative Hierarchy of savings vs. payback periods for a three-bedroom semi-detached house



Packages of measures

The tables below present an example of a package for this property.

Three-bedroom semi-detached – measures package

Improvement measures	Measure costs	Annual savings		Payback	Annual CO_2 savings	
	£	£	%	years	tonnes	%
Boiler/control upgrade	2,200	175	10	12.6	0.9	13
Loft insulation	435	41	2	10.6	0.2	3
Cavity wall insulation	307	162	9	1.9	0.8	12
Cumulative measures	**5,635**	**332**	**19**	**7.9**	**1.7**	**25**

Green Deal: Full Retrofit Package: Three-Bedroom Semi-Detached

	Measure cost	Maximum GD loan	Surplus / deficit
Boiler/control upgrade	2,200	1,343	-857
Loft insulation	435	450	15
Cavity wall insulation	307	1,775	1,468
Cumulative measures	**5,635**	**332**	**19**

The position for the semi-detached contrasts markedly from the example flats because there are sufficient savings to underpin a Green Deal loan. Savings are in a similar range to those used by DECC in their examples.[39] DECC also provided an example for a bungalow where the savings are even higher.

Comparisons between the properties

Both top-up and virgin loft insulation generate savings in all properties. The savings are very similar in all (top floor) tenement types, and are greater in those flats than in the standard semi-detached house. Although savings from loft top-up are relatively limited, low installation costs mean the measures consistently have low payback periods – payback times in top floor tenements are around half of those in the semi-detached (4.7–5.2 years, compared to 10.6 years).

Cavity wall insulation, where possible, also makes significant savings and has low payback periods in both tenements and the semi-detached house. However, with the exception of cavity wall insulation in pre-war four-in-a-block properties, the installation costs for tenements are much higher and, as a consequence, payback periods are considerably longer at 12–14 years.

Boiler upgrades and heating controls give broadly similar savings of between 8.4–11.3 per cent in all properties. Payback in the semi-detached is around 12 years but is higher in most of the tenements (15–25.5 years), apart from the ground and top floor pre-1919 flats before floor or loft insulation. The longer payback times are because the tenements, apart from pre-1919 flats, have lower baseline annual bills than the semi-detached, and therefore savings will also be lower, despite the costs of boiler installation being identical.

[39] http://bit.ly/13e4pOh 30 January 2013 (Example 1 & 3).

The balance of savings between solid wall insulation, where appropriate, and boiler upgrades varies between different property types. In the pre-1919 middle floor flat and all post-war tenements, solid wall insulation makes a better saving than the boiler upgrade. However, the high capital costs of solid wall insulation mean that it consistently has a high payback period of at least 25 years and, in most cases, much longer.

The savings from replacing single glazing with double glazing are relatively small in all tenement property types and in the semi-detached house. However, savings are much more significant (5.5 per cent) in the middle floor pre-1919 tenements because these flats typically have larger windows. Payback in the pre-1919 middle floor tenement is roughly half that of the three-bedroom semi at around 28 years compared to just over 56 years. Investing in glazing upgrades is much more advantageous in a pre-1919 tenement than in a three-bedroom semi, and could be even more so in a tenement property which has larger or more windows, such as a bay window in the lounge. Payback times are much longer in more modern tenements at 75–108 years.

Secondary glazing may be more attractive to pre-1919 tenement residents as it is considerably cheaper than double glazing, provides similar savings, and may be permitted in protected buildings. Although the model is unable to take account of the savings provided by the use of original wooden shutters, Historic Scotland research shows that these do also have comparable benefits to secondary glazing.

In summary, it is possible to say that loft and cavity wall insulation have low payback periods, boiler upgrades have medium payback periods, and solid wall insulation and double glazing generally have high payback periods, although glazing improvements are more attractive in pre-1919 tenements.

The modelling also highlights the importance of floor insulation, particularly for properties with solid concrete floors. This is an area where more work is needed – observed values for heat loss from floors in the pre-1919 tenement were considerably poorer, and therefore the savings from insulation considerably larger, than standard modelling values would suggest.

Green Deal, ECO and tenements

The Green Deal and ECO can, in theory, provide financial support to enable consumers living in tenements to install a much wider range of energy efficiency measures at no up-front cost than has been the case in the past.

However, our modelling shows that:

- energy use and gains from energy efficiency measures in tenements differ significantly from standard models, highlighting the importance of bespoke rather than assumed measurements and values being used in assessments
- it will be difficult to meet the Green Deal Golden Rule in practice, even with ECO subsidy at DECC's assumed levels, for tenements requiring solid wall insulation.

The Green Deal assessment will be based on an RdSAP (Reduced Data Standard Assessment Procedure) assessment of the property; this is the same methodology used to produce an Energy Performance Certificate (EPC).[40] While the assessment will therefore be property-specific, it will also use assumptions on baseline energy efficiency and savings which can reduce the accuracy of the eventual recommendations. As highlighted above, actual and default U-values can differ hugely. In addition, other research suggests that the assumed U-values used for the walls of traditional tenements in RdSAP are inaccurate compared to those measured in situ,[41] or that the U-values of tenement windows may also be inaccurate.[42] This has implications for the savings consumers will make on their energy bills and emphasises the importance of using data which is as accurate as possible throughout the assessment process.

The assessment will also entail an 'occupancy assessment', which is based on the number of occupants and their behaviour, such as number of heating hours. While predicted savings will not change, occupancy information will give an indication as to whether predicted savings will, in practice, be under- or over-estimated.

