NEW FOUNDATIONS

The route to low carbon homes

MAY 2023

FORUM FOR A BETTER HOUSING MARKET NI

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The Forum for a Better Housing Market NI was established to consider the issues facing the housing market in Northern Ireland and to provide guidance on priorities and objectives.

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This research was conducted by the Research on Property and Planning Centre (RPP) at Ulster University, an internationally acclaimed inter-disciplinary research centre specialising in housing, planning, regeneration, real estate and infrastructure investment.

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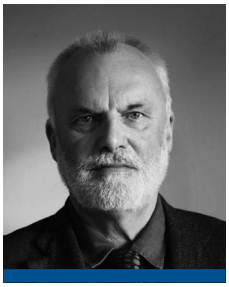
Foreword



The Forum for a Better Housing Market NI was established in June 2018 to consider the issues facing the housing market in Northern Ireland and to provide guidance on priorities and objectives. Our initial report, published in 2019, presented a series of evidence-based policy solutions to the problem of housing undersupply.

In this, our second report, the Forum addresses the pressing need to decarbonise our housing stock – which has the worst thermal performance in the UK – so that future generations in Northern Ireland might enjoy affordable living in homes that do not contribute to the escalating climate crisis.

Ulster University was commissioned to conduct an in-depth investigation, the outcomes of which form a series of evidence-based recommendations that are detailed in this report. It is our hope that these will help policymakers and sector stakeholders – including social housing providers, private developers, builders, landlords, owner occupiers and financial institutions – to deliver greater energy efficiency across all housing types and tenures.

My thanks go to Professor Martin Haran and the property research team at Ulster University and to Lloyds Banking Group, without whose support the research undertaken, and publication of this report, would not have been possible.

It has been a privilege to work with some of the most respected figures in the Northern Ireland housing sector. I would therefore like to extend special thanks to them for their support throughout the preparation of this report.

David Little BSc MBA FCIOB, *Chair*
Forum for a Better Housing Market NI

Executive Summary

This report makes a series of recommendations to aid decarbonisation of the housing sector in Northern Ireland. These include development of a single policy vision that would focus on improving energy efficiency, particularly in the worst performing homes and among the most vulnerable in society. The report also makes several suggestions to help housing associations, private developers and the wider construction value chain to overcome the very substantial challenge of delivering greater energy efficiency within the new build sector. Finally, the report determines that in order to reset attitudes and increase uptake of retrofitting among owner-occupiers, there is a need for a more diverse range of incentive-based green mortgage products and robust, impartial evidence on which to inform the design and application of green retrofit solutions.

1. Develop an Agreed Policy Framework

2. Enable Delivery

3. Improve Financial Incentives

1. DEVELOP AN AGREED POLICY FRAMEWORK

Challenges: There is no decarbonisation strategy for housing in Northern Ireland. The creation of a policy framework will need to incentivise stakeholders - including developers, construction firms, social housing providers and homeowners - to create more energy-efficient homes, while taking account of their disparate needs and the overall impact on energy consumption and greenhouse gas emissions.

Recommendations

Agree Policy

Policy needs to be agreed by all stakeholders to ensure more effective collaboration across government departments as well as supporting and enabling innovation and active mobilisation of the finance, construction and energy sectors.

Make a Plan

A single research-based vision (or roadmap) for new-build standards and the upscaling of green retrofitting is needed to support collaboration among stakeholders, ensure continuity of vision and foster commitment to net zero homes. A bespoke housing decarbonisation roadmap depicting actionable outcomes is essential if the housing and construction sectors are to invest in the necessary technical and operational upskilling.

Set Targets

Based on current carbon profiles, we recommend that 60% of homes in Northern Ireland achieve EPC band C or above by 2030. Existing stock unable to achieve EPC band C status via standard economic retrofit interventions should aim for a minimum EPC band E rating by 2030. Clear EPC or SAP targets allow optimal retrofit solutions to be designed and costed. These should be aligned with the Climate Change (Northern Ireland) Act 2022 and associated climate action plans, incorporate key milestones and annual progress reviews.

Assure Homeowners

The creation of a data hub and accredited supplier framework would give homeowners much-needed knowledge and confidence to select optimal retrofit solutions and assurance about the quality of workmanship.

Roll-out Area-Based Retrofit Solutions

Targeting high-density urban centres offers the most efficient and impactful approach to the decarbonisation of the housing sector. Area-based interventions must overcome the inherent challenges of multiple, diverse ownership interests and offer the scalability and pipeline of work needed to incentivise upscaling of retrofit capacity.

Target Least Efficient Homes

Improving homes with the lowest energy efficiency ratings has the greatest impact. For instance, a 'standard cost' improvement would, on average, increase the lower quartile EPC score in private-built housing from 44 to 61, compared with between 4 and 8 points if applied to the upper quartile.

Support the Vulnerable

Housing in the most disadvantaged areas is among the least energy efficient. Given the pronounced escalation in energy costs, households in the lower deciles will be, on average, more disadvantaged by poor quality housing stock than those in less disadvantaged areas.

Complementary Incentives

Where there is government support (at present there is no support for greener housing development or retrofits within the private housing sector in Northern Ireland) it must work in harmony with private incentives. Government-backed financial incentives should complement existing green mortgage products.

2. ENABLE DELIVERY

Challenges: Retrofitting capacity needs to double if 2030 targets are to be met. This will require an increase in recruitment and upskilling. It will also require better materials and technologies and an improvement in seamless, unobtrusive delivery coupled with greater trust of the retrofitting industry by homeowners.

Recommendations

Support Upscaling within the Social Housing Sector

The Northern Ireland Housing Executive and Housing Associations have taken the lead on decarbonisation and the retrofitting of existing stock. Social housing providers offer the greatest opportunity for scalability and impactful transition through to 2030. Housing Associations need financial support from government, in line with other parts of the UK, as well as innovative, private investment to support the strategic planning and upscaling of green retrofit interventions.

Increase Retrofitting Capacity

The construction and housing sectors need to showcase opportunities afforded by green retrofitting and invest in upskilling conventional trades, given their existing knowledge and role in ensuring the integrity and quality of the retrofit process. Conventional trades and energy efficiency experts will need to collaborate to ensure integrated, cost-sensitive solutions.

Use Integrated Energy Efficiency Models

The housing sector needs to collaborate with technology and energy experts to create holistic occupier-informed retrofit solutions. There needs to be improvements in the performance of building materials (a so-called ‘fabric first’ approach) coupled with technical solutions and changes in behaviour around energy consumption.

Improve Retrofit Delivery

Homeowners often perceive retrofitting to be intrusive and protracted. To counter this, energy efficiency practitioners, together with the construction industry need to design and deliver less intrusive, more streamlined integrated retrofit solutions. This should also be a prerequisite for upscaling retrofit in the social housing sector.

Create Accredited Supplier Framework

An unobtrusive, accredited retrofit supplier framework would boost homeowners’ often fragile confidence in the objectivity and validity of advice and in the quality of workmanship. It would also support growth of the retrofit value chain.

Ensure Valuation Guidance Accurately Accounts for Energy Efficiency

Homeowners need to have confidence that the value created by the addition of energy efficiency features is accurately reflected in the valuation of their property, whether new-build or resale.

3. IMPROVE FINANCIAL INCENTIVES

Challenges: While there is appetite among some lenders to support mortgagees to 'go green', there is also ambiguity as to what the optimal form of intervention looks like and how this might be supported financially.

Recommendations

Support Growth of Green Housing Development

Increase the provision of loans that use incentives to encourage the development of more energy-efficient homes. This would improve build-quality, reduce the cost of capital and operating costs for homeowners, all of which would benefit mortgage providers.

Revise Affordability Calculators

Mortgage lenders should enhance their 'affordability calculators' to take account of the cost benefits of an energy-efficient home.

1.0 Introduction

The housing sector accounts for about 14% of Northern Ireland's total greenhouse gas emissions.[1] Based on current retrofit levels, Northern Ireland housing stock will not comply with UK 2030 decarbonisation targets, which could potentially result in financial penalties.

Decarbonisation of homes has been much slower than anticipated and lags behind the progress being made towards Net Zero in other key sectors of the economy. Northern Ireland also lags behind other UK regions and Ireland in reducing the carbon intensity of housing stock.

A comparison of energy performance for existing homes using the Standard Assessment Procedure or SAP, reveals that Northern Ireland scored an average of 57, compared with 66 in England, 62 in Wales and 61 in Scotland respectively, as of the end of March 2021.

Progress in Northern Ireland is being impeded by a lack of clear policy direction and the absence of a market-enabling environment.

To help map out a path that will initiate and promote change, researchers at Ulster University first established the baseline position across all types of dwellings in Northern Ireland.

Subsequent modelling and interviews with major stakeholders were distilled to produce a series of recommendations designed to incentivise retrofitting across both the social and private housing sectors. The recommendations will help guide the creation of a comprehensive, effective policy that facilitates the transition of the Northern Ireland's housing sector towards net zero.

[1] Department of Agriculture, Environment and Rural Affairs (2019). Greenhouse Gas Statistics 1990-2019.

2.0 **Northern Ireland Policy Landscape**

The Climate Change Committee (CCC) has described progress in tackling decarbonisation of buildings across the UK as “very poor”. The CCC has recommended that at least 25% of heat supply in Northern Ireland should come from low carbon sources by 2030. The CCC’s Sixth Carbon Budget advice suggests an 11% reduction in total domestic energy demand and 4% removal of emissions (based on 2016 levels) in Northern Ireland by 2050[2].

To date, Northern Ireland has been the least responsive of the UK regions in terms of strategic governance and a coordinated policy response to the decarbonisation challenge for the housing sector. It is also some way behind Ireland in this regard. In response to the decarbonisation challenge, the housing sector in England and Wales introduced a Heat and Buildings Strategy in October 2021 that pledges £3.9 billion of new funding to decarbonise heat and buildings to help the UK meet its ‘net zero’ target. It will support boiler upgrades and accelerate the heat pump market. The Scottish Government’s Heat in Buildings Strategy, also published in October 2021, sets out to deliver climate change commitments, maximise economic opportunities and ensure a just transition[3]. The Welsh Government published Decarbonising the Private Housing Sector in February 2023 in which it acknowledges that owner-occupied housing represents the most complex challenge to attaining net zero housing by 2050[4].

