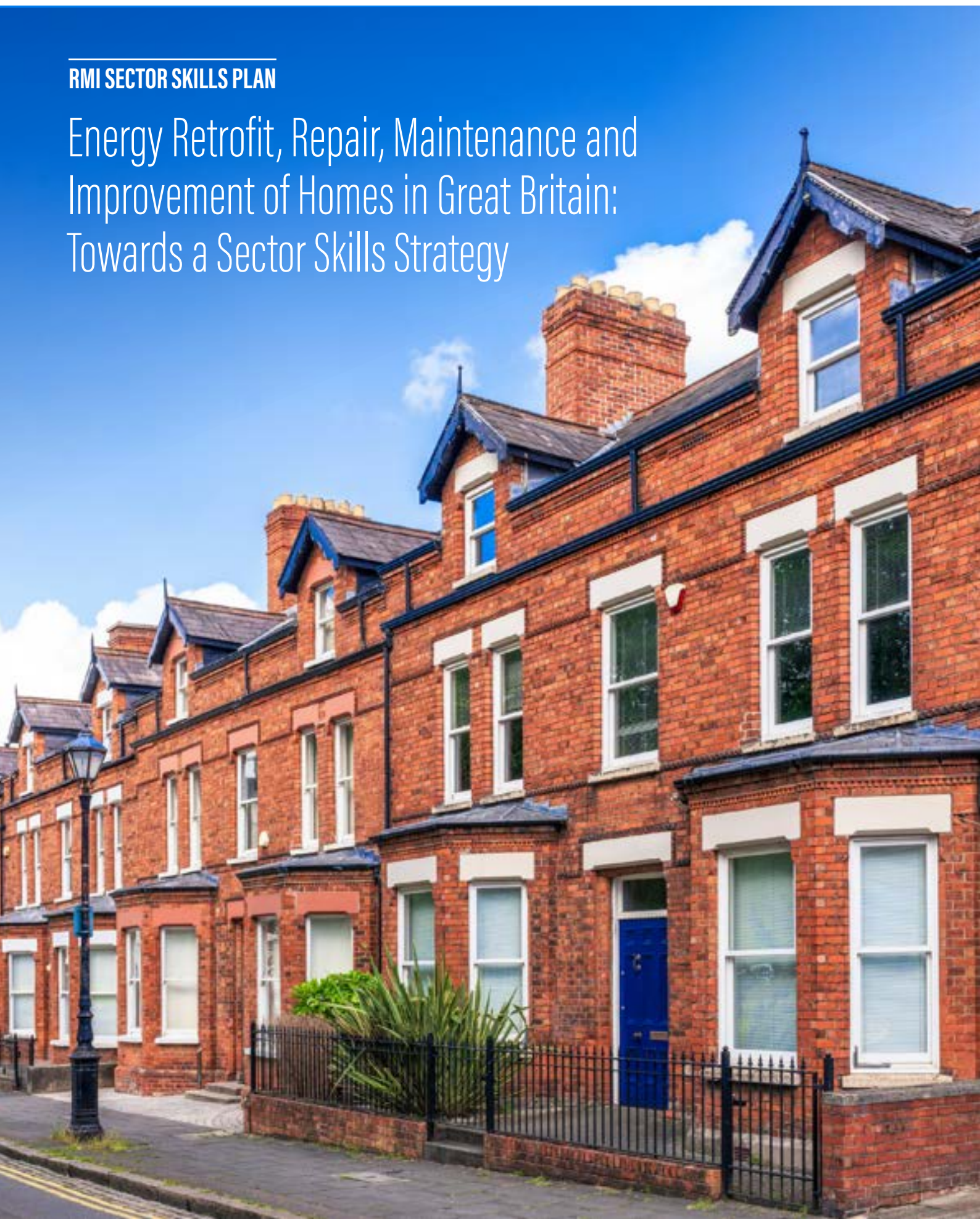


RMI SECTOR SKILLS PLAN

Energy Retrofit, Repair, Maintenance and Improvement of Homes in Great Britain: Towards a Sector Skills Strategy



Contents

4.	Postcard from the future
8.	Executive summary
11.	Introduction
14.	UK housing stock in the net zero transition
21.	Retrofit and repair, maintenance and improvement (RMI)
27.	Retrofit quality matters
34.	Competence
41.	Skills and jobs
46.	Vocational education and training system
53.	Devolution, institutions and funding arrangements
63.	Skills for digitisation, innovation and uncertainty
67.	Conclusions and recommendations
71.	Appendices

About this report

This research has been commissioned by the Repair, Maintenance and Improvement (RMI) Sector Skills Advisory Group in which the Construction Industry Training Board (CITB) has provided funding through the Sector Skills Plan Investment Fund. Sector Skills Plans are designed to address the specific needs of different sectors within the construction industry - outlining clear actions and interventions to the skills challenges in each sector. Sector Skills Plans are independently chaired by representatives from industry.

No claim is made that this research is representative of the entire industry, and the conclusions presented reflect the views of the authors rather than those of the RMI Sector Skills Advisory Group, CITB or any individual industry stakeholders who participated.

The research was carried out between January – September 2025. It does not take account of new initiatives, reports or policy developments after September 2025.

In line with CITB's geographic remit, the report focuses on England, Scotland and Wales but not Northern Ireland. Where available information relates to all of the UK (not only Great Britain), this is stated.

ABOUT CITB

CITB is the industry training board for the construction sector in England, Scotland, and Wales. As an executive non-departmental public body sponsored by the Department for Work and Pensions, CITB is responsible for helping the industry attract talent and develop a skilled, competent, and inclusive workforce. It operates independently in managing its budget and activities and is accountable to Government ministers and Parliament. CITB's strategic aims include enabling people to enter construction, developing a responsive training and skills system, and supporting employers to train and upskill their workforce. Its planning and performance are guided by key documents such as the Strategic Plan, Business Plan, Nation Plans, and the Net Zero Action Plan.

To address specific skills challenges across the sector, CITB has developed Sector Skills Plans-industry-owned action plans shaped by stakeholders and employers. These plans target sub-sectors such as homebuilding and infrastructure. This report focuses on the RMI of existing homes, including domestic retrofit and heritage skills. Each plan outlines tailored interventions and receives dedicated investment, with CITB committing over £3 million to the RMI Sector Skills Plan alone. These initiatives aim to align workforce supply with industry demand, improve training quality, and support the delivery of national priorities.

ABOUT FMB

Founded in 1941, the Federation of Master Builders (FMB) is the largest trade association in the UK construction industry representing the interests of micro, small and medium-sized building companies. The FMB is independent and non-profit making, lobbying for members' interests at both a national and local level. The FMB is a source of knowledge, professional advice, and support for its members, providing a range of modern and relevant business building services to help them succeed.

ABOUT NOTTINGHAM TRENT UNIVERSITY

The Centre for Sustainable Construction and Retrofit (CSCR) in the School of Architecture, Design and the Built Environment at Nottingham Trent University includes a research group that addresses the urgent socio-technical challenges of meeting net zero, safe and climate-resilient built environments. They undertake critical interdisciplinary research to support equitable, resilient, and low carbon transitions across construction, housing, and urban systems. →

ABOUT UNIVERSITY OF OXFORD

The Energy Programme at the Environmental Change Institute (ECI), University of Oxford, is an interdisciplinary research group within the School of Geography and the Environment. Its work focuses on the transition to a low-carbon, climate-resilient energy system, with particular emphasis on energy demand across buildings, infrastructure, and everyday life. Integrating social and technical perspectives, a central strand of the Programme's research examines building decarbonisation, including large-scale retrofit, closing the performance gap, and developing the skills and capacity required to deliver high-quality, low-carbon built environments. Aligned with the University of Oxford's commitment to addressing global environmental challenges, the Energy Programme undertakes applied, policy-engaged research to inform decision-making across Government, industry, and civil society, supporting fair and scalable pathways towards a resilient and inclusive energy transition.

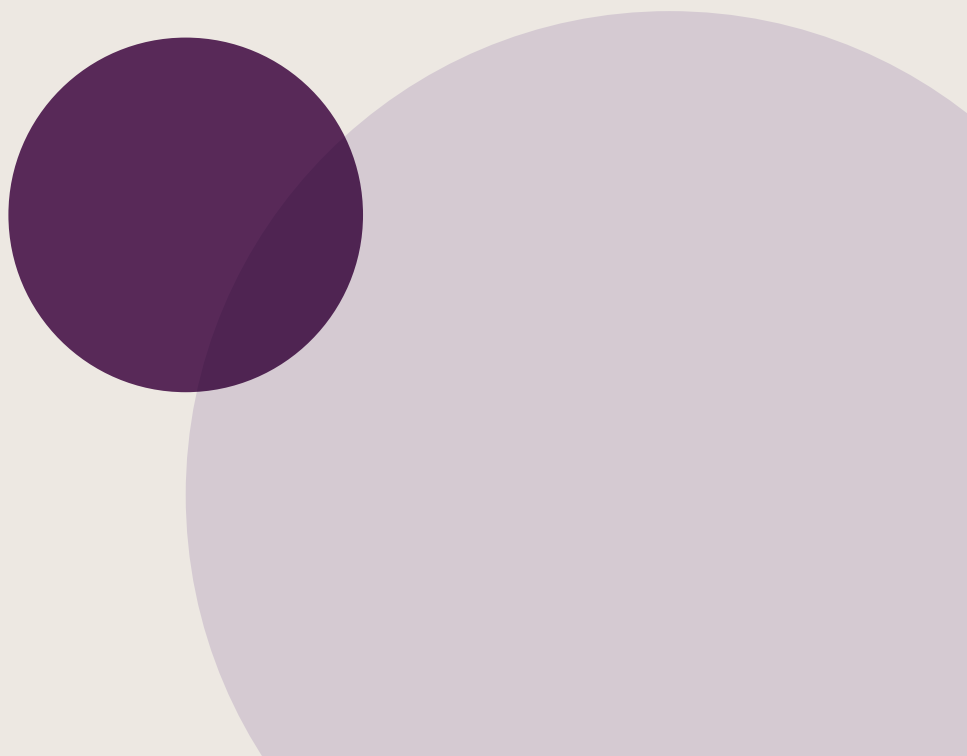
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In conducting this work the research team gratefully acknowledge the support and contribution of several individuals and organisations. We are grateful to the RMI Sector Skills Advisory Group for agreeing to sponsor the research with CITB's Sector Skills Plan investment, and we commend the RMI Sector Advisory Group for seeking to understand the domestic RMI sector better before they develop the first Sector Skills Plan.