Our modelling has shown that the only measures in flats and tenements that will meet the Golden Rule are loft and cavity insulation. Boiler and heating control upgrades will not, in isolation, be fundable via the Green Deal because the payback times are longer than the expected life of the boiler.

[40] http://bit.ly/17XlEIf

[41] Changeworks (2012) http://bit.ly/YQKXLr

[42] Changeworks (pending) Research for Historic Scotland 'Green Deal, ECO and Traditional Buildings'.

Even as part of a package, boiler upgrades provide less scope in flats than for semi-detached houses when developing a Green Deal package that meets all of the Golden Rule.

Scottish Government figures from 2011 show that, while some scope for further work remains, energy efficiency programmes have successfully installed loft and cavity insulation in very many properties in Scotland. In addition, both private and public sector promotion of free basic measures continued at a high level through 2012. It is reasonable to conclude that consumers who have not installed these measures face barriers to do so other than availability or up-front cost.

Our research therefore raises a concern that, paradoxically, the success of earlier basic insulation programmes may have undermined the potential for take-up of more expensive energy efficiency measures under the Green Deal. This is because packages combining expensive and low-cost measures will be less commonly available. Where basic measures can be installed, the existing barriers, such as achieving agreement among tenement residents, which are explored in the following chapters, will still be present.

The modelling has also investigated, to some extent, the financial issues around the use of Carbon Saving ECO. In theory, subsidy will be available for measures (hard-to-treat cavity walls and solid walls, plus other measures installed alongside these) which will be of considerable help to consumers in tenements.

Our modelling shows that, at DECC's estimated of price of CO_2 (£77 per tonne), there will be insufficient ECO available to meet all the up-front costs of internal wall insulation, including redecoration, unless costs fall significantly. Consumers, or a third party, would therefore need to find additional money to support the installation of measures. In addition, achieving U-values which meet the ECO standard in tenements needs to be further explored, as this would involve using thicker insulation than has specified by Historic Scotland in recent trials.

Further, ECO is structured in a way which encourages energy companies to install measures where they can reduce CO_2 emissions at lowest cost. This could, for example, result in companies prioritising work in off-gas properties where CO_2 savings for the same measure are higher, or – as might be suggested by our modelling – installing solid wall insulation only where other lower-cost measures such as loft insulation are also available, and where the costs of arranging installation are lower.

It is also notable that top floor flats will have much greater scope to access Green Deal funding and potentially ECO where virgin or loft top-up insulation is specified. In contrast, opportunities for middle floor flats are much more constrained. This could, where Green Deal loans are involved, make allocating costs between different flats within a block significantly more complicated.

ECO external solid wall insulation projects may therefore focus on social housing where economies of scale can be achieved, and where barriers associated with getting agreement for communal measures can be reduced.

More positively, ECO priced at £77 per tonne CO_2 should be able to more comfortably accommodate cavity wall projects, even for harder-to-treat flats (with more than three stories) where higher costs result from scaffolding.

In summary, our analysis shows that while the costs of installing energy efficiency measures in tenements are similar or in some cases higher to those in houses, the potential for carbon saving is less. The scope for Green Deal and ECO funding is therefore less in flats and tenements, and could potentially make tenement projects less attractive for energy companies.

This highlights the importance of the Scottish Government's stated intention to ensure that publicly funded energy efficiency programmes are designed in ways which make it more attractive for companies to deliver ECO in Scotland.

Photo courtesy of Energy Savings Trust

2 Stakeholder views of administrative and consumer issues

Introduction

The analysis above shows that, for the majority of tenements, some energy efficiency measures will require communal action, for which the agreement of all owners or tenants is needed.

As part of this research, interviews and consultation meetings were held with key stakeholders (local authorities, housing associations, factors, landlords' representatives, installers) involved in the maintenance and improvements of flats and tenements.

Without exception, stakeholder interviews highlighted lack of agreement among residents as a key barrier to the improvement of energy efficiency in tenements. They also told us that similar barriers have long been recognised in relation to issues around communal repair and maintenance.

This chapter therefore explores issues encountered in more detail, and the experience of solutions used.

Legal context for communal works

The research identified considerable variation across Scotland, and between different property types, as to the procedures, rights, proportions of contributions required, and voting decisions to approve communal works in flats and tenements. Stakeholder interviews, for example, suggested that deeds are generally less clear in properties in Edinburgh than Glasgow, and tend to be more comprehensive in newer properties. Some deeds specify voting rights, rules, and the roles and responsibilities of owners, while others do not.

Where title deeds are extensive and well defined, clear guidance may be given to the owners of properties as to their voting rights, how to go about decision-making, and what is communal or individually owned. Where elements of this are absent or unclear, the Tenements (Scotland) Act 2004 comes into play.

The Act is important in that it clearly defines what is classed as 'maintenance' to a property if title deeds are uncertain and make no provision. Maintenance is defined as: 'repairs and replacement; cleaning; painting and other routine works; gardening; the day-to-day running of the tenement; and the reinstatement of part (but not most) of the tenement building'. Maintenance does not mean alteration or improvement. Unless otherwise specified by the deeds, for maintenance work to go ahead a simple majority of owners is required. For improvement works, a unanimous decision is required.

The Climate Change (Scotland) Act 2009 amended the definition of maintenance to include the 'installation of insulation'. This should, in theory, make the installation of energy efficiency measures more straightforward. However, stakeholders were not aware of widespread use of this element of the Act. They suggested that may have to be tested on a case-by-case basis (subject to deeds) and it may be that clarification over how and when exactly the Act can be used may be required. For example, if deeds describe maintenance activities but do not specifically mention insulation, can the Act be applied? What procedures and process should be used in different cases? What is an appropriate level of consultation among consumers before insulation works are undertaken?