Northern Ireland does not have a bespoke strategy or clearly defined goals and pathways aimed solely at the decarbonisation of the residential sector. Rather, Northern Ireland has a policy framework on decarbonisation that can be ‘mapped’ onto a series of relatable policies, including the Climate Change (Northern Ireland) Act 2022, the Northern Ireland Energy Strategy and the Northern Ireland Housing Supply Strategy[5]. Additionally, Building Regulations have been upgraded, effective as of June 2022. An overview of the key policies is detailed below.

The Climate Change (Northern Ireland) Act 2022

The passing of the Climate Change Bill in March 2022 represented a significant milestone for Northern Ireland in terms of tackling climate change and decarbonisation. The Act puts Northern Ireland on a par with other UK regions by putting in place the necessary legislative basis for effective target setting for the years 2030, 2040 and 2050. The Act mandates a system for reporting against targets and budgets across key sectors of the economy. Housing and construction-related activity will fall under the infrastructure sectoral plan. While specific targets and an agreed ‘action plan’ have yet to be finalised, the legislation is a crucial step in establishing the policy framework to proactively support and enable decarbonisation within the housing sector.

The Northern Ireland Energy Strategy

Published in December 2021, this strategy entitled 'The Path to Net Zero Energy,' states that up to £2.4 billion will be spent on reducing energy in housing via low-carbon heating schemes and energy efficiency measures between 2021 and 2030. The objective is to achieve energy savings of 25% from buildings and industry by 2030. To achieve this, 50,000 buildings in Northern Ireland will need to be retrofitted annually. This is more than three times the current annual retrofit rate. The new strategy provides general direction for energy efficiency improvements but does not provide a much-needed framework for implementation of such improvements.

[2] Ogunrin et al. (2022). Domestic Energy Efficiency Scenarios for Northern Ireland. https://doi.org/10.3390/en15092985

[3] Scottish Government (2021). https://www.gov.scot/publications/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings/

[4] Welsh Parliament, Climate Change, Environment and Infrastructure Committee (February 2023). https://senedd.wales/media/q3vcgmmp/cr-ld15695-e.pdf

[5] Department for the Economy (2021). Energy Strategy - Path to Net Zero Energy.

Proposals to establish a one-stop-shop to consolidate advice, guidance and support in energy-related matters and to simplify the decarbonisation journey for households is to be welcomed[6]. Such facilities are already operational in the other UK regions and in Ireland[7].

The Northern Ireland Housing Supply Strategy

Published in December 2021, the Housing Supply Strategy is a long-term framework (2022-2037) that seeks to enable transformational change across the housing sector. The strategy recognises the important role of housing provision in supporting social cohesion and economic development. It also acknowledges the urgent need to redress imbalances in housing supply, improve housing affordability and tackle homelessness. It refers to a “just transition” as we move towards carbon neutrality, while highlighting the crucial role of the housing sector in meeting overall decarbonisation targets and tackling the escalating numbers of households experiencing fuel poverty. The strategy affords a framework within which the housing sector can move forward, however there is little detail on incentives in support of retrofit programmes, particularly for homes in the private sector.

Building Regulations

To date, Northern Ireland policy and legislation has focussed predominantly on the new-build sector via the Building Regulations. For instance, on 31st December 2020, Regulation 43B (Nearly zero-energy requirements for new buildings) came into force. This will require a series a series of uplifts to our Building Regulations, designed to ‘future proof’ new-build housing stock. The first of these saw the publication of Department of Finance ‘Technical Booklet F1 - Conservation of fuel and power in dwellings’. This guidance document came into effect on 30th June 2022.

In addition, a series of local initiatives have been launched. The Belfast Climate Commission published 'A Net Zero Carbon Roadmap for Belfast', which infers that the city could close the emissions gap to net zero by 2050 by choosing cost-effective options in housing, buildings, transport and industry (Gouldson et al., 2021). Meanwhile, the advent of the Belfast Retrofit Hub aims to bring together key stakeholders from the public, private and voluntary sectors to proactively support the decarbonisation of the built environment within the city. Informed by the UK’s National Retrofit Strategy, the hub will advance a series of cross-cutting themes including retrofit, finance, compliance and standards.

[6] The Department for the Economy’s public consultation on the development of an Energy “One-Stop-Shop” for Northern Ireland closed on 31st January 2023.

[7] The Sustainable Energy Authority Ireland (SEAI) is viewed as a key enabler of improvements in the energy efficiency of housing stock and has a list of registered One-Stop-Shops that provide homeowners with a complete home energy upgrade solution.

3.0 Energy Efficiency of Northern Ireland's Housing Stock

This section of the report evaluates the energy performance of Northern Ireland's housing stock using several key databases and the Ulster University House Price Index (UUHPI). It also utilises EPC scores and looks at the various determinants of energy performance and projected CO_2 emissions from housing.

Performance Profile

The average EPC score of Northern Ireland housing stock[8] is 57 SAP points (band D). In terms of the sample distribution, the analysis indicates that 68% of EPC scores in Northern Ireland range between 41 and 73 SAP points, and that 25% of EPC scores fall below 48 SAP points. The 75th percentile has an EPC score of 69 SAP points or less, inferring that 75% of properties are below band C.

Just under 40% of the housing stock is rated below band D. More specifically, 25% fall into band E, 12% are rated band F and 1.9% are rated band G.

The remaining 60% of housing stock is rated band D or better, with 5% in band B, 22% in band C and 33% in band D.

Bands by Property Type

The average EPC scores by property type are as follows: 71 for apartment stock (band C), 55 for terrace/townhouses (band D), and 54 for semi-detached stock (band E). Detached homes exhibit the lowest average EPC score at 51 SAP points (band E).

Social housing stock has a marginally higher average EPC score (56, band D) relative to private sector housing (54, band E). There is also less variance, with 68% of the sample ranging between 44 and 68, whereas private housing ranges between 39 and 69 SAP points. The percentile analysis also shows that private housing has a greater number of EPC scores at the lower end of the distribution.

Table 1. *Standard Assessment Procedure banding parameters*

EPC Rating	*SAP Points*	*% NI housing stock*
A	*92-100*	*<1%*
B	*81-91*	*5%*
C	*69-80*	*22%*
D	*55-68*	*33%*
E	*39-54*	*25%*
F	*21-38*	*12%*
G	*1-20*	*1.9%*

[8] Ulster University House Price Index (2021) - Based on a sample of 21,433 EPC scores.

CURRENT AND POTENTIAL EPC SCORES

Potential for Improvement

Under a scenario where a hypothetical 'standard cost improvement' was applied, the potential EPC score would average 67, denoting band D. This represents a 10-point increase from the current EPC average. Under such a scenario, the variance would decrease significantly: some 68% of the housing stock would achieve EPC scores of between 57 and 77, representing either band C or band D.

Applying the standard cost improvement would increase the average EPC score in private sector housing to 65 (band D), an 11-point increase. For social housing, the standard cost improvement would result in a 13-point increase to 69 (band C).

Such improvements would reduce the volume of stock with low energy efficiency. For private sector housing, the lower quartile EPC score of 44 would increase to 61, meaning that only 25% of stock would then be below band D. This is similar for social housing.

A key finding of the research is that expenditure on improvement has less impact on housing with a higher EPC score. Application of a standard cost improvement to the upper quartile would only increase the EPC score by between four and eight points, compared with around 16 points for the lower quartile. This suggests that it would be more beneficial to apply a standard cost improvement to housing with lower EPC scores.

Link Between Property Age and Energy Efficiency

Unsurprisingly, there is a visible relationship between property age and EPC ranking. Approximately 98% of dwellings with an EPC in rating band B are newer, with only 5% of new-build stock below band B. Among older houses, the percentage of dwellings with lower EPC performance increases. Notably, no properties built before 1980 are in band B or above.

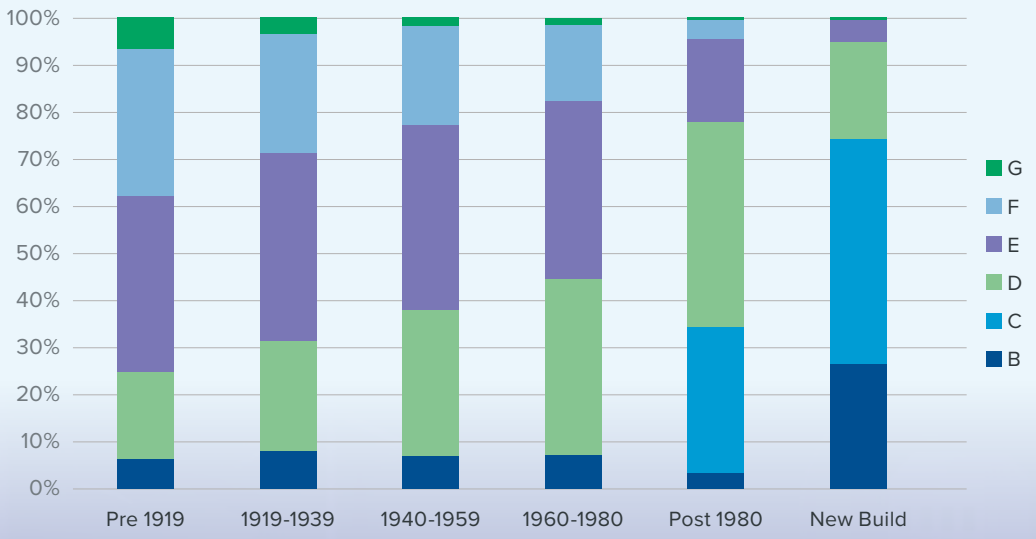
Scrutiny of EPC performance by property type shows that, on average, purpose-built apartments display the highest EPC score (70, band C), followed by post-1990 terrace/townhouse (67), post-1990 semi-detached (62) and post-1990 detached (58), all of which fall within D-rating. Pre-1919 detached properties are the least energy-efficient, exhibiting an average score of 38, or band F. The detached sector shows the poorest EPC performance across all age categories.