The FMB supported this initiative from the beginning and has given help and information when requested. Thanks go to the panel of over 40 stakeholders who attended the project kick-off meeting in February, and to the Project Steering Group, who provided, advice, contextual information and contacts that all helped the project. Last, but by no means least, we gratefully acknowledge the participation of the people who filled in the survey, and the expert interviewees, whose insights and combined experience add detail and nuance to our understanding of the system for training in housing RMI. ●





Postcard from the future

Pages 5 to 7

The year is 2050. Every home across Great Britain (GB) is efficient, decarbonised, resilient, healthy and affordable to heat. The skills system that helps make it possible is thriving.

POLICY AND GOVERNANCE

Governments across the UK no longer fly blind. They gather, analyse and publish clear data on training quality, capacity, and graduate outcomes — feeding directly into smarter policy and industry strategy.

Decisions are no longer reactive or narrowly “employer-led.” Instead, they’re shaped through a commitment to quality, working with employers, trainers, accreditation bodies, sustainability experts, consumer voices and policymakers. Housing is treated as a cornerstone of social, economic, and environmental wellbeing for all.

Conflicts of interest and “gaming the system” are relics of the past. Standards are transparent, consistent, and trusted. Everyone — from trainees to firms to clients — knows what competence looks like. Clear progression routes exist from entry-level to advanced qualifications, supporting lifelong careers.

BUILDING STANDARDS

High-efficiency retrofit standards are now the rule, not the exception. Every project takes account of building energy performance and resident satisfaction. The RMI sector plays its part in the net zero transition and strengthens the resilience, comfort, and value of the UK’s homes.

A single, consistent framework underpins the industry — defining how skills, knowledge, behaviours, and experience are developed, validated, and regularly revalidated. Quality assurance is not a tick-box exercise but a shared goal that underpins good outcomes.

COMPETENCE

Competence is measured not just in certificates, but in the real-world outcomes of building performance — social, economic, and environmental. Feedback loops are built into every stage, so the industry learns and improves continuously.

Broad, collaborative understanding across the sector is shared, while specialisms continue to exist. This is reflected in the concept of the “T-shaped professional.” Everyone, from apprentices to senior professionals, receives shared training in building performance, outcomes, and professional conduct (the horizontal bar across the top of the T). In addition, specific competence is needed for specialist skills and roles (the vertical of the T).

Mentoring is incentivised, breaking down barriers of distance and reach, and helping skills and knowledge scale across every corner of the industry.

Initial vocational education and training (VET) builds a strong, shared foundation for the whole workforce, while continuing professional development (CPD) provides updates on new research, technologies, opportunities and policy. Short courses add value — but they never replace deep, foundational learning.

The data we have now helps trainees enter the right course at the right time, matched to their competence and career stage. Progression is transparent and consistent, creating a reliable skills ladder for the entire sector.

Assessments are truly independent, free from vested interests. Trainers and assessors are recognised as keystones of the system — highly skilled, fairly rewarded, and respected for the quality they safeguard. →

JOB AND CAREERS

The retrofit/RMI sector is professionalised, thriving in a market where competent workers are in high demand, equipped by the training system to be effective in their work. A licence to trade underpins standards, backed by fair transitional support that helped firms and workers adapt to this new landscape.

Career pathways are visible and trusted — by new recruits, graduates, employers, and the wider public. Retrofit is seen as a valued, fulfilling vocation. Experienced workers move seamlessly from independent assessment into tailored VET, ensuring prior learning is respected and competence certified. The workforce is equipped to adapt to innovations from outside construction, and to make the most of opportunities from new technologies and business models.

Employers embrace their responsibility to grow the workforce — offering mentoring, supervision, and meaningful opportunities to apprentices and junior colleagues. Competence is nurtured at every level.

OUTCOMES

UK housing has been transformed. Homes are efficient, warm, and healthy — driving measurable improvements in public health and social wellbeing. Fossil fuel heating is history, and inefficient buildings are a thing of the past.

Retrofit/RMI is in sustained, nationwide demand, backed by industrial strategy and diverse investment — from national Governments to devolved authorities and regional agencies.

The sector delivers more than buildings: it provides trusted local services — now as routine as the old annual boiler check before winter — alongside dignified, purposeful careers with clear opportunities for growth and progression.



Let's make retrofit a badge of honour - something people are proud to be part of. (I17) ●

Retrofit and RMI sector

INNOVATION LANDSCAPE



Figure 1: Retrofit and RMI System: A visual overview of the report's core themes



Executive summary

Pages 8 to 10

It is possible to transform existing homes by the retrofit of materials and technologies that improve energy efficiency and environmental performance, cut CO₂ emissions, improve health and welfare for residents, and potentially reduce energy bills. Across most of the UK's 30 million homes there is a need to replace gas heating (and other fossil fuel systems) with the widespread installation of electric heating (mainly heat pumps), building fabric insulation and other measures.

The construction industry has a key potential role to play in this wholesale transformation of homes. The market for RMI in housing was worth £40.7bn in 2023, representing 18% of total construction output.

All buildings need maintenance and repair, including any buildings that have previously been retrofitted. RMI and retrofit should be seen as interdependent services, repeating over time as circumstances and occupant needs change. There are opportunities for retrofit in RMI activity, and vice versa. The workforce needs the capability to design, plan and deliver improvements that improve the quality and performance of existing homes. There needs to be a plan for retrofit over time; it does not necessarily happen all at once. As more homes undergo retrofit, so the maintenance of those homes will need to take account of previous retrofit work. RMI and retrofit will need to become much more closely aligned.

The quality of retrofit matters for social, economic and environmental wellbeing. Poor quality in retrofit delivery carries serious risks, as shown in high-profile failures over the years. There is a significant design-performance gap between how we expect buildings to perform and what actually happens in real life. Key improvements are needed in technical understanding, communication skills for effective collaboration, and greater clarity of roles and responsibilities among project teams.

Competence is key to better quality. It needs to cover skills, knowledge, experience and behaviour – backed up by independent assessment. The workforce needs to become skilled, knowledgeable, collaborative, self-

reflexive, adaptable and focused on the wider social and environmental dimensions of improving housing. Competence needs to include shared foundational learning as well as specialist competences for specific job roles. Developing a competent workforce requires a dual focus: upskilling existing workers and creating effective pathways for new entrants.

Construction craft trades operate in a 'low skills equilibrium'. Despite notable exceptions, the general picture is of a stable labour market with low real demand for higher skills, and low skills supply. There is not a 'skills gap' that can be easily resolved by simply putting on more training courses. Instead, there is a dysfunctional system between skills training and jobs: the trained people do not necessarily do the jobs for which the training was intended, and the people working in the sector do not necessarily have any (or appropriate) training. There are related issues with recruitment into the sector and the career pathways within it. For retrofit/RMI to be more attractive, it needs to be promoted earlier (e.g. in schools), and opportunities need to be more inclusive. More support is needed for workers via on-the-job work experience, and for employers offering good apprenticeships, with opportunities for ongoing learning and career development. In the currently unregulated RMI labour market (mostly operating in the private market, away from social housing and social welfare programmes), training is seen as a discretionary activity, which can be dropped at short notice. Those who do work to good quality standards are competing with others who do not.

The VET system has structural problems, including conflicts of interest and fragmented provision. Construction VET tends to be led by short-term perceptions of need and available funding, rather than a long-term strategic investment in developing the workforce for good careers. Training data exists but there is no systematic effort to collate, analyse and publish it in sufficient detail. That makes it impossible to gain a clear overview of the quantity and quality of training, assessment and certification, nor the links with employment outcomes. →

Retrofit/RMI is always delivered in a specific local context, and there are important geographical variations in building types, climate, jobs and property markets. Education is a devolved matter between England, Scotland and Wales, and there is some divergence already happening. Retrofit is often identified as a regional policy priority because of the multiple benefits it brings in terms of climate, social and regional economic development. There is an opportunity to compare and learn much more wholeheartedly between the devolved nations and English devolved authorities on retrofit policy and programmes. Equally, there are industry-led initiatives at devolved and regional scale which show promise for better coordination and wider sharing of innovative approaches.

The future is uncertain, and housing RMI is susceptible to significant technological and business model change. Innovations from outside the construction sector may impact future work, requiring improvements in digital skills and new working practices, for example. The workforce need to have the competence to navigate uncertainty and to make the most of opportunities from innovation. Capabilities for self-reflection and self-evaluation will be key to ensuring that the workforce is adaptable and resilient. An important part of competence is the workforce's capability to self-evaluate and identify their own future training needs.

Improving the situation requires a fundamental shift in thinking and approach in policy-making and in industry activity. To frame that shift, we propose three principles:

- **Understand better:** the specific context (technical, market, institutional, policy) of retrofit/RMI and existing housing
- **Foster collaboration:** across the training sector and with external partners – devolution and place-based approaches
- **Clarify goals:** define the common vision, mission for inclusive career pathways, quality standards and funding reform for retrofit/RMI.

In relation to the RMI Sector Skills Plan more specifically, the following recommendations are intended to help prioritise the allocation of funding from CITB for retrofit/RMI:

- **Prioritise** and provide long-term support for initiatives under key themes:
 - **Coordination:** coordinate and advocate good practice, develop networks and shared intelligence
 - **Competence:** enshrine the principles of competence – skills, knowledge, experience, behaviour – across all job roles
 - **Quality assurance:** design training to achieve good quality outcomes with independent assessment/certification
 - **Improve institutional understanding** of the retrofit/RMI context through recruitment and/or an expert independent advisory board.
- **Create mechanisms for evaluation and feedback** of training outcomes, in relation to employment/careers and quality in service delivery, building performance and client satisfaction. ●

The background of the page is a photograph of a row of houses, likely in a suburban area. The houses have a mix of brick and timber-framed exteriors. In the foreground, there is a low brick wall and some greenery. A large, semi-transparent white circle is centered over the image, containing the title and page information. A dotted white line arches over the top of the circle.