Stakeholder experience in practice

The interviews with local authority staff suggest that their approaches are different in practice, both from the theory above and from each other.

The majority of interviewees spoke about their experience of dealing with private owners who had purchased their properties under 'right-to-buy' (RTB) policies, but where the local authority retained ownership of one or more properties in the block. Local authorities therefore had an interest in both maintaining and improving the energy efficiency of all properties to meet the Scottish Housing Quality Standard (SHQS).

Stakeholders consistently reported that RTB consumers assume that responsibility for ongoing repair and maintenance of communal areas continues to lie with the local authority, regardless of deeds or the Tenements Act. This perception, together with an associated unwillingness or inability to pay for communal works, means that works are often held up by a small number of owners. This is very common in cases where a unanimous or more than a simple majority is required. All respondents described this as the major barrier to energy efficiency work. Four-in-a-block examples were mentioned by many as a problem given that if only two owners could be persuaded to act, works could not take place.

The research sought to quantify the scale of this problem by looking at the reported reasons why social housing providers have not achieved the energy efficiency criteria of the SHQS.[43] Headline data shows that almost one third (32 per cent) of exemptions were as a result of owners not being willing to pay or to have work done (and a further 20 per cent from tenants not wishing to have work done).

[43] http://bit.ly/YQLIEq

However, more detailed discussion with the Scottish Housing Regulator suggests that the numbers and proportions of exemptions relating to energy efficiency vary considerably between social landlords; this is an area where more detailed research would be helpful to better understand the detailed issues.

Interviewees reported a range of issues encountered in delivering communal work, which can be grouped into three categories: financial, legal and social:

Financial

- Those who are unable to pay/have not planned for whole block maintenance.
- Those who are unwilling to pay (or who expect that the local authority will ultimately pay in cases where some of the block is owned by the local authority).
- Private landlords unwilling to invest in improvements, because of a lack of benefit.

Legal

- Lack of clarity in deeds leading to uncertainly over responsibilities.
- Lack of awareness of owners' responsibilities in relation to the block.
- A belief that communal areas are the responsibility of local authorities or housing associations (particularly from 'right-to-buy' owners).
- Disinterest or unwillingness of tenants to contact their landlords. This applies especially to short-term tenants who may take less interest in works or may not be aware that they are meant to pass information on.
- Contacting landlords via letting agents can be difficult and time-consuming.

Social

- Lack of perception of need among residents for maintenance works or improvements, especially energy efficiency related measures.
- Those who do not 'directly' benefit from the repair (for example a ground floor flat for roof repair or loft insulation) may be reluctant to agree.
- Lack of owners' willingness or ability to engage with private landlords.
- Ongoing disputes between neighbours preventing communications.
- Difficulties of agreeing contractors and pricing.

A number of interviewees felt that the lack of finance was the biggest barrier to agreeing works. It was felt that more assistance is needed for homeowners who cannot afford to contribute to works (for example loans such as those under the schemes of assistance). A representative of private landlords reported that landlords were unlikely to want to finance work unless they could see a return on it.

At the same time, there was also limited anecdotal evidence that some residents felt social pressure to support installations that they could not afford, as they would be seen to be 'letting my neighbours down'. This could potentially leave them at risk of significant and unmanageable debt.

Approaches to engagement used by stakeholders

While local authorities have powers to force owners to financially contribute to communal works, these powers are not often used, because of a combination of resourcing issues, the bureaucracy involved and associated costs.

Successful approaches, in almost all cases, rely on support and engagement, but respondents emphasised the challenges involved. They typically stated that successful engagement was hugely time intensive, and required the use of multiple techniques, with a clear lead agency, to build relationships and trust to incentivise and persuade residents to participate. Approaches included:

- leafleting, letters and emails to residents
- development and distribution of Q&A forms
- door knocking
- organising and participating in residents' meetings (including inviting maintenance companies, installers and insulation manufacturers)
- tracking down landlords via the landlords' register.

In cases where there is a factoring service, housing association or local authority owner in the block, it is often these agents that will take this co-ordination and engagement role. This role has also been fulfilled by the Universal Home Insulation Scheme (UHIS) programme managers and/or the Energy Saving Scotland Advice Centres across Scotland for energy efficiency schemes.

Working through factors or residents' associations was also identified as successful in cases where this was possible. Factors, in particular, can allocate time to pursuing works which otherwise owners may struggle to do, and also have specialist knowledge to enable them to do so (for example, the appropriate repair to an older property). A small number of respondents felt factors were needed in all blocks as a means of progressing works, but, at the same time, noted that private owners often see factors' fees as a waste of money or too expensive. In addition, the private landlord representative felt that anecdotal feedback from private landlords suggested that factors are not always effective. Factoring services are more common in some parts of Scotland (for example Glasgow), and respondents indicated that title deeds in some newer properties specify that owners' associations must be formed or that factors must be engaged.

Perhaps unsurprisingly, where improvements or maintenance was free or heavily subsidised, there tended to be greater success, and subsidised works were also mentioned by some respondents. Figures from EST[44] show that loft and cavity installs (across all property types) funded via the Carbon Emissions Reduction Target (CERT)[45] increased from roughly 79,000 per annum in 2009–2010 to 149,000 per annum in 2011–2012, the first full year of free installs via UHIS.