Table 2. *Private sector versus social housing stock EPC scores*

	Overall		Privately built		Public-built	
	EPC current	*EPC potential*	*EPC current*	*EPC potential*	*EPC current*	*EPC potential*
Number of properties	21,433	21,308	15,886	15,812	2,217	2,175
Mean score	57.02	67.20	53.87	65.24	56.37	68.76
Median score	59.00	69.00	56.00	67.00	58.00	70.00
Standard deviation	15.918	10.267	15.197	9.974	12.289	
Maximum	92.00	96	92	92	88	96
25th percentile	47.00	63.00	44.00	61.00	48.00	65.00
50th percentile	59.00	69.00	56.00	67.00	58.00	70.00
75th percentile	69.00	73.00	65.00	72.00	66.00	74.00

Source: Ulster University House Price Index

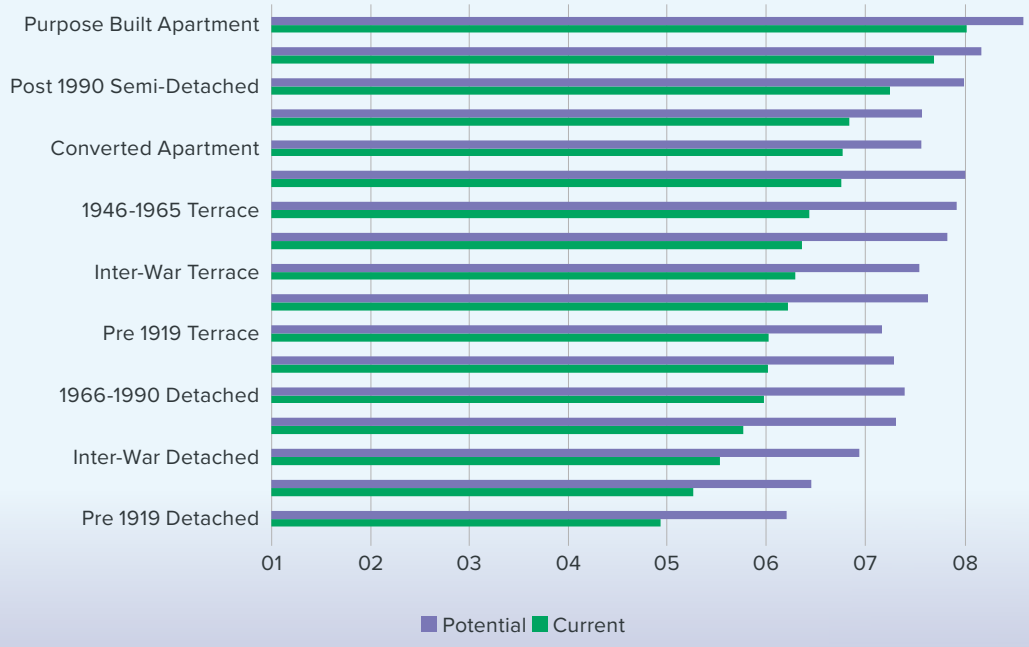
Figure 1. *EPC bands by property age*



Source: Ulster University House Price Index

It is notable that properties built after 1990 and apartments show less improvement potential based on a standard cost improvement, compared with post-war and early modern (1966-1990) stock.

Figure 2. *Current and potential EPC scores by property type*



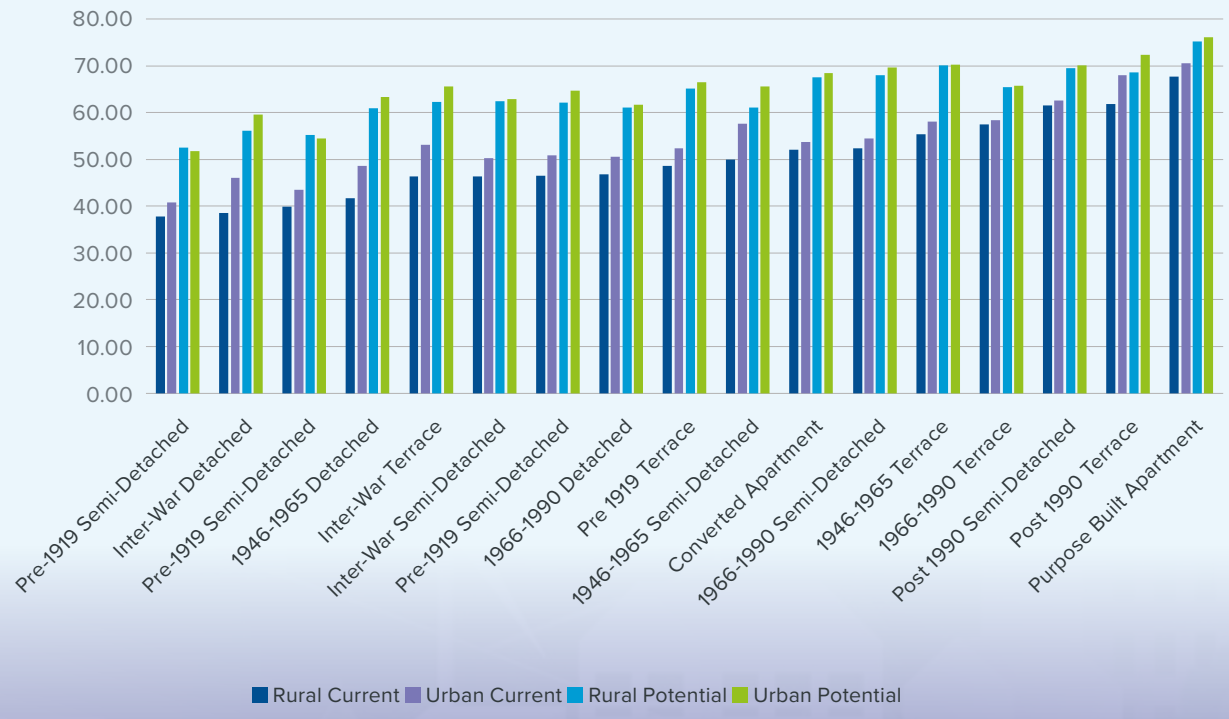
Source: Ulster University HPI Data Series

EPC by Property Type and Location

The average EPC score for bungalows is 49 (band E), while for houses it is 55 (band D). However, bungalows offer scope for greater improvement.

Rural properties show consistently lower EPC scores across property types. Inter-war detached rural properties, for example, exhibit an EPC score of 38 (band F), while their urban counterparts display an average of 46 (band E). However, analysis shows that a standard cost improvement to this type of stock would see rural properties 'catch-up' with their urban counterparts and in some instances surpass them.

Figure 3. Current and potential EPC scores by building type in rural and urban areas



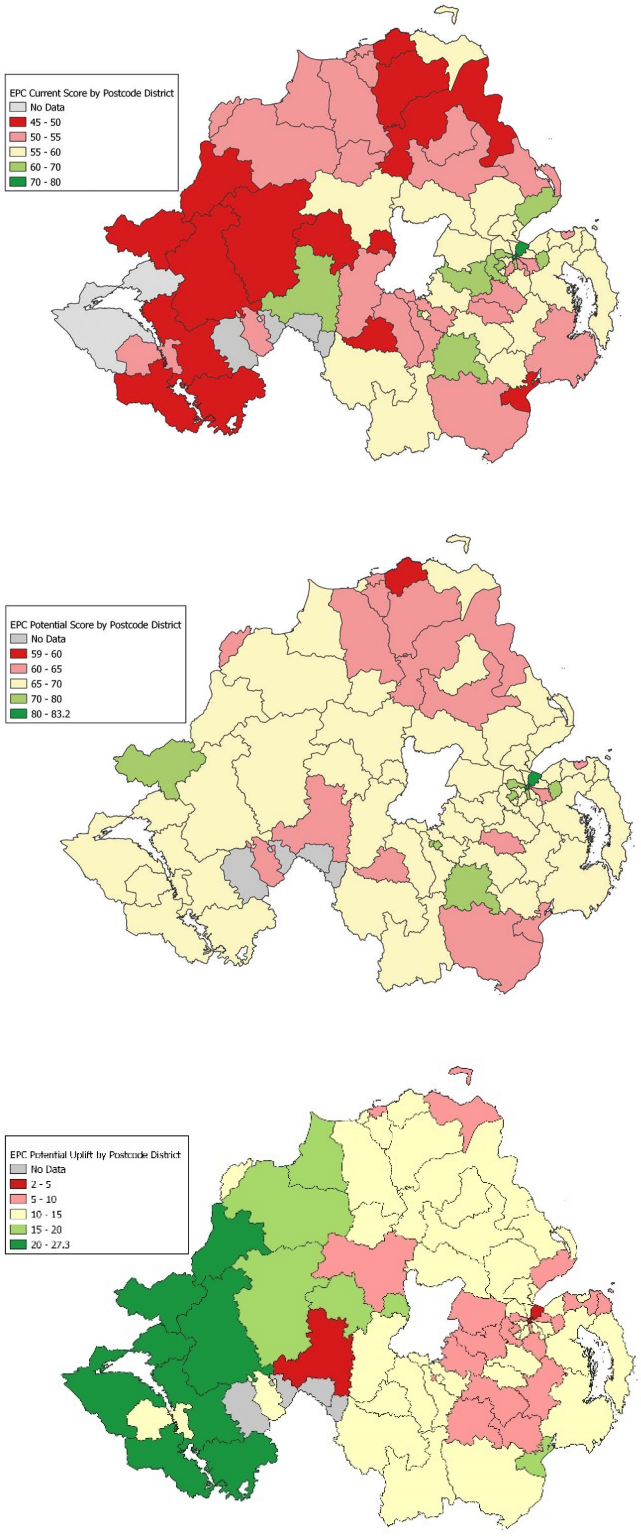
Source: Ulster University HPI Data Series

There are significant differences between rural and urban properties. On average, properties in rural areas are 148m^2, whereas those in urban areas are 114m^2. Urban properties also exhibit a lower variance (55m^2) compared with rural properties (78m^2). Larger rural properties with lower EPC scores will generally have higher C02 emissions but have the greatest potential improvement in CO_2 terms.

There are regional differences too, with less energy efficient housing located in more rural locations of the Southwest, North Coast and Mid-to-Southeast. Urban properties exhibit higher EPC scores.

Standard cost improvements would increase EPC scores and produce more uniform distribution. Notably, the potential uplift in EPC scores is most prominent in the West and particularly the Southwest.