Introduction

Pages 11 to 13

The prospect of the first ever Sector Skills Plan for housing RMI offers an opportunity to take stock and think creatively about how to develop a competent workforce, capable of delivering consistently good-quality outcomes on projects, while being adaptable and future-ready.

Strengthening skills capacity is essential to maintain and improve the nation's housing stock, meet housing and climate targets, and ensure that public investment supports long-term economic resilience and growth.

The report draws on relevant published academic papers, industry reports and policy documents. New research data for this report draws on a survey of training providers, a series of expert interviews, and a multi-stakeholder workshop. Overall, expert perspectives were recorded and analysed, with the identities of interviewees (both individuals and organisations) kept anonymous to encourage open and honest sharing of views and experiences. All interviews were conducted in accordance with the Research Ethics procedures of Nottingham Trent University. Through long involvement with the sector, these interviewees offer new insights on a wide range of topics, with most interviewees having expertise in more than one topic area. The research is presented as being exploratory and indicative. No claim is made for the research to be representative of the construction industry-as-a-whole.

METHODOLOGY OUTLINE

The research followed a mixed-methods approach, combining primary and secondary data to ensure both depth and breadth of analysis. This began with a literature and data review including policy documents, Government and training sector datasets, reports and academic sources (Figure 2).

Primary data collection involved an online survey of 43 respondents representing a diverse range of roles across the RMI skills sector — including directors, training leads, and professionals from further education colleges (24.4%), supply chain organisations (19.5%), non-profits (17.1%), and independent providers or consultancies (39%) — with coverage across England, Scotland, and Wales. The survey gathered information on training provision in areas such as low-carbon technology, craft trades, and plumbing, and revealed key challenges such as limited data-sharing capacity among training providers (see Appendix A). An online stakeholder workshop with 25 industry representatives was held to identify key barriers, opportunities, and innovative initiatives across the nations, helping to inform the research focus and interview design. Complementing this, 20 semi-structured interviews and one focus group (four participants) were conducted using a consistent questionnaire guide, capturing expert insights on how the system works and could change. →

Data sources

Primary data

- Online survey (n=43)
- Semi-structured interviews (n=20)
- Focus group (n=1;4 participants)
- Online stakeholder workshop (n=~25)

Secondary data

- Gov.uk further education (FE) datasets (i.e. "Further education skills", "apprenticeships 2024-25", "regulated-qualifications-dataset-england")
- Literature review

Figure 2: Outline of the primary and secondary data collection

ORGANISATION TYPE	GEOGRAPHY				CONSTRUCTION INDUSTRY			TRAINING PROVIDERS				SKILLS TOPICS							QUALITY SYSTEM			GOVERNMENT		
	ENGLAND	SCOTLAND	WALES	N.IRELAND	INDUSTRY ORGS	LARGE FIRMS	SMEs	FURTHER EDUCATION	HIGHER EDUCATION	SUPPLY CHAIN	INDEPENDENT	MAINSTREAM RMI	RETROFIT	MANAGEMENT/COORDINATION	HERITAGE AND TRADITIONAL	RENEWABLE/MECH. AND ELEC.	SOFT/NON-TECHNICAL	MMC RETROFIT	SURVEYING	ACCREDITATION OF FIRMS/PEOPLE	STANDARDS/QUALIFICATIONS	COMPLIANCE OF WORK	DEVOLVED/REGIONAL	LOCAL
Total	7	6	5	1	5	2	1	1	1	2	4	5	8	4	5	1	1	1	2	2	7	2	4	1
Traditional and Heritage Buildings															1									
Traditional and Heritage Buildings		1													1									
Traditional and Heritage Buildings	1														1									
Local and National Government/Public Bodies			1												1								1	
Training Providers	1	1	1	1							1		1	1										
Local and National Government/Public Bodies			1								1				1									1
Professional, Accreditation and Advisory Bodies	1		1		1								1	1						1	1	1		
Professional, Accreditation and Advisory Bodies		1			1								1	1										
Professional, Accreditation and Advisory Bodies			1		1								1	1									1	
Industry, Employers and Delivery Organisations		1																			1			
Training and Education Providers	1										1	1												
Professional, Accreditation and Advisory Bodies					1														1					
Training and Education Providers								1	1				1	1					1	1	1	1		
Industry, Employers and Delivery Organisations	1				1	1								1	1									
Local and National Government/Public Bodies		1																					1	
Training and Education Providers																					1			
Training and Education Providers												1					1				1			
Local and National Government/Public Bodies		1																			1		1	
Industry, Employers and Delivery Organisations	1					1				1								1						
Industry, Employers and Delivery Organisations						1																		
Professional, Accreditation and Advisory Bodies																								
Training and Education Providers										1			1											
Professional, Accreditation and Advisory Bodies																					1			
Industry, Employers and Delivery Organisations	1										1	1	1			1								

Table 1: Range of participant organisations involved in primary data collection through interviews and focus groups.

Interviewees included representatives from industry organisations, independent providers, and devolved bodies, with the strongest coverage in retrofit (eight), heritage and traditional skills (five), and mainstream RMI (five). Their collective range of expertise are summarised here in Table 1.

Further Education Skills and Apprenticeships 2024-25 datasets,¹ which were excluded due to their cross-sectoral scope and the Regulated Qualifications Dataset (England),² which was used to identify overlaps between RMI and retrofit skills and inform qualification development. These datasets were reviewed to highlight data gaps, potential

integration of RMI and retrofit pathways, and opportunities for improved reporting through the Department for Education (DfE) and the Office for National Statistics (ONS). Qualitative data were coded to identify common themes, while quantitative survey data were analysed descriptively to reveal representation patterns and training focuses. Analysis of the literature review, survey, interviews, and datasets provides an overview of the detailed working of the RMI training system and its wider context. The report is intended to stimulate debate among all relevant stakeholders and to inform the development of the RMI Sector Skills Plan. ●

1. ONS (2021) Age of the property is the biggest single factor in energy efficiency of homes. 1 November 2021. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/ageofthepropertyisthebiggestsinglefactorinenergyefficiencyofhomes/2021-11-01> (accessed Oct 2025)
2. Federation of Master Builders (2018) Licence to build: A pathway to licensing UK construction, July. Available at: <https://www.fmb.org.uk/resource/licence-to-build-a-pathway-to-licensing-uk-construction.html> (accessed Oct 2025)



UK housing stock in the net zero transition

Pages 14 to 20

Energy use in buildings (including homes) is still a significant source of CO₂ emissions and a focus of climate policy. The Climate Change Committee's (CCC) Balanced Pathway for the Sixth Carbon Budget scenario sets out a series of key assumptions for improving the energy performance of existing homes and decarbonising heat supply.³ These include the phase-out of new fossil fuel boilers off the gas grid by 2028 and of new gas boilers by 2033, alongside rapid growth in heat pump deployment and the widespread implementation of fabric insulation measures, (Appendix B). Progress in decarbonising the electricity grid has reinforced the policy focus on electrification of heat.

Under the CCC's Balanced Pathway scenario, by 2050 most homes are projected to be heated by heat pumps (75%), low-carbon heat networks (19%), or other electric systems (5%). Uptake is expected to increase rapidly in the near term before stabilising as the market matures towards mid-century.⁴ The growing focus on electrification over deep retrofit has prompted debate about whether the traditional 'fabric first' principle remains appropriate.⁵ The CCC's Balanced Pathway assumes that building fabric improvements remain important, in combination with a shift to high-efficiency electric heating and a decarbonised grid. Current research debates suggest that this combination provides the lowest-cost route to net zero. For the retrofit/RMI sector, this implies that the workforce needs to be competent to identify and deliver 'good enough' improvements to buildings, tailored to each property, in line with policy priorities, local energy infrastructure, and household needs.

PROFILE OF THE EXISTING HOUSING STOCK IN GREAT BRITAIN

A defining feature of the retrofit/RMI sector is its focus on existing buildings, rather than new developments.

In 2023, the UK housing stock was estimated by the ONS at 30.4 million homes, the majority of which are located in England (83%), followed by Scotland (9%), Wales (5%) and Northern Ireland (1%). These characteristics are summarised in the following sections. Further figures relating to the housing stock are provided in Appendix B.

The opportunities and challenges facing the RMI sector are shaped not only by the size of the housing stock but also by its diverse characteristics — including tenure, age, built form, energy performance (EPC rating), heating systems, and geographical distribution.

Stock by tenure

In 2023, England accounted for most of GB's housing stock across all tenures with 25.4 million homes compared to 2.7 million in Scotland and 1.5 million in Wales. Owner-occupied remains the dominant tenure in all three nations, followed by the private rented and social rented sectors. This distribution highlights the importance of tailored retrofit strategies that reflect the differing tenure profiles and policy frameworks across GB.

Stock by age

The age of the UK housing stock remains one of the strongest predictors of energy performance. According to the ONS, older homes, particularly those built before 1930, tend to have lower energy efficiency due to construction methods and materials that predate modern standards.⁶ →

3. Committee on Climate Change (2020). The Sixth Carbon Budget: The UK's path to Net Zero. London: CCC. Available at: <https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf> (Accessed 20 Oct. 2025).
4. Ibid. Figure 3.2c, page 115.
5. Eyre, N., Fawcett, T., Topouzi, M., Killip, G., Oreszczyn, T., Jenkinson, K., & Rosenow, J. (2023). Fabric first: Is it still the right approach? *Buildings and Cities*, 4(1), 965–972. <https://doi.org/10.5334/bc.388>
6. ONS (2021) Age of the property is the biggest single factor in energy efficiency of homes. 1 November 2021. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/ageofthepropertyisthebiggestsinglefactorinenergyefficiencyofhomes/2021-11-01> (accessed Oct 2025)

Within the historic and traditional buildings sector, there is a recognition of the need for sympathetic retrofit approaches that maintain the integrity and breathability of original materials. The use of inappropriate insulation or sealing methods can increase the risk of moisture damage and structural deterioration.⁷ Policy and retrofit delivery therefore need to balance energy efficiency objectives with the preservation of heritage and building fabric performance, ensuring that interventions in older properties are both effective and compatible.