In the cases of councils funding maintenance works in their own properties, many used their own contracts to offer work to private properties at discounted cost (because of economies of scale). However, in some cases, their own fixed contract costs meant that works were viewed as expensive by other owners who felt they could source better deals. In another instance, the council received approval from the Scottish Government to use Energy Assistance Package (EAP)[46] funding to discount a certain measure for homeowners. Free scaffolding through UHIS schemes was also stated to be very helpful in enabling large blocks to get measures, as costs were considerably reduced. Combining energy efficiency measures with essential repairs or wider upgrading also increased uptake.

Another council had taken the opportunity to encourage homeowners to install energy efficiency measures when a repair was being carried out (for example loft insulation when roof repair was being carried out). Other local authorities offered interest-free loans and/or grants for repairs and maintenance, in addition to access to hardship funds for those unable to pay.

Wider promotional and engagement work was highlighted. One council set up a staffed show flat to help homeowners to understand the advantages of external wall insulation and combined heat and power. Others offered tailored incentives; for example, one energy efficiency project offered various low-cost energy saving devices, such as chimney balloons or radiator panels, to lower floor flats to encourage them to agree to loft insulation works where deeds dictated that this required communal agreement.

Despite all the above, respondents typically described the engagement process as extremely difficult. Those comparing their experiences of working with repairs and essential maintenance felt that generating agreement with energy improvements might be even harder as this type of work would most likely be viewed as an improvement by owners, regardless of the formal legal position. Some local authority interviewees said that homeowners were more likely to object to the installation of cavity wall insulation than loft insulation or routine maintenance, due to concerns over damp and damage to the building.

[44] http://bit.ly/13sWss0
[45] http://bit.ly/10IcoHp
[46] http://bit.ly/xOxd0P

Looking ahead, some respondents mentioned the recent Scottish Government consultation on Homes that don't cost the earth: a consultation on Scotland's Sustainable Housing Strategy.[47] Among other issues, the strategy included questions on whether powers should be given to Scottish local authorities to enforce minimum standards of energy efficiency in all housing stock in their area.

A review of the published responses generally – although not universally – suggests that there is support for the use of local authority powers to enforce energy efficiency measures. The main concerns with applying such powers are the lack of council resources to implement enforcement, and a lack of finance: councils are concerned about the potential to have to fund all measures where owners do not pay. There was mixed feeling on what powers local authorities should have in terms of enforcing a majority vote. Some respondents felt that householders need more advice and support to carry out repairs, others felt that enforcement powers are necessary, while for others it was felt that enforcement should only be used as a last resort.

Summary

Interviews with stakeholders consistently highlighted the issues involved in achieving consensus among all consumers in tenement blocks, especially those in mixed tenure, towards energy efficiency measures.

Positively, stakeholders were able to highlight a wide range of actions they had taken to address this issue, although, at the same time, all emphasised the complexity and time needed to engage successfully. Related to this, a majority of stakeholders highlighted a need for stronger powers to help deliver measures.

Photo courtesy of Changeworks

[47] http://bit.ly/Xx2JlZ

3 Feedback from tenement owners and tenants

Introduction

To complement the discussion on both technical measures and the views of stakeholders, our research included six focus groups involving residents of flats and tenements. Two sessions were held in each of Glasgow, Edinburgh and Dundee, involving a representative mix of tenants (private and social) and owner-occupiers. Groups were split broadly into upper and lower socio-demographic groups and by age (older and younger).

The content of the focus groups drew on both the findings from the modelling exercise and the stakeholder interviews. Discussions explored, firstly, participants' experiences of maintenance and repairs in communal areas of tenements and, secondly, their attitudes towards energy efficiency measures more specifically.

Experience of maintenance and repairs in communal areas

Participants had mixed experiences of carrying out maintenance and repairs in communal areas. To some degree this was influenced by the existence of a formal management arrangement such as a factoring company; those with factors were more likely to have regular maintenance undertaken. These provide a mechanism to organise works, although in practice, participants suggested they do not always work effectively.

Consumers' experiences are therefore discussed below, based on the types of management structure.

No external management structure or residents' association

In general, most householders were not fully satisfied with the level of maintenance in communal areas of their block, and wanted more work to be done. Experiences varied widely from those reporting that it was easy and simple to organise works, to situations where agreement could not be reached. Owner-occupiers appear more likely to take an active interest in maintaining and improving the communal areas. Some indicated that they may even take communal repairs into account when purchasing a property. Roof repairs were a particular concern:

"I'd check to see… what roof work has been done as you don't want a huge bill."

Most private and social tenants were satisfied with the maintenance of their individual property and felt that their landlord would satisfactorily and promptly deal with any issues raised. However, tenants stated that they usually only contact landlords about specific problems rather than suggestions for improvements, and that these tend to be issues in individual rather than communal areas.

Short-term renters (particularly private tenants) did not appear to take much responsibility or interest in maintaining communal areas. However, those tenants who were hoping or expecting to live in a property long term took more pride in the area; some social housing tenants had invested in improvements in their individual properties.

Although there was little experience among participants of formal residents' or owners' associations, one participant who had previously been part of a residents' association described it positively:

"Every month we would have a meeting and everyone went along… We even got the stained glass in the door replaced."

In the absence of a residents' association or formal management arrangement, participants indicated that maintenance and repairs were often left to one or a small number of proactive residents:

"I wouldn't do it – it's too much hassle… but Mrs Brown would be straight onto that [repair]."

"We take turns to sweep using a note – I am assuming someone organises it, I don't know. I don't see my neighbours."

Some residents expressed willingness to take on the responsibility of organising works themselves, sometimes due to an acceptance that it would not otherwise be carried out. In some situations, participants indicated that other owners would not agree or pay for works. While some owners would proceed with works knowing they would not financially recoup their costs (since they perceived this to be their only choice), others were cautious:

"I wouldn't want to do it as I'd be scared of being out of pocket."