Figure 4. *Geographic distribution of EPC scores and potential improvement*



Source: Ulster University HPI Data Series

[9] See full regression models in the technical annex.

Modelling EPCs in the Northern Ireland Housing Market

To investigate whether there are statistically significant determinants of EPC scores and whether there is a relationship between EPCs and deprivation, we constructed two analytical EPC models[9].

The findings indicate that houses located in either the most advantaged (decile 9 or 10) or disadvantaged areas (decile 2 or 3) appeared to display lower EPC scores. This suggests that in the lowest decile (highest disadvantage) there may be less capacity to retrofit or improve/upgrade the energy efficiency of the housing, whereas in the highest decile (lowest disadvantage) the low EPC ratings may be driven more by the tendency to reside in older, larger and more traditional detached housing.

Unsurprisingly, building age exhibits a negative relationship with EPC score. On average, a 10-year increase in the age of housing tends to decrease the EPC score by 4.7%. Our regression results also indicate that houses that are poorly maintained and/or poorly repaired have an average EPC score that is 13.3% lower than that of a typical well-maintained house.

Furthermore, the EPC scores of social housing are, on average, 3.1% higher than privately-built housing, suggesting that the public sector has either retrofitted more or constructed more energy-efficient housing.

In terms of housing type, purpose-built apartments have higher EPC scores, with an average EPC score 15.7% above that of a typical home in Northern Ireland, while converted apartments' scores are 7.1% higher. Both chalet-style housing and semi-detached housing are also higher at 5.4% and 3.9%, respectively. In contrast, bungalows display a negative coefficient of 3.1%, signalling that, on average, they have lower EPC scores.

Lastly, the size of housing has a negative effect, with a 10 meter-square increase depressing the EPC by 0.2%.

EPC Scores Under Improvement Scenarios

It was observed that building age, while still having a negative effect on the potential EPC, is reduced in magnitude under a standard cost upgrade scenario, so that a 10-year increase in the age of housing only decreases the EPC score by approximately 1% compared with 4.7% previously identified.

Consistent with current EPC ratings, rural location has a negative impact, however the coefficient is reduced to 1.8%. This implies that rural homes would be closer to urban homes in terms of energy efficiency if they adopted a standard-cost upgrade.

There was a similar finding for the private sector housing coefficient which, though still negative, was reduced in magnitude, suggesting that a standard improvement would bring these properties closer to social housing.

In line with current EPC scores, purpose-built apartments were found to be the most energy-efficient after an upgrade. There would be a limited change in semi-detached housing, however bungalows saw a low negative effect, which suggests that, on average, their EPC rating would be 0.3 % lower than typical housing.

Lastly, the size of dwelling has a negative association with potential EPC. Specifically, a 10 square metre increase tends to statistically depress the EPC score by 0.1%, confirming that, on average, larger dwellings are less energy efficient even when considered within the standard cost improvement scenario.

Energy Performance in the Rental Market

The average EPC score among a sample of 9,645 rental properties is 58 (band D), which is slightly higher than in the owner-occupied sector. Approximately 3% of rental stock has an average EPC score of 83 (band B) and above, with 23% having an average score of 74 (band C) and above.

The largest percentage of rental stock (35%) falls within band D. Approximately 27% of rental stock falls into band E. Further down the scale, band F constitutes 11% of the stock, while 1% of rental market stock falls into band G.

With respect to property type, the average EPC score for rental apartments is 69 (band C). Scores for both terrace and semi-detached properties fall within band E, on average, at 54 and 53, respectively. Detached housing has the lowest average score of 50 (band E).

In terms of property age, new-build housing displays an average score of 81 (band B) with post-1980 stock showing an average of 68 (band D). An interesting finding is that pre-1919 properties exhibit an EPC score of 67 (band D), which is higher than those constructed in the interwar and post-war periods, which have average EPC scores of 58 and 55 (band D), respectively.

The Northern Ireland Assembly has backed a new law which sets a minimum Energy Performance Certificate (EPC) rating for landlords hoping to rent their properties in Northern Ireland. While the parameters and timeline have yet to be announced, it is anticipated that the minimum standards would seek to position Northern Ireland on an equal footing with England and Wales, who will set to introduce minimum B and C EPC ratings for new tenancies from 2025. The Northern Ireland Bill has now passed to Royal Assent and a schedule for implementation is to be announced[10]. The regulatory framework to govern energy efficiency within the Private Rented Sector has been laid out in the Private Tenancies Act (Northern Ireland) 2022.

Summary of Key Points

- Northern Ireland residential energy performance is lagging behind other UK regions. The average EPC rating falls within EPC band D and approximately three quarters of properties are below band C.
- Our findings show that applying a ‘standard cost’ improvement would substantially improve the energy performance of the Northern Ireland housing stock, although this would not be sufficient on its own to reach passive or net-zero targets. Under such a scenario, EPC scores would be on average 10 points higher than at present, placing the average at the top end of band D and marginally below band C.
- The findings show that detached properties, and specifically detached bungalows in rural areas, are the worst performing. This is due to their age, construction type and larger size. The analysis indicates that these properties have the greatest potential for improvement, although the logistics and costs of such an approach would be much greater than a targeted place-based retrofit roll-out within high-density urban areas.
- Energy efficiency is worse in properties in the lowest and highest deciles of deprivation. For the most deprived, this is more likely to be due to older, poorer quality stock, while for the least deprived, this is more likely to reflect older, larger detached properties with value-enhancing features such as high ceilings and occupiers who place less emphasis on reducing operational costs.

[10] https://rsua.org.uk/new-bill-sets-minimum-energy-efficiency-for-renters/

4.0 Estimating $C0_2$ Emissions from Northern Ireland Housing Stock

There was a 21% reduction in residential greenhouse gas emissions from 1990 to 2019, however this was much less than the reduction in emissions achieved by a number of other key sectors of the economy over the same period[11].

That said, over an eight-year period, from 2012, average residential emissions in Northern Ireland fell from a long-term average of 80,303 $ktCO_2e$ per year to 70,430 $ktCO_2e$, representing a 12.3% reduction. Emissions have fallen further to 67,687 $ktCO_2e$ in 2019, a 15.7% reduction relative to the long-term annual average in 2015.

Emissions from residential properties accounted for 12.8% of total greenhouse gas emissions in Northern Ireland between 1990 and 2019. Over a more recent four-year period, from 2016, this average increased to 14.6%, despite a decline in residential emissions over the same period[12].

To estimate CO_2 emissions across the residential sector, we used 106,895 observations, approximately 14% of the Northern Ireland housing stock. These were then applied to the remainder of the housing stock (a further 700,000 properties), except for new-build properties. The volume of emissions was determined by creating a discrete energy assessment of CO_2 (kilogram) per metre squared per annum (CO_2 kg m^2 pa) per property[13]. This was then modelled with current EPCs and 'potential' EPCs under a best cost-effective improvement scenario.

The findings show that rural properties, on average, are the poorest in terms of energy performance and have the most to gain by improving performance. The core urban areas appear to be the best or 'greenest' in terms of CO_2Kgm^2pa when accounting for property size.

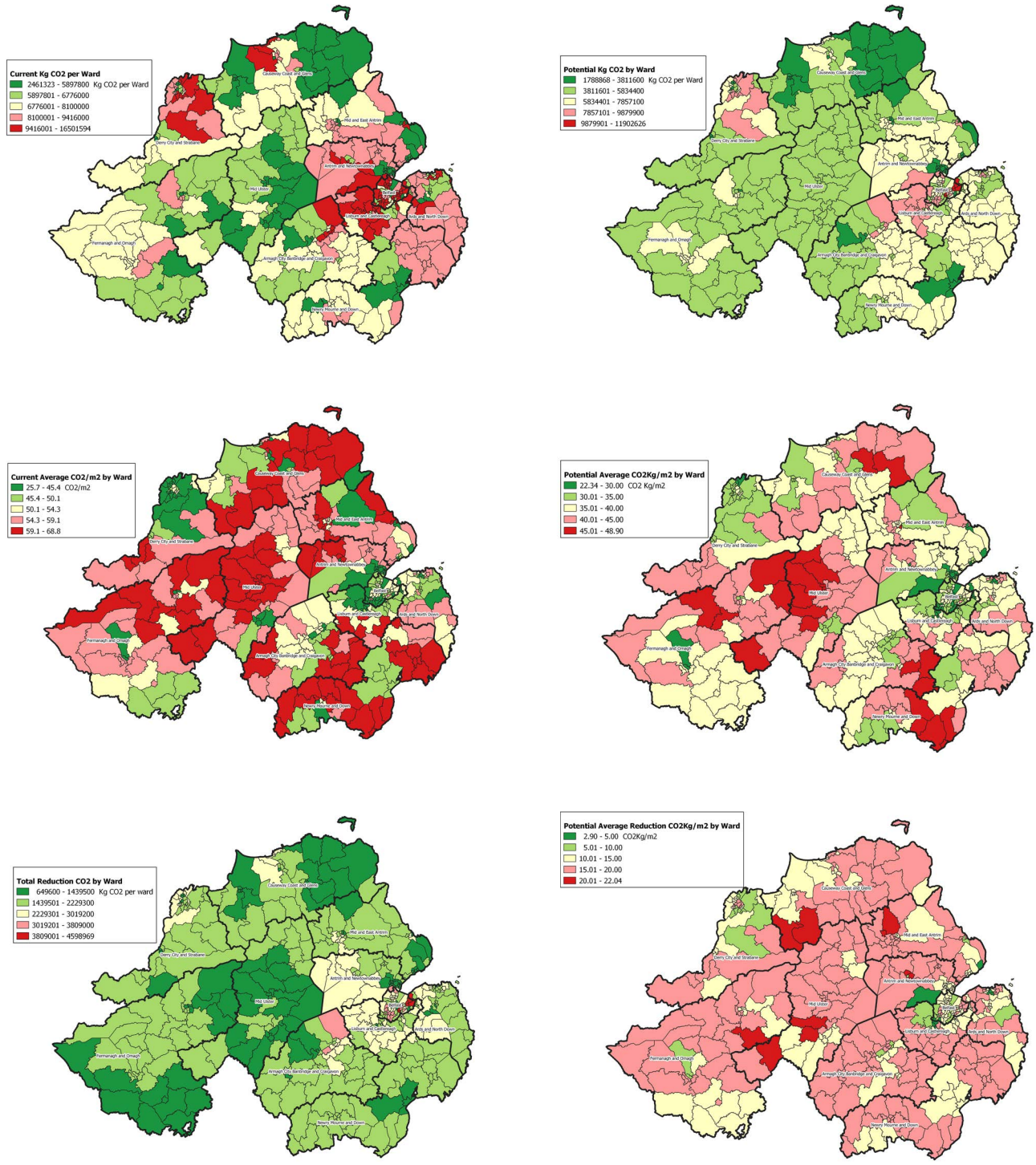
The analysis clearly identifies a difference between areas that consume a lot of energy (urban areas) and areas with properties that consume a lot of energy (rural areas), and indeed highlight where improvement can be best targeted. The research advocates the need for a range of retrofit pathways with clear advantages to undertaking area-based improvements within high-density urban areas. In rural areas, most retrofit activity will be undertaken on a property-by-property basis, with rural properties in the main gaining the greatest uplift from a standard retrofit intervention.