Stock by built form

The built form of UK housing — whether terraced, semi-detached, detached, bungalow, or various flat types — plays a critical role in determining energy performance and retrofit potential. Terraced and semi-detached dwellings dominate the stock, followed by detached homes and flats, making them the primary targets for large-scale retrofit programs.

These structural differences directly influence both retrofit design and the skills needed for effective delivery. Costs, material choices, access, constraints, design details and legal issues (e.g. party walls) are all influenced to some degree by the built form.

Stock by EPC rating

Energy Performance Certificate (EPC) data provides insight into the energy performance of homes, but it must be interpreted with caution. Because certificates are recorded only when a dwelling is sold, let, or newly built, the dataset covers only a subset of properties rather than the entire housing stock. Moreover, the data tends to be biased toward better-performing homes, since all new builds must obtain an EPC, whereas many older or less-efficient existing dwellings may never yet have been assessed.⁸

Stock by heating system type

A decade of data from home EPCs (2014–24) shows that mains gas remains the dominant heating system in existing homes, supplying 81% of dwellings in England and 79% in Wales (Figure 4).

In Scotland, heating system data are categorised differently, without a distinct breakdown for renewable technologies or heat pumps. Nonetheless, the pattern is similar: the Scottish Housing Survey (2019) reported that 81% of homes used gas as the main heating fuel, followed by electricity (11%) and oil (5%). Other fuels, including communal heating, LPG, solid fuel, and biomass, each accounted for around 1% or less of the total housing stock (See Appendix B).



There's a gap in knowledge about how to work with older buildings – especially solid wall properties. (104)

Despite progress in new construction in terms of energy efficiency, gas remains the main heating source in new homes (67% in England; 80% in Wales), indicating a continuing retrofit need even within the newest housing stock. →

7. Historic England (2025) Risks of energy efficiency interventions in buildings of traditional construction. Historic England, 19 June. Available at: <https://historicengland.org.uk/advice/technical-advice/retrofit-and-energy-efficiency-in-historic-buildings/improving-energy-efficiency-through-mitigation/risks-of-energy-efficiency-interventions/> (Accessed: Sept 2025).
8. UK Government. Live Tables on Energy Performance of Buildings: EPCs for Existing Domestic Properties. Available at: <https://www.gov.uk/Government/statistical-data-sets/live-tables-on-energy-performance-of-buildings-certificates#epcs-for-existing-domestic-properties> (Accessed Oct 2025).

IMPLICATIONS OF HOUSING STOCK CHARACTERISTICS FOR RETROFIT AND RMI

The combined characteristics of the UK's housing stock — including tenure, age, built form, energy performance, and heating system type — illustrate both the scale and diversity of the retrofit/RMI market.

Much of the UK's housing is owner-occupied and built before 1930, with many of these

dwellings still falling within EPC band D. This reflects poor thermal performance and highlights the need for better assessment of existing fabric conditions to inform tailored interventions, regardless of current or future heating systems. The continued dominance of mains gas heating — even in new builds — highlights the scale of the transition required to meet net zero. →

Heating systems in existing housing by region, England and Wales

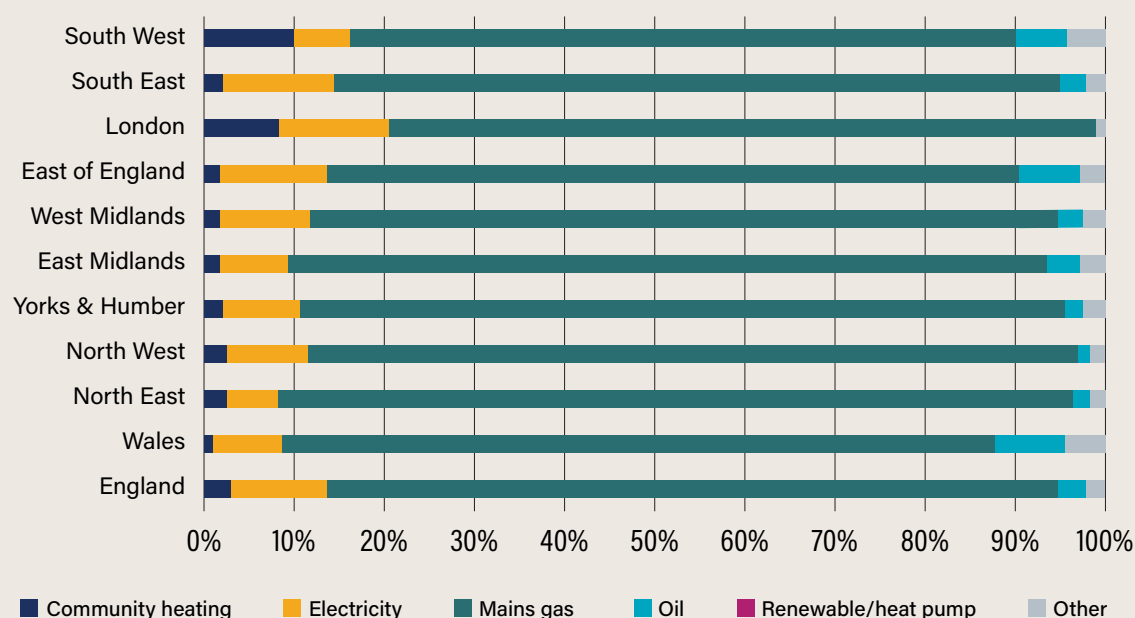


Figure 4: Heating systems in existing homes in England and Wales, based on EPC lodgements 2014-2024⁹

9. EPC lodgements only cover properties for which an EPC has been lodged in the period, so it is not truly representative of the whole stock. As all new homes are required to have an EPC, the data here are likely to be skewed to some extent towards new homes. Nonetheless it gives an approximation of the distribution of housing stock energy efficiency based on 10 years of EPCs.

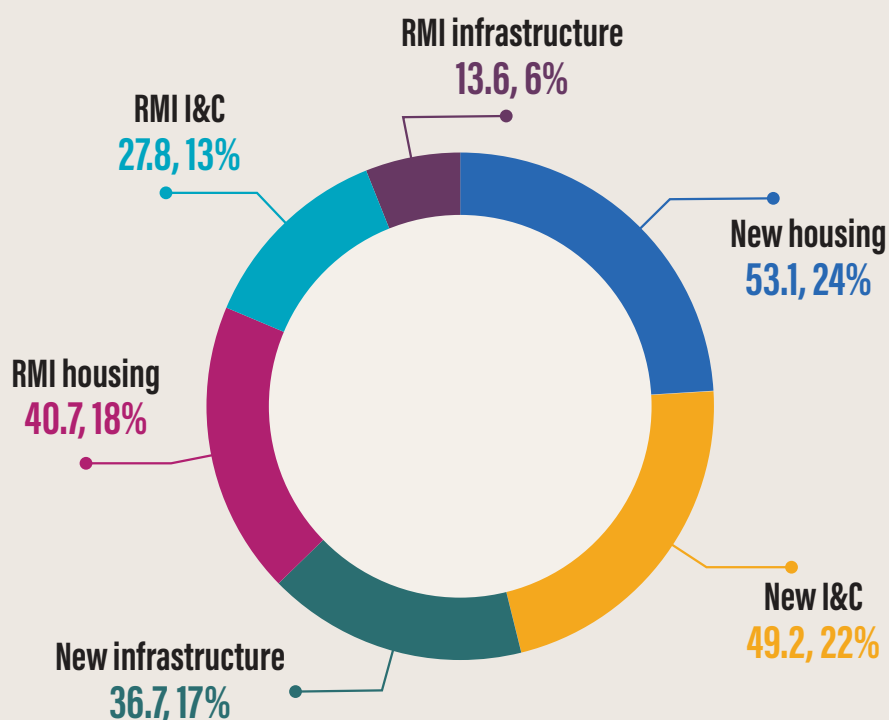


Figure 5: The RMI sector within the construction sector¹⁰

THE RMI MARKET WITHIN THE UK CONSTRUCTION SECTOR

The construction industry remains a cornerstone of the UK economy, with total output in GB reaching £221 billion in 2023. Of this, new construction accounted for 63%, while RMI made up the remaining 37%. When disaggregated by sub-sector — housing, industrial and commercial (I&C), and infrastructure — the RMI market in existing housing emerges as a significant component, valued at nearly £41 billion in 2023. This represents around 18% of total construction output and equates to an average annual RMI spend of approximately £1,500 per dwelling (Figure 5).

The structure of the construction industry varies substantially across sub-sectors. The large firms delivering major infrastructure projects — such as railways, bridges,

and highways — are distinct from those operating in the domestic RMI market. The private housing RMI sector is dominated by SMEs, micro businesses, and sole traders, while the social housing RMI sector tends to involve Tier 1 contractors and Direct Labour Organisations (DLOs) employed by some social landlords. DLOs can offer advantages in terms of coordination, communication, and workforce development at scale, yet social landlords and Tier 1 contractors also rely heavily on sub-contracting to manage fluctuating workloads and access specialist skills as required.

The RMI market is mature, compared with the retrofit market, which is still largely dependent on grant funding and specialist providers, working with pioneering clients — a situation that also holds true across Europe, North America and Australia.¹¹ →

10. Office for National Statistics (2024). Construction statistics, Great Britain: 2023. Retrieved from <https://www.ons.gov.uk/releases/constructionstatisticsgreatbritain2023>.

11. Hanna, R., Simpson, K., Camacho McCluskey, K. and Gross, R. (2025) [Accelerating energy efficiency retrofits in owner-occupied homes](#) | UKERC | The UK Energy Research Centre

Most firms secure sufficient work through RMI contracts without engaging directly in energy retrofit activity. This creates a challenge for expanding retrofit capacity, as many RMI firms currently lack incentives or capability to integrate energy efficiency measures into their service offer. Retrofit is expensive and not a high priority for most private property owners, so there is very low real demand in the private market when compared with the scale of the challenge across the entire housing stock.