Participants indicated that maintenance tasks such as stair cleaning or grass cutting were often carried out by a minority of residents, and frustration was expressed at tenants, landlords or others who did not share the responsibility:

"It's been so bad I have considered moving out. People on short-term leases don't care, and trying to get in touch with landlords is difficult – we don't know them."

"The four of us [owner-occupiers] pay for the garden to get done and we take turns to clear the stairs… We've been in touch with the landlords but they refuse to pay anything, and the tenants don't care. The roof repair was too much money though – we got the council involved and they ordered them to pay. They had originally refused."

Differences between residents may also hinder the sense of community. One group felt that first-time buyers, in particular, perceive their responsibility as being limited to their individual property. Overall, householders considered themselves 'lucky' if they got along with their neighbours.

The number of properties in a block also influences approaches. Organising works in a block of six properties was considered to be 'very easy', whereas it was thought to be much more complex and time-consuming to gain consensus and co-ordinate work in larger blocks.

None of the participants had experience of keeping a communal reserve pot of money, (which owners regularly contribute to, towards future maintenance and repair bills), and reactions to the suggestion varied:

"It cushions the blow for when there is big work."

"… but not in a good light… heard of someone running off with the money."

Very few participants were aware of the specifications in their title deeds or had heard of the Tenement Management Scheme (TMS). In one instance, an owner had spent six months trying to organise a roof repair which had caused a leak in her flat. She had not looked at her title deeds but was eventually directed to the TMS by a landlord in the block.

Factoring services

All private tenants and owners in Glasgow had current or previous experience of factoring organisations, whereas only a minority of participants in Dundee and Edinburgh did. Participants in Glasgow in particular reported poor experiences of factoring, based in part on a perception that they did not secure the best deal for residents:

"They [the factor] wanted to put new light bulbs in which cost £15 each. You can get those bulbs for 85p each at ASDA."

While some participants said that factors provide an opportunity for them to choose a quote or find an alternative, this does not appear to be commonplace. An additional issue with factoring services for some participants was the unpredictability of future bills, which could cause concern:

"The factoring bill was crippling – it was a big thing for me… I decided to move to a flat owned by a housing association. Now, I have my rent and that's all I pay… But it's not just less money – it's less stress for me knowing what it will be."

Participants with factors expressed dissatisfaction with the level and quality of maintenance carried out in communal areas, and also cited examples of factors undertaking work which householders felt was unnecessary:

"They come regularly in the summer to do the garden but don't do a good job – they leave the paths and walls covered in dirt. We complained to the factor."

"They just painted the close but they didn't give us the option – I don't think it needed doing. We just got a bill for around £500."

While some residents may report problems to factors, others would not raise issues due to the fear of the cost:

"I wouldn't report things – the door broke and we've just left it. It's a security door so it's now not secure… No one wants to phone the factor. I don't want to trigger a large bill. If we didn't have a factor, I'd probably try and fix the door."

Some participants, particularly those who had good relationships with their neighbours, felt they would manage the blocks better without a factor:

"We used to organise the works between ourselves – it worked much better and it was cheaper."

"I didn't have factor in my last flat – would be interested in getting rid of the factor now."

However, despite there being a prevalent negative feeling towards factors, many participants in the Glasgow group felt factors are necessary to ensure works get carried out:

"I used to live in a four-in-a-block where we had no factor. I did everything, had responsibility for arranging all the work. I would prefer to have a factor, even though I think they're expensive."

One Dundee participant took a similar view:

"You'd be too busy fighting with your neighbours to get anything done [without a factor]… but people need to know what they are being charged for, not just an amount."

Social landlord part-ownership

Councils and housing associations will sometimes take responsibility for organising works where they part-own the block. In some situations participants seemed unclear as to the council's role:

"The council supposedly factors our block… the grass is cut but they don't do anything else."

In a couple of instances participants stated that the council had undertaken communal works in part-owned blocks but never requested a financial contribution from them, as private owners. Participants also displayed mixed expectations of whether the council should take a lead in organising repairs and maintenance:

"The council had an eighth share – they should have been sorting it out."

"We [the five owners] organised to have the stair re-painted. We did it and went to the council for the sixth share [for the one council-owned property]. It works well this way."

A minority of participants had purchased their home from the council through the right-to-buy scheme. These participants said they would expect to 'chip in' to communal repairs, although they expected the council would take responsibility for organising the works.

Some participants cited a couple of instances where work they felt was unnecessary had been carried out by the social landlord, in a way similar to that described above for factors. More positively, one owner expressed their appreciation that a social landlord would have to meet certain standards of maintenance for their tenant, which benefitted the whole block.

Where social landlords take a lead in organising works, participants indicated that there are varying levels of consultation. In some cases, there was no consultation and works sometimes proceeded without a vote. For example, one participant stated:

"We all got a letter to say it's going to be £790 each to paint the close, which doesn't actually need painting."

In contrast, some participants, particularly council tenants, stated they were usually consulted on works. This led to more positive perceptions of the council's role.

Overall, there appeared to be a higher degree of satisfaction and trust with councils and housing associations compared to commercial factoring organisations. However, this was not always the case; some participants, particularly social housing tenants, felt that their landlord did not always carry out enough maintenance or repairs in communal areas or to a high enough standard. There were also instances where private owners in the block felt that the price of communal works was excessive.