[11] National Atmospheric Emissions Inventory (2020).

[12] Department of Agriculture, Environment and Rural Affairs (2021). Northern Ireland greenhouse gas statistics 1990-2019.

[13] This metric applies to the actual measured area (in m^2) for each property to produce a robust $CO_2Kgm^2p.a.$ estimate.

Figure 5. *Energy performance total $CO_2Kgm^2p.a.$ p/m^2* [14]



Source: Ulster University House Price Index

[14] Ulster University House Price Index – Based on data sample 2019-2021.

5.0 **Retrofitting Existing Housing Stock**

Decarbonisation of the housing sector in Northern Ireland has predominantly focused on the new-build sector. However, meaningful progress towards the UK's stated carbon reduction targets will require a substantial increase in the number of properties that are retrofitted. This presents a complex challenge, but could have a major impact in terms of reducing greenhouse gas emissions.

Interviewees from the construction and energy sectors contributing to this investigation advocated the need for a 'fabric first' approach, which would improve the insulation of existing buildings and enhance airtightness, thereby reducing the level of energy consumption. Alongside measures to improve the energy efficiency of existing homes is the need to decarbonise heating systems. Heat pumps, PV panels and hydrogen-based heating systems were highlighted as potential retrofit solutions based on experiences from other UK regions and the Republic of Ireland.

An average of 16,500 units are retrofitted in Northern Ireland every year[15]. To put this into context, the Climate Change Committee's Sixth Carbon Budget advice suggests an 11% reduction in total domestic energy demand and a 4% removal of emissions (based on 2016 levels) is needed in Northern Ireland by 2050[16]. This can be achieved if 'fabric first' retrofit measures are implemented in 410,000 existing dwellings (including fuel-poor households) in Northern Ireland by 2050. A significant increase in retrofitting capacity in Northern Ireland therefore will be required, together with a focus on measures to address dwellings in the more problematic homeownership and private rented sectors.

Retrofit Cost Modelling and Projections

The Northern Ireland Housing Executive (NIHE) calculates that the cost of improving the energy efficiency of the poorest performing 23,200 dwellings (those rated G) to band E via a 'fabric first' approach would cost £86 million, equating to about £3,700 per unit[17]. This NIHE study was specifically focused on calculating the costs of uplifting the poorest performing housing stock. However, upgrading to SAP rating E would not be sufficient to comply with carbon reduction targets. Retaining so many SAP E-rated units within the overall housing portfolio would represent a much less ambitious commitment than in other UK regions.

In a more recent report, published in 2021, NIHE calculates that the total cost of improving the approximately 390,000 eligible dwellings in Northern Ireland to at least band C would be £2.4 billion[18]. This equates to an average cost of £6,200 per dwelling. Improving their energy performance rating to band C would provide annual average energy cost savings per unit of £500 per year and CO_2 savings of 3.2 tonne per year, with an increase in the average Standard Assessment Procedure (SAP) rating of 14.

[15] Arup (2020) Research into the Future of Energy Efficiency Policy in Northern Ireland.

[16] Ogunrin et al. (2022). Domestic Energy Efficiency Scenarios for Northern Ireland. https://doi.org/10.3390/en15092985

[17] https://www.nihe.gov.uk/Documents/Research/HCS-2016-Additional-Reports/Cost-to-improve-SAP-rating-of-NI-dwellings.aspx

[18] NIHE (2021). https://www.nihe.gov.uk/Documents/Research/Single-Downloads/Cost-of-carbon-savings-in-NI housing.aspx?ext=.#:~:text=The%20total%20cost%20to%20improve,of%20%C2%A36%2C200%20per%20dwelling.

The report also looked at improving 586,000 eligible dwellings in Northern Ireland to at least band B and found that the cost would be £9.2 billion, at an average cost of £15,600 per dwelling. Improving the EPC rating to band B would provide average energy cost savings per unit of £700 per year and CO_2 savings of 3.7 tonnes per year, with an average SAP rating increase of 18.

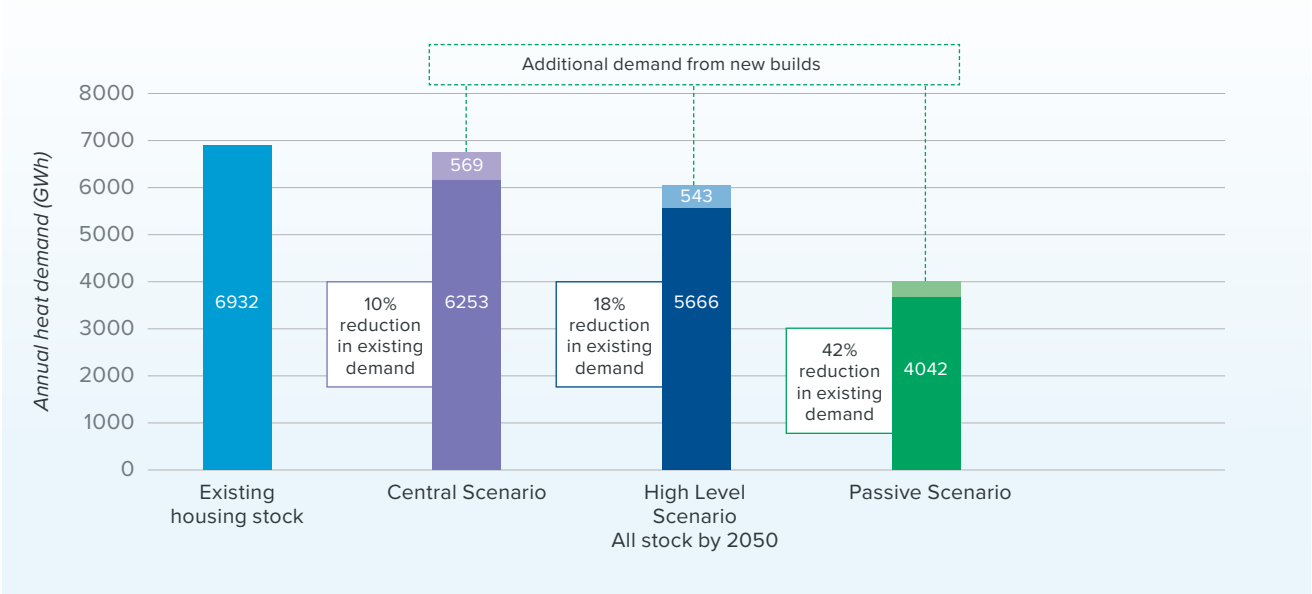
Generally, traditional improvement measures, such as installing fabric insulation and upgrading heating systems, would be sufficient to improve dwellings to an EPC band C. To reach the target band B threshold, however, further measures would be required in most cases. Specifically, the installation of PV panels would be essential in improving a significant proportion of the stock to a band B, which contributes to the higher cost estimate.

In 2020, civil engineering firm Arup completed a detailed review of energy efficiency policy in Northern Ireland on behalf of the Department for the Economy to inform a new energy strategy. The Arup report suggests that Northern Ireland must dramatically upscale domestic retrofits, from the current rate of 16,500 per year to 30,000. This is the minimum required to meet the UK Government's target to reduce UK emissions by at least 68% by 2030, compared with 1990 levels. To meet the 2050 'net zero' commitments, it is estimated that policies would need to drive retrofits to more than 50,000 per year within the next decade. The Arup report also details the need for deeper levels of retrofit, with scenario modelling indicating peak annual energy savings that are 14 times higher than the historic figures. The study does not detail how retrofitting can be delivered.

Recent research by Ulster University's Centre for Sustainable Technologies (CST) has attempted to advance understanding of retrofit solutions, associated costings and uplift potential. The research takes account of different archetype profiles and floor areas of existing housing stock and proffers three retrofit intervention scenarios, each of which has a base year of 2018 and is aligned to the UK's 2050 carbon reduction targets.