A survey of 200 SME building firms published in 2024¹² identified cost as the biggest barrier to consumer demand for retrofit (costs of materials, equipment, labour). Other reasons for low demand (as perceived by builders themselves) include:

- Low consumer awareness or interest
- Lack of familiarity among firms about the work and their own relevant skills
- Availability of materials
- Confusing grant support
- Inconsistent policy and standards
- Burden of paperwork for compliance.



...Demand for retrofit is almost entirely dependent on central Government funding. (I01)

The construction industry's long-standing underinvestment in training compounds this issue. Although the CITB Levy provides a

mechanism for funding skills development, uptake has been uneven, particularly among SMEs that dominate the domestic RMI market. Furthermore, manual trades remain largely unregulated, except for statutory health and safety, gas, and electrical safety requirements. When regulation is introduced — such as new accreditation schemes for retrofit or low-carbon installations — it often leads to further fragmentation of roles. New compliance requirements create niche specialist functions, which are typically fulfilled through sub-contracting, rather than embedded within the core workforce.

RETROFIT PROGRAMMES AND FUNDING FOR THE HOUSING STOCK

Retrofit funding programmes and strategic priorities differ markedly between nations, reflecting variations in policy design, focus, and delivery capacity. English programmes total around £4 billion of investment, focused on large-scale social housing decarbonisation and low-income retrofit programmes designed to accelerate progress toward net zero. Scotland allocates approximately £500 million, targeting social housing energy improvements and the development of zero-emission heat networks, underpinned by a clear alignment with its 2045 net zero target. Wales, by contrast, invests around £13 million, prioritising innovation, digital tools, and PAS 2035-compliant delivery to build foundational knowledge and capacity across the sector (Table 2). →

Nation	Main funding streams	Funding scale	Key areas	Focus
England	SHDF / Warm Homes Social Housing Fund ECO4 GBIS Warm Homes: Local Grant	£4bn+	Social housing decarbonisation Insulation Low-carbon heating	Largest national scale Co-funding model PAS 2035 compliance
Scotland	EESSE / SHNZS SHNZHF Heat Network Fund	£500m+	Social housing Heat networks Fabric-first	Strong alignment with Net Zero 2045 Rural uplifts Social landlord focus
Wales	Optimised Retrofit Programme (ORP)	£13m	Innovation Data-led retrofit PAS 2035	Focus on developing tools and pathways rather than scale

Table 2: Summary of retrofit funding programmes by devolved nation

12. Owen, A. & Killip, G. (2024) Delivering healthy, comfortable, net zero housing. London: Federation of Master Builders. Available: <https://www.fmb.org.uk/resource/delivering-healthy-comfortable-net-zero-housing.html> (accessed 06/08/25)

The owner-occupied housing sector remains largely outside the scope of current programmes and incentives for retrofit uptake, presenting a major challenge across all nations. The quality of retrofit works is a serious concern. Persistent issues with installation standards, inconsistent quality assurance, and a shortage of skilled retrofit professionals continue to undermine performance and public confidence across all nations. Recurring installation failures, such as those identified in recent evaluations of wall insulation under the Energy Company Obligation (ECO4) and the Great British Insulation Scheme (GBIS), often require costly remediation. These issues have a major negative impact, undermining confidence in retrofit programmes and highlighting the

urgent need for stronger competence, quality assurance, and a skilled RMI workforce to prevent and correct poor installations. They also reveal a systemic gap between policy ambition and delivery capability. Scaling up retrofit will require not only adequate funding and regulation, but also recognition of the key entry points provided through RMI activity. This demands a competent, accredited, and well-supported workforce capable of delivering high-quality fabric improvements and carrying out ongoing RMI work on both retrofitted and newly built homes. Without a coordinated focus on skills, training, and quality assurance, there are real risks of embedding poor practices and weakening public trust. ●





Retrofit and RMI

Pages 21 to 26

Retrofit is not a single event, but a process embedded within the building lifecycle, with repeated intersections between RMI and energy measures.

This chapter compares what is meant by the two terms ‘RMI’ and ‘Retrofit.’ It sets out an argument that there are many synergies on the ground when it comes to delivering both RMI and retrofit. RMI can be an opportunity for retrofit, and vice versa. Examples from the literature on how these terms are defined are provided in Table 3.

It is important to note that these definitions deliberately avoid referring to specific technical standards or metrics of building energy performance. Instead, the level of improvement is often implied through contrasting retrofit approaches — such as deep versus shallow, whole-home versus room-by-room, or energy-focused versus non-energy-focused retrofits. In practice, the scope and nature of retrofit or RMI works can vary significantly. They are shaped by a combination of factors, including cost considerations, available opportunities,

household circumstances, residents’ values and priorities, levels of awareness and education, access to finance and grant funding, and the availability of competent, trustworthy professionals and builders.

Retrofit works are typically assessed using formalised technical metrics, most commonly expressed in terms of annual energy consumption or carbon emissions per unit of floor area. Policy and funding programmes often use EPC ratings as proxies for minimum technical standards or as benchmarks for higher-level improvements, such as those defined in BSI PAS 2035.

 **We need to train people not just to install but to maintain buildings for 100 years. (I15)**

By contrast, RMI activities are generally less regulated and are not evaluated against formal metrics. Unlike retrofits, they are rarely guided by technical or regulatory standards and are instead driven by cosmetic upgrades, functional improvements, and the need for routine upkeep. →

Retrofit	“Retrofit is a process of making changes to buildings and technical systems in buildings so that energy consumption and associated carbon dioxide emissions are reduced, in line with energy and climate and policy goals. The work involves reducing heat loss (via insulation, minimal thermal bridging, improved airtightness and controlled ventilation), installing low carbon heating systems such as heat pumps, as well as efficient lighting and appliances and building-integrated renewable energy technologies, such as solar panels.” ¹³
RMI	“...work includes all forms of construction and maintenance activity on existing homes, from window replacement to adding extensions. Factors relating to energy efficiency are not typically a primary objective of RMI work and the individuals already making a living within repair and maintenance may not see benefit in expanding to cover energy-related retrofit.” ¹⁴

Table 3: Domestic retrofit and RMI definitions

13. Killip, G., Fawcett, T., Jofeh, C., Owen, A. M., Topouzi, M, Wade, F. (2021) Building on our strengths: a market transformation approach to energy retrofit in UK homes, Federation of Master Builders/Centre for Research into Energy Demand Solutions <https://www.creds.ac.uk/building-on-our-strengths-transformation-to-energy-retrofit/>

14. Murtagh, N., Owen, A., & Simpson, K. (2021). What motivates building repair-maintenance practitioners to include or avoid energy efficiency measures? Evidence from three studies in the United Kingdom. *Energy Research & Social Science*, 73, 101943. <https://doi.org/10.1016/j.erss.2021.101943>

THE RELATIONSHIP BETWEEN RETROFIT AND RMI

Retrofit and RMI are not mutually exclusive but intersect and often overlap in the scope of works, though not necessarily in the associated standards, skills, training, or workforce requirements, as Table 4 illustrates.

Retrofit can be done all at once or in phased stages. Research on retrofit timing and decision-making shows that property owners frequently design projects to meet multiple objectives. A retrofit may be undertaken solely for energy reasons (e.g., fitting external wall insulation to a home that otherwise needs no repair), or it may begin as RMI and incorporate energy improvements (e.g., adding external wall insulation while replacing worn or damaged external render). RMI tasks may be required ahead of retrofit to prepare the building appropriately, particularly where moisture risks occur.

Similarly, the installation of energy systems or equipment may occur alongside building-fabric upgrades or as a standalone intervention.

In practice, once energy retrofit is undertaken, repairs, maintenance, and other improvements are typically integrated into a single, coherent package of works under PAS 2035, or within a whole-house plan that may be delivered either as a one-off project or in stages.¹⁵ Building improvement approaches can be more piecemeal according to available time and resources. Either approach has direct implications for the design and delivery of sectoral VET, which must prepare practitioners to work on multi-trade, whole-building projects. →

Aspect	Domestic retrofit	RMI	Overlap/interaction
Main focus	Energy efficiency Carbon reduction Sustainability	Repairs, maintenance, general improvements	Retrofit measures can be integrated into RMI and will require RMI when products reach the end of their life
Typical skills	Building physics Insulation Renewable technologies	Carpentry Plastering Plumbing Electrics General trades	Trades people can currently work across both retrofit and RMI
Training	Retrofit-specific courses New qualifications	Traditional trade qualifications	Foundation skills often the same
Standards	Building regulations Voluntary retrofit standards PAS 2035 Technical quality standards BSI codes of practice	Building regulations Safety Cosmetic quality Codes of practice	Retrofit adds new compliance requirements
Workforce	Retrofit specialists Upskilled RMI practitioners	Micro-enterprises Sole traders Tradespeople	RMI workforce can deliver retrofit with training

Table 4: Summary of characteristics retrofit vs RMI

15. Fawcett, T., & Topouzi, M. (2019). The time dimension in deep renovation: Evidence and analysis from across the EU. In eceee 2019 Summer Study on *Energy Efficiency: Is efficient sufficient?* (pp. 1253–1258). European Council for an Energy-Efficient Economy



Figure 6: Case example of integrated RMI and energy retrofit in an existing home

Is it RMI or retrofit or both? Figure 6 shows an existing project in which building works were sequenced to maximise the opportunity presented by access to the building fabric, using careful planning and integrated design/installation.

Scope of works:

- **Repair and maintenance (dealing with wear and tear, preventative maintenance, resolving safety issues):** replace a leaking drain, resolve damp problem in wall, replace unsafe gas pipe, replace old concrete floor
- **Improvements (providing more or better service to occupants):** build an extension, fit a new kitchen

- **Retrofit (tasks to improve energy efficiency and reduce CO₂ emissions):** insulate walls of pre-existing kitchen, build an insulated new floor, insulate new extension to exceed Building Regulations, install under-floor heating (ready for future heat pump), fit efficient new windows and external doors.