Consumers' views of majority and unanimous decisions

Although opinions about communal works varied, there was some consensus that a repair should only require a majority, whereas an improvement should require unanimous agreement. While there was sympathy that everyone 'should have a say', situations where one person prevented works proceeding were considered frustrating.

Generally, householders indicated that they were willing to proceed with works in the event of a majority decision, although this seemed to depend on the costs of works. In addition, the existence of good social relationships between neighbours appeared to make participants more willing to financially contribute towards a measure they did not directly benefit from:

"You'd pay towards a measure to help your neighbour, and they will repay the favour next time."

Only a minority of householders would feel social pressure to go ahead with significant measures they did not want. One participant cited an example of her friend's block which had been re-cladded. Private owners who had not voted for the measure had to pay a large amount for it, while social housing tenants in the block may have voted for the measure but did not pay for it. This was perceived as unfair.

Energy costs and energy efficiency

Energy bills, and particularly rises in fuel prices, were a concern to many participants. Responses to rises were varied, with some participants simply turning the heating down:

"I only use two radiators… I once told my wife, 'go and get your jacket on' and she said, 'are we going out?' I said, 'no, I'm turning the heating off.'"

The majority of participants had not considered taking action on energy efficiency, either because they felt it was the responsibility of energy companies or government, or because they viewed energy bills as 'just something you to have to pay'. Indeed, there were very few respondents who indicated that they had actively undertaken energy saving measures:[48]

"My flat is cold and I pay a lot for energy bills – but haven't really thought about it." [making improvements]

This was reiterated by people 'putting up' with problems such as draughts, and tenants stating they would not generally contact their landlord about energy efficiency unless there was a significant problem; for example, one participant with a small child who slept in a cold room had asked for improvements to be carried out. A number of householders had recently had measures installed, usually through free insulation schemes or where social landlords had upgraded properties (for example installing new boilers). Few had taken the initiative to carry out works themselves:

"If the TV broke I would get it fixed right away… but something like insulation is so far down the list of priorities and you won't see the benefit."

Participants were provided with a list of energy efficiency measures to discuss. Generally, householders would consider any measure that keeps their home warm or reduces bills. Measures of most interest related to areas in their home which they felt were particularly cold (for example double glazing if window area felt cold). Similarly, those with no/few heating controls were interested in getting full heating controls. Recommendations from friends and family also appeared to influence attitudes, both positively and negatively:

"My parents had cavity wall insulation put in recently and they noticed the difference."

"My son is training to be a gas engineer and he said you don't save much by putting in a new boiler."

Overall, however, there was a low awareness of the benefits of energy efficiency. There was both scepticism and positive surprise about the possible predicted savings from measures, in both theory and practice. A participant who had recently had loft insulation installed stated:

"I didn't think I would notice the difference, but you do."

[48] These findings are consistent with research published by Consumer Focus Scotland: http://bit.ly/10Sx2yO (2012).

There was limited understanding of what some of the measures are or what they would entail; for example, one participant thought that re-plastering would be necessary after cavity wall insulation. This issue was complicated by consumers receiving mixed advice. One person had been told leaving a boiler on all the time would be more energy efficient than using it on a timer.

At the same time, double glazing was perceived very positively. Householders tended to have prior experience of this so were familiar with it, and it is a noticeable measure, unlike, for instance, cavity wall insulation:

"Better as you can see that it is working… and making a difference."

In contrast, there were some negative perceptions of efficient lighting as dim, or taking a long time to light up, although these views were not shared by all.

The up-front cost was a major concern for participants, especially for more expensive measures, and the principle behind the Green Deal was welcomed as a result. Payback times were an important consideration in influencing participants' views of specific measures for their own homes.[49]

Although cavity wall and loft insulation were generally perceived as desirable energy efficiency measures, householders were more motivated to install energy efficiency measures in their own (individual) property than communal areas. In addition, organising communal measures was perceived to be more hassle and more complicated by some, even where measures are free or help is provided:

"That's not a big saving [£135 for cavity wall insulation] – it's not worth the hassle."

"Even if it was free, talking to neighbours would put me off."

Those with a factor did not trust them to arrange installation of free insulation measures:

"There would have to be something in it for them – why else would they go to the hassle of distributing letters to 12 flats?"

Generally, participants felt that energy efficiency measures should be considered an improvement rather than a maintenance measure, when making a decision about it:

"Double glazing, cavity wall insulation… I don't think that's a maintenance thing because it's not ongoing, it's a one-off."

[49] Consumer Focus published a range of research on consumer engagement in energy efficiency in general, and attitudes to the Green Deal more specifically, available at: http://bit.ly/xzGUWS

There was some sympathy for the idea of communal energy efficiency measures being delivered by government or local authorities.[50] However, there was also a sense that householders would need convincing of the benefits and that it would only be acceptable where measures are free or low cost:

"People wouldn't like it [insulation measures], you would need someone to explain things to them… you would need some examples of savings and benefits."

"If they said this is the plan [to install cavity wall insulation], I would look at it, probably favourably, if it's going to save money in the long term, as it does. But where they impose it, it's a different thing. I'd probably be a wee bit reluctant, say, if I didn't have the money to hand. I don't think it's something you can impose on people. If it's free, that's different, that's OK."

Summary

Findings from the focus groups have, in line with stakeholder interviews, reinforced the difficulty in carrying out works on communal areas of tenements. Where no formal management structure exists, managing works largely depended on a minority of residents (usually owners) taking a lead, building on social relationships between neighbours. Difficulties particularly arose in mixed tenure blocks.

Formal management structures can overcome the inertia and hassle of arranging works. However, there was a strong dislike of factoring services due to the expense, sense that they do not provide value for money, and lack of consultation. Where factoring services existed, householders tended to become more like tenants, taking less responsibility for communal areas. Householders therefore need factoring services that are trusted and carry out more consultation with residents.