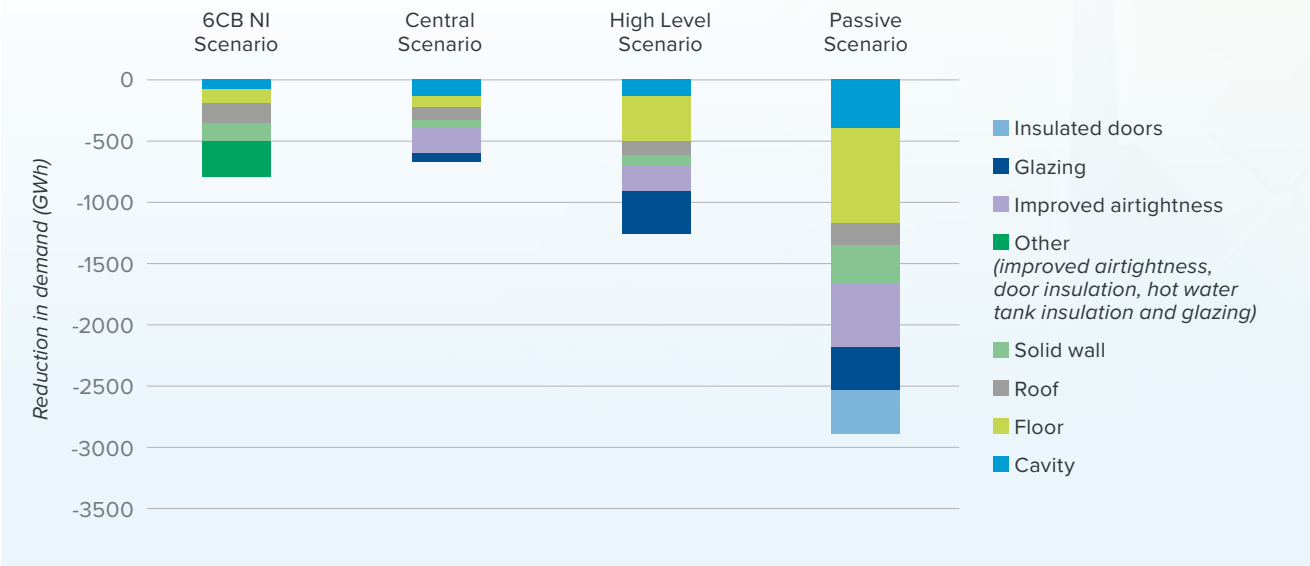
The first of these is the Central Scenario, which is aligned with the Committee for Climate Change's Sixth Carbon Budget Balanced Pathway Scenario. It represents a modest and balanced pathway for domestic retrofit, premised on existing building regulations. The second, the High-Level Scenario, requires that all 2018 baseline stock needing any of the five basic retrofit strategies (wall insulation, floor insulation, loft insulation and double glazing) is retrofitted by 2050. This includes replacing all single and pre-2006 double glazing with triple glazing. The final scenario, Passive, includes all the above measures and a requirement that all retrofitted dwellings also have external door insulation installed.

Figure 6. *Overall heat demand reduction across all scenarios*



Source: Ulster University, Centre for Sustainable Technologies.

Figure 7. *Retrofit measures contributing to heat demand reductions across all scenarios*



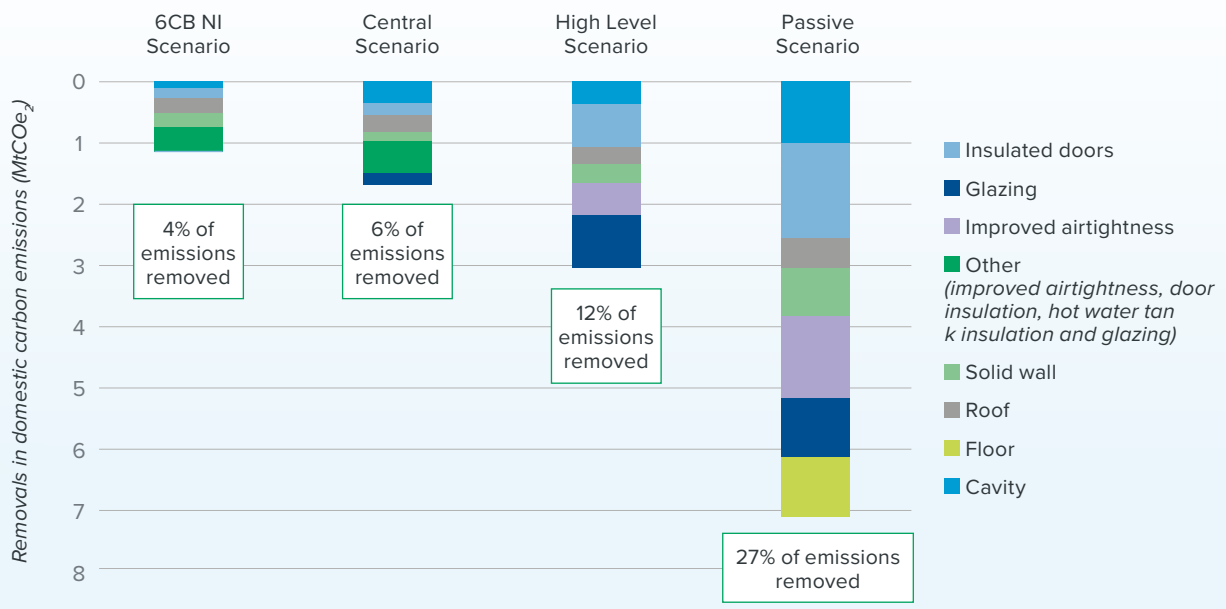
Source: Ulster University, Centre for Sustainable Technologies.

In the **Central Scenario**, there would be an overall 10% reduction in heat demand for existing housing stock through to 2050. The highest changes in demand would accrue from improved air tightness (almost all existing stock is recommended to improve air tightness). Under this scenario, 6% of domestic carbon emissions would be removed by 2050 with the greatest reductions coming from improving airtightness, cavity wall insulation and topping-up loft insulation.

Under the **High-Level Scenario**, there would be an overall 18% reduction in heat demand from existing dwellings through to 2050. The highest changes in demand would be derived through solid floor insulation, triple glazing improvements and improved air tightness. Under this scenario, 12% of domestic carbon emissions would be removed by 2050.

The **Passive Scenario** would result in a 42% reduction in heat demand from existing housing stock through to 2050. The greatest changes in demand would be derived through solid floor insulation, enhanced cavity wall insulation and improved air tightness. This would remove 27% of domestic carbon emissions by 2050.

Figure 8. *Reductions in carbon emissions across all scenarios*



Source: Ulster University, Centre for Sustainable Technologies.

Cost Modelling the Three CST Scenarios

The Central Scenario would cost approximately £2 billion to implement. Cavity wall insulation, upgrading pre-2006 to post-2006 double glazing and solid floor insulation would be the costliest measures to implement.

The average cost of retrofit across all house types under the Central Scenario is £3,700, which is line with previous calculations from NIHE. Bungalows (£5,500 each) and flats/apartments (£1,900 each) would be the most and least expensive house types to retrofit. Although detached houses have the largest floor area, bungalows have the highest cost per square metre because they occupy more land.

Table 3. *Summary of CST Scenario Outcomes*

	Central	*High-Level*	*Passive*
Reduction in heat demand	*10%*	*18%*	*42%*
Reduction in carbon emissions	*6%*	*12%*	*27%*
Overall cost	*£2.0bn*	*£5.9bn*	*£10.7bn*
Projected average cost per unit	*£3.7k*	*£4.5k*	*£38,000k*
Price range	*£1.9k - £5.5k*	*£2k - £7k*	*£6k - £15k*

Note. The projections are based on a 2018 baseline and projections through to 2050.

6.0 Upscaling Green Retrofit Solutions: Industry Perspective

Interviews suggest there is a knowledge gap on the delivery side. Discussions with retrofit experts, for example, show that there is limited knowledge about how to translate information about PV generation capacity and battery efficiency accurately into 'real' savings.

They also reveal that there is acceptance that there can be divergence between the modelled scenario and the operational reality, and that it is not yet possible to provide bespoke household-level savings.

Knowledge Gap

Robust scientific research is needed to inform policy and guide the roll-out and upscaling of green retrofitting. A suite of retrofit models will need to be developed to reflect the diverse nature of the challenge and the contrasting approaches needed in rural and urban areas to optimise impact and support upscaling within the construction sector. A housing decarbonisation roadmap would support collaboration across stakeholder groupings, ensure continuity of vision and commitment to targets and associated milestones contained within the roadmap. The housing and construction sectors need to see a clear policy commitment and associated work pipeline in order to invest in the necessary technical and operational upskilling.

Skills Gap

The construction sector has a skills gap when it comes to addressing decarbonisation. There has been sustained underinvestment in training and apprenticeships, with perhaps an overemphasis on higher education qualifications. The COVID pandemic has also had an impact on the sector in terms of scalability, while the high age profile of the sector remains a concern. To address these challenges, the sector needs to highlight opportunities that the decarbonisation agenda presents.

Decarbonisation will require integration of existing and new skills, which might serve to broaden the appeal of the sector outside the more conventional entry routes. There have been concerted efforts to achieve this, but scope remains for greater innovation, both in creation of job opportunities and in how the sector promotes itself to future generations.

Government in Northern Ireland needs to do more to promote skills, to support apprenticeships and to support wage parity relative to the skills base. There is a need to train future generations to be multi-skilled rather than becoming 'specialists' in niche areas as this would support more effective resourcing across the more technical areas of retrofitting. There also needs to be greater opportunity for reskilling among older people from other sectors of industry.

Enhancing Service Provision

A major barrier to the 'fabric first' approach is inconvenience to the homeowner. Fully upgrading a property is expensive and can be messy and protracted. The challenge for the construction sector is to make retrofitting 'scalable' and more customer orientated.

The HEAT business model[19] is an example of an attempt to make the retrofit process more appealing. By improving planning and collaboration between trade operatives, it can reduce heating system replacement time from two days to just one. This model highlights the need for the construction and energy efficiency sectors to work collaboratively, to enhance quality-of-service and to focus on the needs and expectations of homeowners.

While conventional 'wet' trades will continue to occupy an integral role in the retrofitting of the housing sector, energy and engineering professionals will need to contribute knowledge and innovation both in terms of process and technical capacity. Some interviewees inferred that the construction sector has a reputation for failing to embrace technical innovation or to revolutionise working practices. While this criticism cannot be justified across the entire sector, interviews with developers suggested that contractors are often discouraged from applying innovative techniques because of the procurement and contractual process. Clients in the main, when pushed, tend to opt for 'tried and trusted' delivery models, they said. A culture that nurtures and supports innovation needs to be fostered within the value chain, and that includes the client (in many cases the government) via the procurement process.

[19] The HEAT model refers to planning and collaboration across the value chain to ensure all 'trades' collaborate and align to create efficiency on the contractor side.

7.0 Upscaling Green Retrofit Solutions: The Homeowner's Perspective

There is a clear commitment amongst housing associations to decarbonise. NIHE has also embraced the low carbon agenda and has commissioned a series of pilot projects to improve understanding of the benefits of energy efficiency retrofits.

However, among homeowners and in the private rental sector the challenge is more complex, owing to the diverse range of ownership and varying degrees of willingness and capacity to reduce carbon intensity.