Interpretation of intervention: Is it retrofit, RMI or both? Both. The project combines repair, maintenance, and general improvements with targeted energy-efficiency measures, delivered together as a coordinated package of works. It also demonstrates forward planning (under-floor heating to make the home more suitable for a heat pump at a later date).

RETROFIT AND RMI AS REPEATING, CYCLICAL PROCESSES

Why this matters: buildings evolve over time. Yet in climate and energy policy debates, retrofit is too often cast as a one-off, “fit-and-forget” exercise — installing materials and technologies to deliver long-term energy savings and carbon reductions. Many components do have long service lives, but none are permanent. Whether a home is new or has been retrofitted before, it will still require ongoing repairs,

maintenance, and adaptations as household needs, lifestyles, and ownership change.

From one-off to ongoing circular lifecycle view: retrofit and RMI should be understood as cyclical and interdependent rather than isolated events. A more accurate framing than “fit and forget” is “maintain and manage.” Doing this well depends on competent assessment of the existing building, clear identification of risks and opportunities, and coordination across trades. →

Decision points and natural triggers: households encounter recurring decision moments — e.g., “move or improve,” accommodating a new baby, caring for older relatives, or doing routine maintenance. These life stages can trigger RMI works, which in turn create efficient opportunities to integrate energy measures (and vice versa). Even minor works (like redecorating) can unintentionally damage previous energy upgrades (e.g., internal insulation), underscoring the need to plan RMI with awareness of existing retrofit systems.

Depth and legacy: the more ambitious the project, the more it is likely to need multi-trade teams. But whether shallow or deep, retrofit commonly overlaps with RMI activities — even when energy efficiency is not the primary driver. In previously retrofitted homes, any RMI must account for legacy materials and systems to avoid performance losses.

Figure 7, shows the ongoing cycle of activity across a building’s life and how RMI and retrofit intersect:

- The intersection shows where RMI and retrofit are planned and delivered together, with indicative lifespans of individual measures
- The four stages — Preparation, Design, Construction, and In-Use — are all potential entry points. Retrofit can begin at any stage and loop back as evidence and circumstances evolve, whereas RMI activity is mostly concentrated in the post-construction and in-use phase
- Feedback loops (monitoring performance, user experience, and building audits) ideally feed forward to the next round of decisions, fine-tuning operation or prompting further upgrades. →

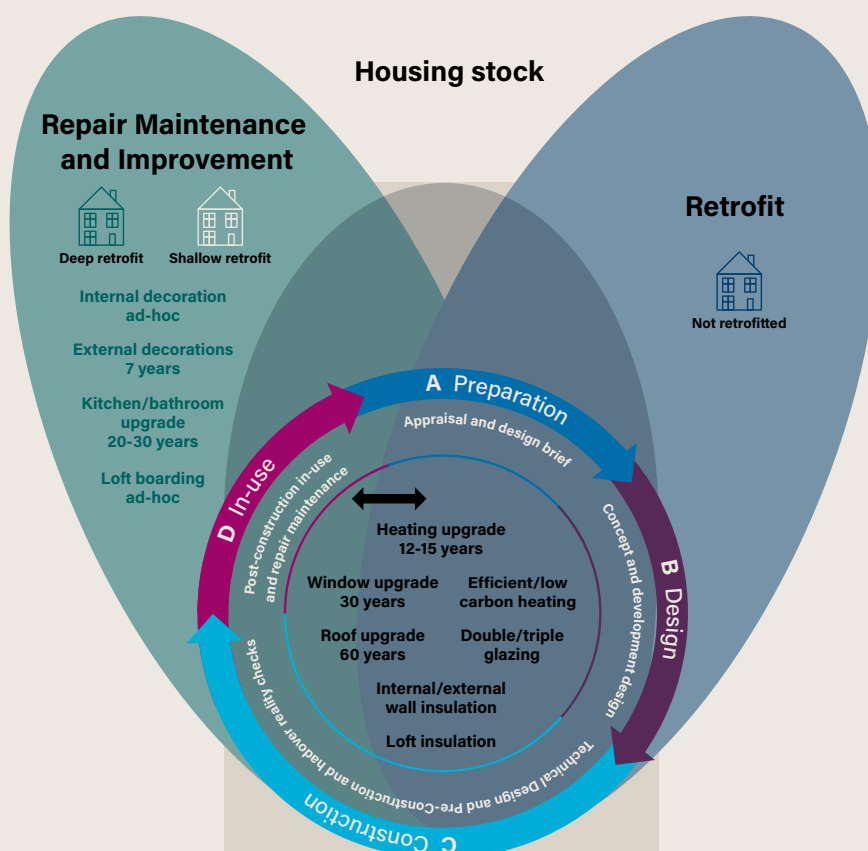


Figure 7. Intersection between Retrofit and RMI (grey shaded area), outline of key work stages in the retrofit process, and examples of measures/works¹⁶

16. Adapted from: Topouzi, M., Killip, G., & Owen, A. (2017). Retrofit 'daemons' in the process of low-carbon housing stock renovation. In *Proceedings of the eceee 2017 Summer Study on Energy Efficiency* (Paper 8-207-17). European Council for an Energy-Efficient Economy; and Killip, G., Fawcett, T., Jofeh, C., Owen, A. M., Topouzi, M., & Wade, F. (2021). Building on our strengths: A market transformation approach to energy retrofit in UK homes. Centre for Research into Energy Demand Solutions (CREDS).

Together, these elements emphasise that retrofit is not a single event, but a process embedded within the building lifecycle, with repeated intersections between RMI and energy measures. For example, a house that has already been retrofitted — either through a shallow or deep retrofit — or is newly built, may, after 7 to 10 years, require external or internal decorative improvements or other types of work that could affect the existing insulation measures. In this case, understanding and assessing the current condition of the building before any RMI intervention is crucial, as such works could otherwise have unintended consequences and significantly reduce the building's energy performance.

The interdependencies between RMI and retrofit are not taught in any systematic way, creating an important gap in training provision:



We need a module [...] That enables people doing those maintenance jobs to understand exactly the implication that their work will have and whether they can do it. (I03)

This highlights the overlap of retrofit that VET for the RMI sector needs to equip the sectoral workforce with the understanding, skills and competence to assess (or 'read') a building, take account of the building lifecycle, identify key intervention points for upgrades, and recognise intersection points and legacy aspects of RMI and retrofit works. ●





Retrofit quality matters

Pages 27 to 33

Retrofit quality matters in terms of delivering safe home retrofits that result in healthy internal environments, minimise risks to the building fabric and meet designed targets.

Improving the UK's poor-quality housing could save £135.5bn over 30 years through reductions in NHS costs and improved health, reduced energy bills, and carbon emissions.¹⁷ Between 1988 to 2022 almost 200,000 deaths are attributed to the cold and almost 52,000 during the same period to the heat; with over 4,500 from heat in 2022 alone, across England.¹⁸ The built environment should offer protection from external elements, yet climate extremes are intensifying, and temperature-related deaths are increasing. Those living with disabilities, who are older or very young are disproportionately affected as they may require electricity for medical devices, spend more time at home, be less able to adapt to temperature changes or have conditions which require additional heating or cooling.¹⁹

Hundreds of thousands of GB households spend over 10% of their income (after housing costs) on domestic energy, in England in 2024 this was 36.3% of households; Scotland 34% in 2023,²⁰ and 25% of households in Wales using the same estimate in 2024.²¹ These percentages are expected to rise in 2025. Fuel poverty results from high energy costs, low energy efficiency of homes and low incomes. As a result of underheating, along with other factors such as overcrowding, poor property condition and poor-quality insulation or faulty ventilation systems, in 2023, 8.7% of private rented, 8.5% of social rented, and 3.3% of owner-occupied households with children experienced condensation or mould, in England.²² With 14% of homes in England failing Decent Homes standards, the sector must adopt a holistic approach that integrates occupant wellbeing and climate resilience.

Poor quality retrofit and maintenance work can undermine potential benefits of retrofit. One participant suggested knowledge and skills on insulation and ventilation detailing are lacking:



We need more people who can do the basics well - like sealing, insulation, and ventilation. (I02)

While insulation and ventilation might be considered 'the basics' by this participant, getting them wrong can lead to negative health impacts and building fabric deterioration. In 2025, a Parliamentary Accounts Committee inquiry followed reports of faulty installations under the Energy Company Obligation 4 and Great British Insulation Scheme.²³ →

17. Building Research Establishment. (2023). *The cost of ignoring poor housing*. BRE Group

18. Office for National Statistics. (2023). *Climate-related mortality and hospital admissions, England and Wales: 1988 to 2022*

19. National Energy Action. (2023). *UK Fuel Poverty Monitor 2021–2022: The hardest hit – Impact of the energy crisis*.

20. Department for Energy Security and Net Zero. (2025). *Annual fuel poverty statistics report: 2025 (2023 and 2024 data)*

21. Welsh Government. (2025). *Fuel poverty in Wales: Interactive dashboard*. Retrieved from <https://www.gov.wales/fuel-poverty-interactive-dashboard>

22. Ministry of Housing, Communities & Local Government. (2025). *English Housing Survey 2023 to 2024: Health and housing – fact sheet*

23. UK Parliament. (2025). *Faulty energy efficiency installations: Inquiry by the Public Accounts Committee*

The National Audit Office (NAO) then published its investigation into energy efficiency installations. NAO (2025) found that over 30,000 households were affected by issues of poor-quality, such as missing insulation and poor ventilation, leading to damp and mould.²⁴ Of the 3% of households with external wall insulation installed, 98% (22,000 to 23,000) are believed by DESNZ and Ofgem to require major remediation at an estimated cost of £250–£18,000 per home in the cases of external wall insulation but in some case higher, with one case estimated over £250,000 to remediate. Up to 2,000 homes with external wall insulation and 1,400 with internal wall insulation are posing immediate health and safety risks due to issues such as blocked boiler ventilation and exposed electrical cabling; a combination of energy retrofit and repair and maintenance issues. As a result of the audit, TrustMark suspended 38 installers, as of September 2025, 21 installers were reinstated following remediation of identified problems. The problems found can significantly disrupt households in terms of their physical and mental health, the home should be a place that enables rest and comfort. This participant reflected on the context of working in people's homes during an interview:



It's not just the technical aspects... It's that you're working with the public, you're working with people in their homes. (I16)

Previous research on householder experiences of refurbishment found that the unexpected disruption, delay, safety and quality concerns relating to housing retrofit/RMI can cause considerable stress.²⁵ Citizens' Advice recommend a redress scheme for households as remediation support is difficult to find even when using accredited installers.²⁶ One good example of redress is the National Energy Action project which helped 45 households in Fishwick which suffered from poorly installed external

wall insulation in 2013, as a result of these remediations resident satisfaction and quality of life improvements were observed.²⁷

In 2025, Citizen's Advice published a report based on insights from 10,698 households surveyed in 2024 and find that despite interest in energy efficiency measures, 73% express concern about the process and 86% concern in selecting a contractor. As a result, they recommend a national advice service and a reformed consumer protection landscape specifically for home retrofit with a single, mandatory quality scheme and a single Ombudsman.²⁸

Unfortunately, poor public perception of retrofit is nothing new. Policy failings have also undermined confidence in retrofit. In 2016, the NAO published a review of the first ECO scheme alongside the Green Deal. The Green Deal was a policy scheme that ran 2013 to 2015, offering a loan to homeowners for retrofit measures, and was scrapped suddenly due to low uptake – partly because of the high-interest rates on borrowing. ECO and the Green Deal were initiated with the intention of developing a supply chain for 'hard-to-treat' homes over ten years. However, the previous Department for Energy and Climate Change reduced the ambition to 15 months.²⁹

The Department then planned to replace ECO with a smaller obligation aiming to address fuel poverty. The future of energy efficiency schemes was at that time uncertain. The 2016 NAO report noted that the uncertainty with its main stakeholders – households, small businesses and energy suppliers – could increase the long-term cost of improving the housing stock. The NAO also recognised the risk to supply chain enterprises investing in skills and equipment as the Government could deprioritise energy efficiency in future schemes. →

24. National Audit Office. (2025). *Energy efficiency installations under the Energy Company Obligation*. Department for Energy Security & Net Zero

25. Simpson, K. (2017). *Energy efficiency refurbishment of UK owner-occupied homes: The householders' perspective* [Doctoral thesis, Loughborough University]. Loughborough University Repository

26. Citizens Advice. (2024). *Hitting a wall: Protecting consumers who install net zero technologies*

27. National Energy Action. (2025). *Rebuilding trust: Learnings from Fishwick*

28. Citizens' Advice. (2025). *Consumer attitudes to retrofit*

29. National Audit Office. (2016). *Green Deal and Energy Company Obligation*. Department of Energy & Climate Change

Table 5 summarises previous NAO Audit Reports on UK Energy Efficiency Schemes. The first scheme; Warm Front, launched 20 years ago in 2005. The need to improve engagement with the sector, monitoring of outcomes and clarify standards and success criteria have been consistent conclusions throughout each of the four audits dated 2009,³⁰ 2016, 2021³¹ and 2025.

Standards have progressed for publicly funded retrofit work following the Each Home Counts review focused on consumer advice, protection, monitoring, enforcement and standards in retrofit, stemming from challenges in the delivery of ECO and the Green Deal.³² Yet, while PAS2035 and

PAS2030 standards aim to improve the quality of retrofit work, their inconsistent application, non-mandatory status for all retrofits and perceived complexity limit their overall effectiveness.

Many installers view these standards as bureaucratic and disconnected from practical realities.³³ In a study based on interviews on willingness to engage with energy efficiency with 31 micro-to-small enterprises operating in the RMI sector, maintaining a viable business was a primary driver. They were found to be highly motivated to deliver satisfaction for customers but lacked confidence in technical standards.³⁴ →

Scheme name	Report date	Scheme dates	Public investment amount	Typical measures installed	Quality and monitoring recommendations
Warm Front Scheme	4 Feb 2009	2005–2013	£852 million	Central heating systems Insulation	Improve targeting and data collection Monitor contractor performance Assess impact on fuel poverty
Green Deal and ECO	14 Apr 2016	2013–2015 (Green Deal) 2013–present (ECO)	£3.2bn	Solid wall insulation Boiler upgrades Loft and cavity wall insulation	Set clear success criteria Improve data on costs and savings Monitor retrofit quality
Green Homes Grant	8 Sep 2021	2020–2021	£314 million	Insulation Low-carbon heating systems	Ensure realistic timelines Strengthen installer engagement Simplify processes Improve oversight
Energy Company Obligation (ECO)	14 Oct 2025	2013–present (ECO4: 2022–2026 GBIS: 2023–2026)	Not specified £280 million annual savings expected	External and internal wall insulation Loft insulation	Reform consumer protection Audit subcontractors Clarify standards Address workforce competence

Table 5: Summary of key UK energy efficiency schemes for housing

³⁰. National Audit Office. (2009). The Warm Front Scheme. Department of Energy and Climate Change

³¹. National Audit Office. (2021). Green Homes Grant Voucher Scheme. Department for Business, Energy & Industrial Strategy

³². Bonfield, P. (2016). *Each Home Counts: Review of consumer advice, protection, standards and enforcement for energy efficiency and renewable energy*. Department for Business, Energy & Industrial Strategy

³³. Fylan, F., & Glew, D. (2022). Barriers to domestic retrofit quality: Are failures in retrofit standards a failure of retrofit standards? *Indoor and Built Environment*, 31(3), 710–718. <https://doi.org/10.1177/1420326X211027197>

³⁴. Murtagh, N., Owen, A. M., & Simpson, K. (2021). *Written evidence submitted to the Environmental Audit Committee: Sustainability of the built environment* (SBE0035). UK Parliament

Fragmented responsibilities and a lack of legal obligations for reporting further hinder uptake. The role of the retrofit coordinator was introduced in 2019, under projects requiring alignment with PAS 2035. The retrofit coordinator:

"Is an individual who project-manages a retrofit project on a dwelling and in doing so oversees its assessment, the identification and specification and evaluation of energy measures for installation and their subsequent monitoring and evaluation."³⁵

The retrofit coordinator role is much like a clerk of works, a UK term for a practitioner who oversees construction work on-site. This role has been recommended in research to minimise building defects or shortfalls towards zero-carbon performance detailing.³⁶ In private retrofit projects, there is no formal obligation for either a retrofit coordinator or a clerk of works to ensure quality. Multiple challenges with the current building control system were identified in the Hackitt Review, one of which is the part-privatisation of the sector. This has created competition for work between Local Authority Building Control and Approved Inspectors (private building control practitioners). Both groups need to secure ongoing work and may therefore be inclined to act favourably toward contractors, who have the freedom to choose their building control officers independently.³⁷

With retrofit training and oversight being under-invested and the supply chain development being hindered by inconsistent policies with a lack of attention on skills the current gap in understanding of retrofit detailing and outcomes is unsurprising:



There's a lack of understanding of what retrofit actually involves, even among experienced tradespeople. (I01)

The lack of understanding is contributed to through a lack of consistent outcomes evaluation of retrofit schemes, including on public health³⁸ is a risk to both public spending and housing quality.

The new British Standard BS 40104:2025 aims to clarify retrofit assessment methods to understand quality of delivery,³⁹ however, it currently sits behind a paywall and is not mandated.

A study investigating 38 Local Skills Improvement Plans in relation to energy retrofit, proposed for all the relevant RMI qualifications in the construction sector to include retrofitting and building physics.⁴⁰ The challenge is not limited to on-site manual craft trades; building surveying also needs to integrate ventilation assessment into its work — a change which is in development with the new RICS Retrofit Standard, alongside BS 40104:2025:



We now hopefully will start to carry around airflow meters and start to look at extracts and things like that. Because [...] You know, we can't recommend things like insulation upgrades, airtight upgrades and ignore the fact that the bathroom extract fan doesn't work [...] Because we're setting ourselves up for a fall here. (I09) →

35. TrustMark. (2022). *Retrofit Coordinator Scheme Requirements v1.3*. PAS 2035

36. Simpson, K., Janda, K. B., & Owen, A. (2020). Preparing 'middle actors' to deliver zero-carbon building transitions. *Buildings and Cities*, 1(1), 610–624. <https://doi.org/10.5334/bc.53>

37. Hackitt, J. (2018). *Building a Safer Future: Independent Review of Building Regulations and Fire Safety – Final Report* (Cm 9607). UK Ministry of Housing, Communities and Local Government

38. National Retrofit Hub. (2025). *Measuring Outcomes & Impact Evaluation: Measuring for success?*

39. Fitton, R. (2025) BS 40104 aims to clarify retrofit assessment. *Property Journal*, RICS

40. Ravenscroft, C. (2024). *Ready for retrofit? An analysis of Local Skills Improvement Plans in England*. Gatsby Foundation

This attention to ventilation detail and quality of existing devices such as extractor fans is important and inclusion in building surveying practices of ventilation systems would be a positive step forward.