Householders generally have low levels of awareness of the benefits of energy efficiency work, although they were open to discussion about costs and benefits. They generally regard insulation as an improvement (requiring near-universal agreement) rather than maintenance, and the cost of measures is also an important factor.

Overall, these findings suggest that there will be very limited demand from residents for more expensive communal energy efficiency measures, except in circumstances where there are proactive residents, trusted factors or external third parties. Further, even willing residents are often likely to lack sufficient information to take ideas forward.

[50] The attitudes expressed by these consumers are consistent with those explored in our recent research http://bit.ly/ZUIURZ

This is reiterated in the inertia residents displayed in reducing their own fuel bills.

Households need more information about energy efficiency measures, what they are (especially unusual measures), what the installation involves, and greater convincing of the benefits. This is consistent with the clear success of the UHIS approach of offering free measures and third-party support for engagement.

Photo courtesy of Energy Savings Trust

4 Conclusions and recommendations

This research has considered both the costs and benefits of different energy efficiency measures in different types of tenements, as well as the theoretical and practical approaches taken to deliver measures which require communal agreement among consumers living in tenements.

Our modelling has confirmed that different types of tenement require different measures to improve their energy efficiency. However, it is clear that the effectiveness of different measures varies depending on other measures which are already in place, or which can be installed at the same time. The modelling also shows that the range of measures needed, and their relative effectiveness, can vary significantly between flats with different positions within the same tenement block. Further, the costs and benefits of measures differ significantly between all types of tenements and the 'standard' three-bedroom semi-detached house which is used as the basis for most energy modelling.

Overall, the modelling confirms that well-understood measures like loft and cavity wall insulation and boiler upgrades can and do provide benefits for consumers, with payback periods[51] in the short to medium term. Solid wall insulation also provides significant benefits, but the high cost of installation means that payback periods are much longer.

In most types of tenement, glazing improvements deliver only limited benefits. The exceptions to this, to some extent, are pre-1919 tenement flats, which tend to have larger windows, and in which higher savings with relatively low payback times can be achieved.

Our research has also included some simple modelling as to the extent to which the Green Deal and ECO are likely to be effective in providing financial support for different measures. These initial findings raise clear concerns. Only low-cost measures like loft and cavity wall insulation will meet the Green Deal Golden Rule in most tenements at present, and the success of recent energy efficiency programmes which focused on these measures may, paradoxically, undermine the potential for Green Deal take-up.

More complex and expensive measures, such as solid wall insulation, would either require higher levels of subsidy through ECO than would be likely to be available under the current DECC modelling. Alternately, additional funding to bridge the gap would be required from either consumers or a third party such as the Scottish Government.

[51] Payback period is the time, in years, for the savings from an energy efficiency measure to equal the cost of initial installation.

While some of the modelled measures can be installed by individual consumers, others such as loft, cavity wall and external wall insulation are communal measures which require at least a majority of consumers to agree before they can be installed. Findings from the focus groups suggest that the levels of consumer interest in installing energy efficiency measures remain low.

Many consumers reported that they absorb energy cost increases or reduce their use of energy rather than seeking to improve the energy efficiency of their properties. There remains a lack of understanding of both the possible savings that can be made and the possible improvements that could be installed.

In addition, residents are unlikely to proactively push for communal measures – even those that are free – due to the perceived challenges in relation to generating consensus or upsetting neighbours.

The findings suggest, therefore, that in the absence of external support, energy efficiency improvements in flats and tenements are most likely to occur in individual properties. To support take-up, consumers appear to continue to need information about appropriate energy efficiency measures, what they are (especially unusual measures such as floor or solid wall insulation), what the installation could involve, and clearer demonstration of the benefits.

The expense of measures is clearly a barrier, and particularly for communal measures, only free or low-cost measures are likely to get installed. The introduction of the Green Deal, and consequent removal of up-front costs, could therefore provide some incentives for more households to take up measures for their own homes.[52]

However, consumers' perceptions of the benefits of measures are not always consistent with the benefits identified in the modelling. In particular, many consumers express a preference for double glazing and for new heating systems, as these are clearly recognisable measures, which are also reflected positively in housing valuations.

Overall, the research has confirmed and added depth to existing stakeholder perceptions about the issues involved in promoting energy efficiency in tenements. More positively, however, the modelling and discussions have also identified both existing good practice and a range of actions which will support consumers living in tenements to take both individual and collective action to improve the energy efficiency of their flats.

[52] Consumer Focus published a range of research exploring consumer attitudes to energy efficiency in general, and to the Green Deal in particular. All are available at http://bit.ly/xzGUWS

The recommendations which emerge from the research are set out below.

Ensuring energy efficiency programmes deliver measures and support for tenements

Local authorities and the Scottish Government should develop 'tenement action areas' to prioritise the funding of cavity wall and loft insulation in tenements through new energy efficiency programmes, levering in ECO funding where possible.

Building on existing good practice, Scottish Government energy efficiency programmes should continue to combine access to appropriate energy efficiency measures with advice and support for residents.

Previous Scottish Government energy efficiency programmes such as the UHIS[53] have successfully encouraged take-up of loft and cavity insulation in tenements. Staff time to build consensus among residents has been a critical part of the success of these programmes.

Loft and cavity insulation remain the most cost-effective measures, where appropriate. Although ECO will, in general, only fund these measures in target households or communities, properties with three or more storeys qualify for cavity wall insulation as they are classed as hard-to-treat cavities. There is therefore an opportunity to develop 'tenement action areas' to focus funding and installation activities using ECO, targeting both low income areas and areas with large numbers of three-plus storey properties.