Knowledge Gap

The knowledge gap pertaining to decarbonisation of housing stock is twofold. First, there is a lack of data about homeowners and landlords, both private and social. Secondly, there is a need for pilot studies to generate robust information about associated savings and accurate payback periods that could be used to inform investment decisions.

The current spike in energy prices has meant that energy costs and efficiency is uppermost in the minds of homeowners. Equally, in the social and private rental sectors, there are heightened tenant concerns about energy costs and expectations related to efficiency.

While not perfect, Energy Performance Certificate (EPC) scores are the most widely used and understood measure of energy efficiency and carbon profiling. Clearly defined targets sharpen focus but also showcase the magnitude of the challenge and the need for prompt action. These should include achieving EPC Grade B or above for at least 60% of all housing stock by 2030.

There is also a need to develop guidance on how consumers can reduce energy consumption. In Scotland, for example, Home Energy Scotland and Resource Efficient Scotland provide free, impartial advice to property owners, including on energy saving behaviours such as heating system management.

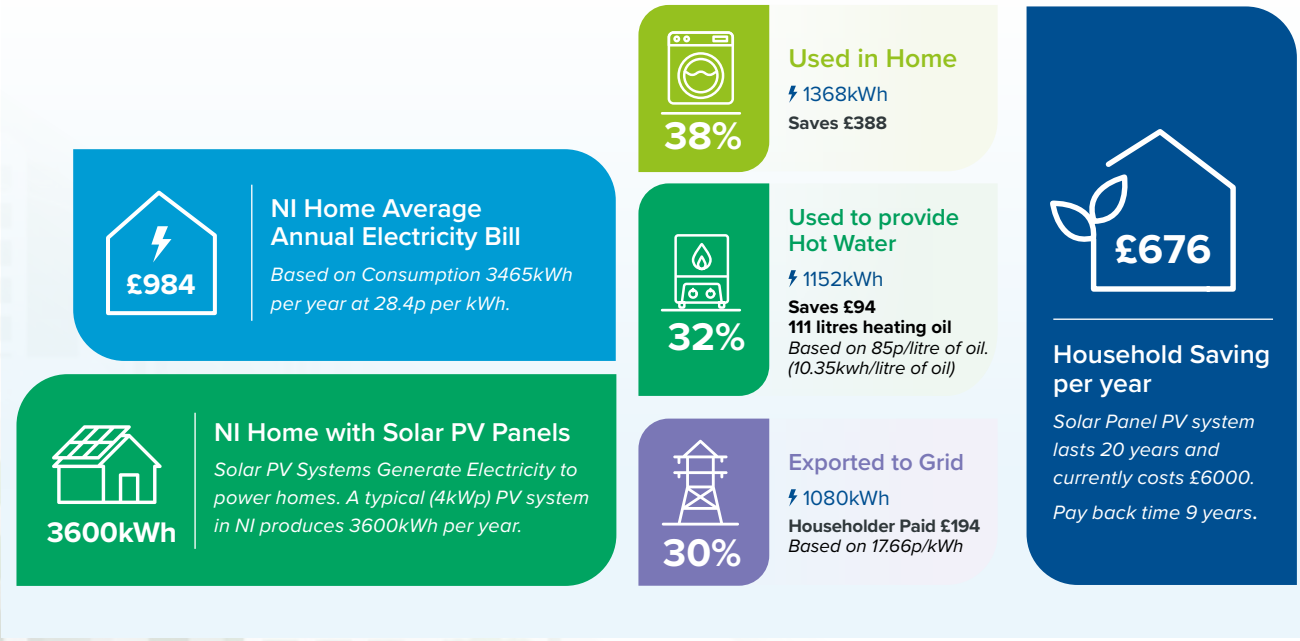
Inflation Boosts Case for Green Retrofitting

Despite recent inflation in the cost of construction materials, the cost of solar PV panels has fallen in real terms over the last five years. The price of a 4kWp PV system is currently around £6000 while their efficiency has also improved over this period.

The spike in energy prices had promoted the average payback period on PV panes to fall from 8-9 years five years ago to 4-5 years. Nonetheless, government electricity subsidy has brought the price per kWh down to 28.4p. This has resulted in the payback period for PV panel systems moving back to 9 years.

Our research has shown that there is scepticism amongst homeowners as to objectivity and validity of advice being offered on retrofit solutions. There is also a major 'trust' issue to be addressed centred on the quality of workmanship. It is imperative that retrofit works including, those supported by any forms of government funding going forward are undertaken by suitably qualified professionals and that all work is validated at key stages of implementation and upon completion. The presence of an unobtrusive accredited supplier framework would heighten consumer confidence and support growth of the retrofit value chain.

Figure 9. *Solar PV Panels Household Electricity Savings*



Source: MacIntyre, S., McCord, M., Davis, P. and Zacharopoulos, A. (2023) Residential PV Panel Performance. Publication forthcoming.

Green Mortgage Market Provision

The financial services sector could help to drive decarbonisation in Northern Ireland. At a corporate level, lenders are reviewing the overall carbon profile of their lending books as a basis for reform. Interviewees highlighted that the transition to 'net zero' for the financial services sector has two primary dimensions.

First, there is the need to 'green' the organisation itself by placing sustainability at the centre of the corporate plan and ensuring that governance and procedure are fully aligned.

"The banking sector needs to take the lead on decarbonisation – we cannot advocate and encourage our corporate customer base and our mortgagees to 'go green' if we, as an organisation, are not actively committed to decarbonisation ourselves" – Danske Bank spokesperson

Secondly, financial institutions have a vested interest in the energy-efficiency and carbon-intensity of the housing stock on their books. This has assumed heightened prominence in the last three years. While there is appetite among lenders to support mortgagees to 'go green', there is also ambiguity as to what the optimal form of intervention looks like and how this can be supported financially.

Lenders are also having to consider climate change and the increased frequency and intensity of extreme weather events. It is apparent that most have increased their due diligence on climate-related risk to buildings and are more aware of risk factors associated with the decarbonisation agenda.

While most mortgage providers do not have any 'specified' restrictions around lending on homes with poor energy efficiency ratings, their products are increasingly incentivised towards energy-efficient assets.

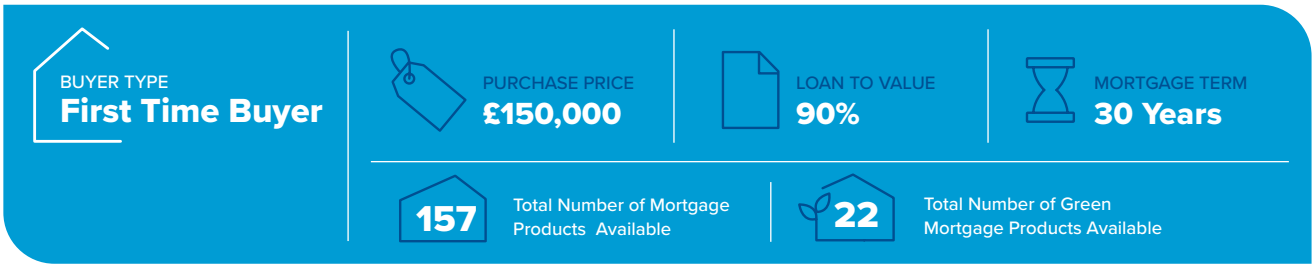
To better understand the carbon intensity of their mortgage loan books, banks are stress testing using EPC data, which they acknowledge is not perfect but is, at present, the most accurate proxy. In addition, they are carrying out valuation-based variance testing premised on existing EPC scores. As the EPC profile of a property has the potential to compromise the loan-to-value ratio, it is conceivable that poor performing stock could breech the terms of the loan.

Some banks are offering green mortgage products to more efficient homes. The number of lenders offering 'green' mortgages increased from eight to ten over the course of 2022. However, several interviewees suggested that many green mortgage products are in essence 'green wash'. Indeed, exploration of the mortgage market would seem to suggest that some of the 'favourable' mortgage rates being offered for 'greener' homes are not much more favourable than standard mortgage products (see Figures 10, 11, 12 and 13).

Figure 10. *Overview of the mortgage market landscape*

Source: PropertyPal Green Mortgage Market Research (November, 2022).

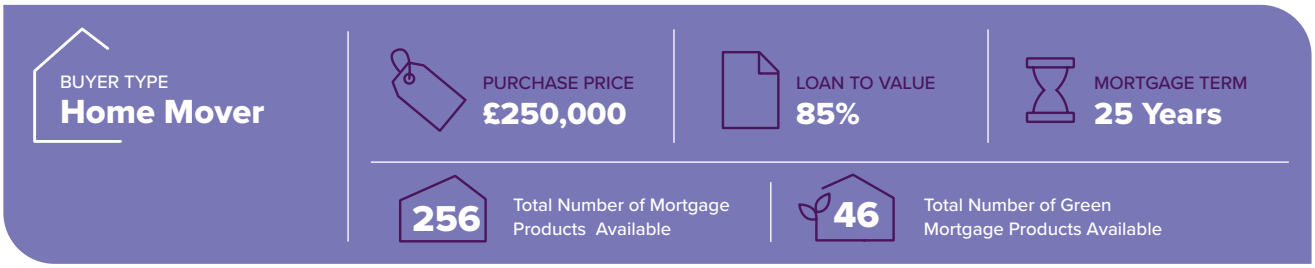
Figure 11. *Scenario 1, first time buyer*[20]



LENDER	CHEAPEST GREEN MORTGAGE	CHEAPEST NON-GREEN MORTGAGE	GREEN PRODUCT SAVING WITH THAT LENDER*
PROGRESSIVE BUILDING SOCIETY	4.59% | £697.99 2 YEAR DISCOUNT	4.68% | £705.35 2 YEAR DISCOUNT	£7.36 pm
Leeds Building Society	5.44% | £766.61 5 YEAR FIXED	5.54% | £775.13 5 YEAR FIXED	£8.52 pm
AIB	5.59% | £781.11 5 YEAR FIXED £500 CASHBACK	5.69% | £790.38 5 YEAR FIXED	£17.60 pm

Source: PropertyPal Green Mortgage Market Research (November, 2022).
**Including the value of the cashback calculated on a monthly basis over deal period.*

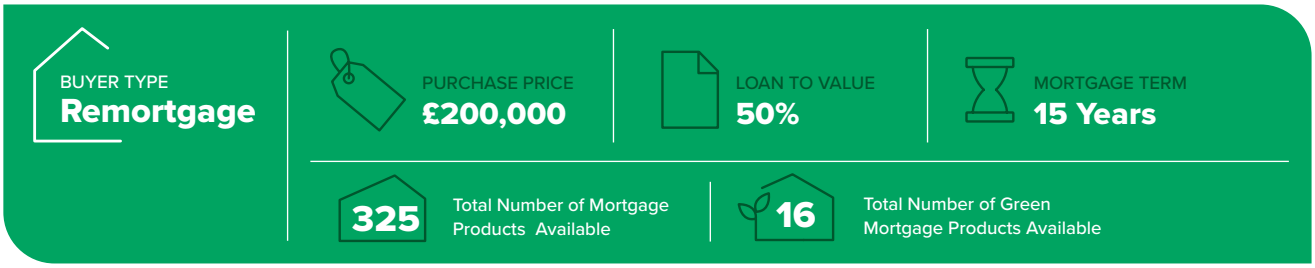
Figure 12. *Scenario 2, home mover*[21]



LENDER	CHEAPEST GREEN MORTGAGE	CHEAPEST NON-GREEN MORTGAGE	GREEN PRODUCT SAVING WITH THAT LENDER*
PROGRESSIVE BUILDING SOCIETY	3.83% | £1113.27 2 YEAR DISCOUNT	3.93% | £1125.17 2 YEAR DISCOUNT	£11.90 pm
AIB	4.15% | £1151.59 2 YEAR DISCOUNT	4.14% | £1150.38 2 YEAR DISCOUNT	-£1.26 pm
Virgin money	5.24% | £1278.10 5 YEAR FIXED £300 CASHBACK	5.29% | £1284.41 5 YEAR FIXED £300 CASHBACK	£6.31 pm

Source: PropertyPal Green Mortgage Market Research (November, 2022).
**Including the value of the cashback calculated on a monthly basis over deal period.*

Figure 13. *Scenario 3, remortgage*[22]



LENDER	CHEAPEST GREEN MORTGAGE	CHEAPEST NON-GREEN MORTGAGE	GREEN PRODUCT SAVING WITH THAT LENDER*
NatWest	5.37% | £818.26 5 YEAR FIXED	5.24% | £823.48 5 YEAR FIXED	£5.22 pm
AIB	5.54% | £828.58 5 YEAR FIXED	5.54% | £830.10 5 YEAR FIXED	£9.85 pm
Kensington	6.02% | £843.68 5 YEAR FIXED £500 CASHBACK	6.02% | £843.68 5 YEAR FIXED £400 CASHBACK	£1.67 pm

Source: PropertyPal Green Mortgage Market Research (November, 2022).
**Including the value of the cashback calculated on a monthly basis over deal period.*

Integrating Energy Savings into Mortgage Affordability Decisions

Interviewees highlighted the need for cost savings attained by more energy efficient homes to be factored into lenders' decision-making processes. Mortgage providers and advisors outlined the need for these economic benefits to be incorporated within affordability assessments. This would be a game-changer as it would bolster borrowing capacity and promote the acquisition of 'greener' homes.

Enhancing the Market for Retrofit Mortgages

There is a gap in the market for borrowers looking to retrofit existing housing stock. Niche mortgage provider Kensington is the only lender offering a green retrofit mortgage aimed at homeowners in Northern Ireland, who are motivated to improve the energy efficiency and reduce the carbon intensity of their homes. The product is designed to bridge the capital investment gap that many homeowners experience. Interview-based discussions inferred that more providers, including Halifax, Progressive Building Society and Danske Bank are exploring innovative mortgage products targeted at existing homes owners. If the housing sector is to make a meaningful contribution to the agreed carbon reduction targets, it is essential that more lenders support the retrofitting of existing housing stock.

Summary of Key Challenges of Green Mortgage Provision

- Getting access to EPC data for lending institutions, even when the property is on their own mortgage book
- The physical risks of climate change are not fully priced into valuations and nor is the transition to low-carbon housing, for instance through the impact of cost savings from energy efficiency measures on mortgage affordability
- Lenders that offer green mortgage products are losing business to those who do not because they are not competitive enough
- Government has a big role to play in driving the agenda and creating an enabling environment.

[20/21/22] The top 3 lenders offering green mortgage and non-green mortgage products. Based on Northern Ireland Primis panel. Sourcing System - Twenty7Tec. 18/11/2022

8.0 Future Proofing the Development Pipeline

Just over 6,400 new housing units are built in Northern Ireland each year[23]. Presently, most of the new build stock in Northern Ireland is EPC band B rated, with a small percentage rated in band A and band C[24]. The social housing sector has led on improving the energy efficiency of new build stock and has been the strongest advocate of the need for Building Regulation in Northern Ireland to be enhanced so that it is in line with the rest of the UK.

Our research shows that the consensus within the social housing sector is that the regulations could have been more ambitious. Private developer views on the ambition levels were more mixed, despite the consensus that higher energy efficiency standards were necessary.

Explored against a backdrop of raw material price inflation, several developers said that raising standards would most likely increase costs and that these would probably be passed through to the purchaser. However, developers with prior experience of passive house and 'nearly zero' energy standard development suggested that building to higher energy efficiency standards could be close to 'cost neutral' through effective design, product/technical innovation and better integration of the construction value chain. Our research suggests that while many developers in the private sector are willing to build to higher standards (if this is what the market demands) there is limited tangible evidence to justify the additional costs currently.

The high volume of planning applications submitted by developers circa £1 billion in development value prior to the obligation to conform to revised Building Regulations is alarming. This highlights that private housing development remains predominantly 'cost' driven. The steps taken to avoid the enhanced efficiency standards will result in a significant pipeline of future housing development that is built according to the minimum mandatory levels of energy efficiency – mandatory levels that were already outdated relative to other UK regions and the Republic of Ireland.

Heightened borrowing costs will make prospective purchasers more constrained in terms of budget, which will only serve to reinforce the cost-based approach within the new build sector. Educating prospective homeowners on the operational cost savings of more energy efficient homes is needed. Additionally, lenders need to better incentivise the purchase of energy efficient homes, thereby creating the market demand that will drive up energy efficiency standards.

From the developer viewpoint more needs to be done to financially incentivise the greening of the new build sector. This could include green development loans at more attractive rates akin to the Home Building Finance Ireland (HBFI) model in the Republic of Ireland. There is a clear need to redress the dominance of the cost-based approach to new housing development and to take account of the operational costs of housing upon occupation.

Tentative steps are already being taken by some private developers in Northern Ireland, with a number of schemes surpassing current building regulation standards and, in some cases, pursuing passive house accreditation. One of the most notable developments is the Fraser-Millar scheme Lancaster Park in Belfast, the first large-scale development of its kind in Northern Ireland. The scheme has been highly successful in terms of uptake, with purchasers seemingly happy to pay a premium for improved energy performance.

[23] NISRA annual average housing completion rate for the 10-year period 2012-2021.

[24] UU House Price Index (2022).

Going forward, it is imperative that new-build stock across both the social and private housing sectors is future proofed and aspires to the highest attainable energy efficiency standards. For Northern Ireland to make a meaningful contribution to the UK decarbonisation commitments and to future proof stock from expensive early-life-cycle retrofits, there is a requirement to raise all new build stock to EPC band A. The uplift in standards should be phased in and become mandatory by 2030.

Moving forward, the housing and construction sectors need to be supported both technically and financially in order to drive up energy efficiency standards within the new build sector.

There is clearly appetite amongst prospective buyers for lower energy homes and some anecdotal evidence of potential price premiums for more energy-efficient homes is starting to emerge[25]. Since the spike in energy prices, prospective purchasers are placing more emphasis on energy performance, according to estate agents interviewed for this research. There is also emerging evidence that EPC ratings affect 'time-on-the market' statistics, which will be interesting as we move into a more discerning market environment.

[25] Price premiums based on housing transactions in the year to June 2022.

9.0 Conclusion

Northern Ireland lags behind other UK regions and the Republic of Ireland in the decarbonisation of housing. This is partly because the policy landscape is fragmented, while the lack of agreed targets and associated milestones has permitted a lacklustre approach, particularly amongst private homeowners and the private rented sector. The lack of incentives for green retrofitting in Northern Ireland has also been identified as a major barrier to the decarbonisation of the housing sector.

A legacy of failed initiatives allied with a non-sitting Stormont Executive has ensured that Northern Ireland is failing to grasp the economic and environmental uplifts that an evidence-based green retrofit strategy would provide.

Indecision on decarbonisation will consolidate Northern Ireland's position as the poorest performing region in the UK housing sector, while ensuring that a much more capital-intensive programme of retrofitting will be needed to comply with agreed UK targets set for 2030 and 2050. In addition to the financial cost, there are societal implications, with many of the most vulnerable households amongst those most adversely impacted by the pronounced escalation in energy prices.

A wide-ranging retrofit programme is needed. A selection of fabric-based interventions alongside installation of low-carbon heating systems will be essential to attaining decarbonisation targets. The key to successful upscaling of retrofit solutions, particularly in the private sector, will be confidence in technologies, robust evidence to inform decision-making as well as operational data to determine accurate energy and financial savings, alongside adequate incentives.

It is imperative that the social and private housing sectors embrace technology and collaborate with energy experts to develop and expand the retrofit value chain. An increase in capacity and skills will be fundamental to attaining housing decarbonisation targets. Wet trades people have intricate knowledge and understanding of construction processes, which in addition to specialist knowledge and competence, will be crucial to development of greater capacity across the value chain.

The further education sector and professional bodies will need to ensure that future trades people have the skills and knowledge to contribute to a carbon-neutral building industry. Decarbonisation affords opportunities for the construction sector, but it must embrace innovation and support inter-disciplinary approaches. Decarbonisation is also an opportunity for the industry to broaden its appeal by showcasing diverse new career opportunities.

Policy makers and mortgage providers must collaborate to ensure that any future public and private financial incentives are evidence-based and complementary. Some mortgage providers have designed a range of 'green' mortgage products, most of which target new housing with very limited provision for retrofitting existing homes. Uptake of green mortgages has been limited, reflecting homeowners' lack of knowledge and the absence of credible unbiased information on which to base decisions.

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