To ensure these opportunities are realised in practice, energy efficiency programmes which cover areas including such properties should explicitly include similar levels of staff support for tenement residents. The additional costs involved in supporting this service should be seen by the Scottish Government as an investment necessary to achieve the overall aim.

Stakeholders also highlighted the longer timelines required in delivering communal improvement schemes, because of the need to engage with large numbers of people. Scottish Government funding should therefore be available over sufficient timescales to ensure that staff can be retained across financial years, in order to see complex projects from inception to completion.

[53] http://bit.ly/zVOdVk

The modelling also highlights that energy efficiency packages which include lower-cost measures can help improve access for higher-cost measures – for example, using the carbon savings from loft top-up to help subsidise boiler upgrades. A facilitation service should also encourage take-up of measures suitable for individual flats at the same time. This approach will help maximise benefits for all consumers, while also encouraging acceptance of communal measures among those who may not benefit directly from them, as would be the case for loft insulation for lower floor flat owners.

Innovative approaches towards the engagement of consumers in tenements could also be encouraged from community groups and housing associations through the Climate Challenge Fund.

Mainstream programmes delivered by local authorities will remain the most important vehicle for mass delivery of energy efficiency improvements. However, the difficulties of engaging consumers identified in the research are clear. Projects supported by the Climate Challenge Fund, such as the advice project delivered by South Seeds to tenement residents of some Glasgow communities,[54] should be used to deliver projects which can help inform and improve wider delivery.

Improving and promoting understanding of energy efficiency measures and delivery in tenements

The Scottish Government should work with local authorities, housing associations and Historic Scotland to ensure that a range of detailed and accessible case studies are available of the costs and benefits of improving energy efficiency in different types of tenement.

It is notable that solid wall insulation products successfully tested recently by Historic Scotland do not achieve the U-values required to meet ECO standards. The Scottish Government should commission further research to confirm whether these products can be used at greater thickness, so delivering the required insulation levels, while at the same time providing acceptable levels of breathability, cost and consumer acceptability.

Similarly, clearer understanding of the benefits of different approaches to improving the energy efficiency of glazing, especially in pre-1919 tenements, is needed. The assessment processes used to produce EPCs and identify Green Deal measures need to reflect research findings and, in particular, to consider the benefits of measures such as shutter restoration or secondary glazing which are suitable for listed properties or those in conservation areas.

[54] http://southseeds.org/

Both this and the previous research has highlighted the benefits for both consumers and professionals of having appropriate case studies available to inform projects. In this case, we believe that case studies should discuss social as well as technical factors, especially the approaches used to engage consumers. Where different types of solid wall insulation are used, the experience of consumers should also be covered.

DECC should ensure that the learning from both current experience and future research is reflected throughout all appropriate aspects of the Green Deal and ECO processes and, in particular, that emerging issues are included in training courses for Green Deal advisers.

Following from the recommendation above, it is critical that Green Deal and ECO assessments accurately reflect both the baseline energy running costs of tenement properties and the likely gains from energy efficiency measures. Without this, there is a high risk that consumers will either not benefit from measures to the extent suggested by modelling, or may be put off installing measures which would make savings.

The Scottish Government should discuss with DECC issues around the way communal properties are considered under the Green Deal and ECO.

Although tenements and flats form a greater proportion of housing in Scotland than in other GB countries, the issues are by no means unique to Scotland. In particular, it would be helpful if mechanisms could be developed which would allow the assessment and use of ECO for entire blocks of flats. This is needed to address the issue of the benefits of measures varying throughout a block; for example, where top floor flats could attract more ECO funding due to the larger carbon savings offered by loft insulation.

Clarifying approaches to communal measures in practice

The Scottish Government should promote and support the practical use of the Tenements Management (Scotland) Act.

In theory, the Act provides a legal framework to support owners to assist with progressing works, and the inclusion of insulation as a maintenance measure means that a majority of consumers can use the Act to improve the energy efficiency of the block overall.

However, depending on the title deeds of a specific property, the Act is not always applicable. In addition, our focus group research shows that few consumers seem at present to be aware either of this legislation, or indeed of the specifics of their own deeds. Support in utilising the Act will therefore be needed, especially since our findings suggest that consumers do still tend to view communal energy efficiency works as an improvement rather than maintenance issue.

One approach could, for example, involve the development of verbal guidance and a simple written guide that could be disseminated and distributed through channels such as local authorities and Energy Saving Scotland Advice Centres.

In addition, the Scottish Government should clarify that the intention of ministers is indeed that the Act should be used to help facilitate communal insulation upgrades, even for flats that have existing deeds covering a range of repairs. This will provide owners with more confidence to make use of the Act. As above, case studies of the use of the Act in practice would also be helpful for consumers.

The Scottish Government should investigate the extent to which improvements to the energy efficiency of flats in social housing are limited by lack of communal agreement

The Scottish Housing Regulator collates data from social landlords on the extent to which their properties meet the minimum energy efficiency levels required by the Scottish Housing Quality Standard. Although this data could, in theory, be used to identify the extent to which lack of communal agreement in multi-tenure blocks is a barrier to achieving the standard in tenements, it does not in practice provide this level of detail.

It would be helpful to explore this issue, in order to provide better data on the extent of the problem, and to help inform the development of appropriate solutions, especially since social housing is often occupied by vulnerable or disadvantaged consumers at greater risk of fuel poverty.

Consumer Futures

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