Due to the focus on fuel-poverty alleviation, evaluating outcomes from retrofit are critical for health and wellbeing of those residents, who are more likely to be vulnerable and living with multiple health diagnoses. Improvements in indoor environmental quality such as better thermal comfort, reduced moisture, and enhanced acoustic conditions, can lead to lower winter mortality and improved respiratory and cardiovascular health.⁴¹ However, these benefits depend on effective ventilation and moisture control, which can be compromised when PAS2030 and PAS2035 are poorly implemented or misunderstood. The ARDEN study found that deep energy retrofits improved comfort but frequently led to under-ventilation and increases in indoor particulate counts (PM2.5), particularly in bedrooms, due to inadequate mechanical ventilation and limited user understanding of new technologies in their home.⁴²

Yet, across both GB and internationally, the quality of monitoring data — including that on indoor air quality, comfort, and the health impacts of home energy retrofitting — is particularly poor,⁴³ making it difficult to strengthen quality standards in housing improvement. The urgency of addressing damp and mould in homes is reinforced by Awaab's Law, which comes into force in October 2025 across the UK. It requires social landlords to address emergency hazards and significant damp and mould risks, following the death of two-year-old Awaab Ishak from respiratory illness caused by mould exposure.⁴⁴ Retrofit and maintenance strategies must evolve to support quality retrofit that includes evaluation of health outcomes. One interviewee summed up the risk as:



We've got a ticking time-bomb. (I06) →

41. Lozinsky, C., Casquero-Modrego, N., & Walker, I. S. (2025). The health and indoor environmental quality impacts of residential building envelope retrofits: A literature review. *Building and Environment*, 270, 112568. <https://doi.org/10.1016/j.buildenv.2025.112568>
42. Hassan, H., Mishra, A. K., Cowie, H., & Coggins, M. (2024). Estimating the health impact of exposure to indoor PM2.5 concentrations in Irish deep energy retrofitted residential dwellings. *Proceedings of the AIVC Conference*
43. Hanna, R., Simpson, K., Camacho McCluskey, K. and Gross, R. (2025) [Accelerating energy efficiency retrofits in owner-occupied homes | UKERC | The UK Energy Research Centre](#)
44. Ministry of Housing, Communities & Local Government. (2025). *Awaab's Law: Guidance for social landlords – Timeframes for repairs in the social rented sector*

THE DESIGN-PERFORMANCE GAP

The quality and successful integration of retrofit design and installation are important for outcomes in terms of real-life energy performance and other indicators of good-quality outcomes (e.g. comfort, resident satisfaction). The behaviour of residents and their use of technology in a home have a bearing on energy performance, with some households using relatively more energy than others. Such variation across the population is normal and to be expected: it is a misconception (among some in the industry) that variation in energy performance can be attributed solely to householders. Industry practice and the organisation of project teams also have a direct bearing on energy performance, with real-world performance being significantly higher than intended or expected at design stage. A review of over 100 studies on the design-performance gap highlighted three broad causes connected with industry education and practice:

- Poor communication
- Poor technical understanding
- Unclear roles and responsibilities⁴⁵

Research also shows that, where design and installation are integrated and done with care in a well-managed process, it is possible to significantly reduce the design-performance gap.⁴⁶ Despite these studies being over ten years old, the challenges remain.

For construction work in relation to climate and energy policy, the design-performance gap is important. Studies by the CCC and others set out how the UK can achieve net zero, using scenarios for technology deployment that effectively assume perfect installation every time. If the design-performance gap is not addressed (and the gap massively reduced), then the building sector will use more energy and emit more CO₂ than necessary, adding extra, avoidable cost to bill-payers and potentially undermining net zero policy.

Minimising this risk requires better retrofit quality that can be strengthened through education — improving communication and technical understanding — as well as through better project and team management, with clear accountability, defined roles and responsibilities, and effective feedback loops to prevent the repetition of failures.

Quality assurance must address not only technical standards but also the processes that underpin retrofit delivery throughout the entire building lifecycle. Construction skills, competence, knowledge, and industry behaviours are all integral to this effort.



...It's so important that we get this right because we don't want a public perception of retrofit being a risk to properties because our houses are really important to us, aren't they? (I08) ●

⁴⁵. Zero Carbon Hub (2014) Closing the gap between design and as-built performance: Evidence review report. Available: https://building-performance.network/wp-content/uploads/2023/05/Closing_the_Gap_Between_Design_and_As-Built_Performance-Evidence_Review_Report_0.pdf

⁴⁶. Johnston, D., Farmer, D., Brooke-Peat, M., & Miles-Shenton, D. (2014). Bridging the domestic building fabric performance gap. *Building Research & Information*, 44(2): 147–159. <https://doi.org/10.1080/09613218.2014.979093>

A high-angle photograph of a group of people, including two women and a man, gathered around a wooden table. They are looking at and pointing to architectural blueprints spread across the table. On the table, there is also a tablet, a coffee cup, and a small container with pens and pencils. A large, semi-transparent white circle is centered over the image, containing the title and page information.

Competence

Pages 34 to 40

'Competence' is defined as a combination of four personal attributes — the first two of which can be taught, and the latter two of which must be developed, at least in part, through workplace experience:

- **Skills:** ability to perform a task required; practical manipulation of tools and materials
- **Knowledge:** theory underlying skills; understanding that enables someone to create new solutions from first principles
- **Experience:** time spent in the workplace or relevant context, where skills and knowledge are practised and developed; repeated successful applications of skills and knowledge; linked to career stage
- **Behaviour:** self-reflexivity, taking responsibility for future training needs (e.g. CPD), acting with honesty and integrity towards others, professionalism.

For skills training a key component of the new competence frameworks (Table 6) is the process for validating — and periodically revalidating — competence. This relates to the various methods used to assess existing knowledge, initial training, and CPD, including written tests, practical exercises, observation, and questioning. Taken together, the elements of the competence frameworks form a structure that integrates different types of learning, practical experience, and cultural attitudes or dispositions (such as acting with integrity). They also provide mechanisms for assessing and validating overall competence — encompassing not only technical expertise but also the soft and behavioural skills that support effective work processes. →

Term	Definition
Competence	Application of skills, knowledge, experience and behaviour to achieve a defined outcome
Skills	Ability to perform an activity or task consistently with a specific intended outcome
Knowledge	Retrofit-specific courses, new qualifications
Experience	Participation in relevant activities or observation of facts and events leading to acquisition or improvement of knowledge and skills
Behaviour	Observable things that an individual does or does not do
Validation	Formal process of assessing an individual's competence against a sector-specific competence framework
Revalidation	Formal process of reassessing an individual's competence against a sector-specific framework on a periodic basis to check that competence has been maintained and is up to date

Table 6: Definitions of key terms in the development of competence frameworks⁴⁷

47. Cited in CITB Competence Framework for External Wall Insulation, based on BS8670-1:2024 <https://www.citb.co.uk/standards-and-delivering-training/training-standards/competence-frameworks/#whatare>

COMPETENCE, OUTCOMES AND BUILDING PERFORMANCE

While the new competence frameworks provide a clear and useful way of thinking about skills development in context, they are generally defined in terms of individual job roles (e.g. bricklaying) or specific tasks (e.g. external wall insulation). They do not yet focus on the outcomes of a whole project or the quality of building performance that derives from the coordinated activities of a whole team of different people working together to achieve a shared goal. Furthermore, building performance measurement methods are not demonstrated to trades trainees, as standard. Evidence from CITB and the Construction Leadership Council (CLC) skills reviews indicates that building performance measurement and verification methods are not routinely demonstrated or assessed within standard trades training programmes, remaining limited to specialist retrofit courses.^{48,49}

The construction VET sector typically takes a task-oriented approach to the organisation and development of training. With relatively few exceptions (e.g. Health and Safety training), courses are designed to fit with established job roles. So, for example, courses for carpentry focus on the tools, materials and skills needed for working with timber. If the industry is to achieve consistently high-quality retrofit projects, then there needs to be a process for mapping the requirements of quality

onto the future needs of the sector and to work out the implications for conventional job roles. One interviewee summed this up as a 'back-casting' approach, which starts at the desired endpoint and does the thinking 'in reverse' to understand what needs to be done to get from the current starting point to that desired endpoint:



... These are the competences that people need to demonstrate and practise. [...] So just work back from competence. (I01)

This idea may sound straight-forward enough, but it is radical in two important respects. Firstly, it goes against established practice, which is firmly wedded to thinking about work and training in terms of jobs and tasks, not quality of outcomes. Secondly, it assumes that the definition of competence can and will be used as a basis for effective vocational training reform. An interviewee who had tried to do this talked about how hard it is in practice:



We tried to co-develop a multi-skilled technician course... But couldn't get it off the ground. (I15)

The CLC's 'Roadmap of Skills for Net Zero' sets out two sets of competencies for retrofit, which provide an example of this 'back-casting' approach (Table 7). It is worth highlighting that the retrofit/RMI workplace (unlike a new construction site) often brings the workforce into contact with residents (private property owners or tenants). →

Core transferable competencies	Overarching technical competencies
Retrofit advocacy	Regulatory landscape
Communication	Client needs and advice
Collaboration	Cost
Commitment to excellence	Property assessment
Continuous improvement	Technology and design
Digital	Coordination and integration
	Evaluation, monitoring and feedback loops

Table 7: Proposed transferable and technical competencies for retrofit competence⁵⁰

48. Construction Industry Training Board (CITB). (2021). Building Skills for Net Zero. Retrieved from: https://www.citb.co.uk/media/vnfoegub/b06414_net_zero_report_v12.pdf

49. Construction Leadership Council (CLC). (2024). *Roadmap of Skills for Net Zero: Competencies for Domestic Retrofit*. Retrieved from: https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2024/05/CLC-Roadmap-of-Skills-for-Net-Zero-Report_07-May-2024.pdf

The need to communicate and negotiate with residents arguably makes communication skills particularly relevant in retrofit/RMI, especially where changes are made to a property that the residents do not fully understand:



So the softer skills are most definitely needed and I probably think more so in a retrofit [...] scenario where you've got someone who's already a tenant or already a homeowner living in a home and suddenly they have a change in energy system [...] and it requires [behaviour] changes to get the most out of it. (I15)

THE 'T-SHAPED' PROFESSIONAL

Research on low-energy construction expertise highlights the need for better, more integrated teamwork, where each worker has a sufficient understanding of what other workers are doing, to deliver high-quality projects with few defects and good performance.⁵¹ Partly this requires shared understanding of general principles (theoretical knowledge), and partly it is about communication and collaborative working. At the same time, each individual trade specialism has specific competences that are specialist in nature.

The concept of the T-shaped professional has been proposed to describe the combination of broad capabilities (holistic thinking and team-working) and narrower skillsets (specialisms). The need for self-reflexivity and self-evaluation over time (in response to innovation and uncertainty) is also captured in the T-shaped professional model (Figure 8). →

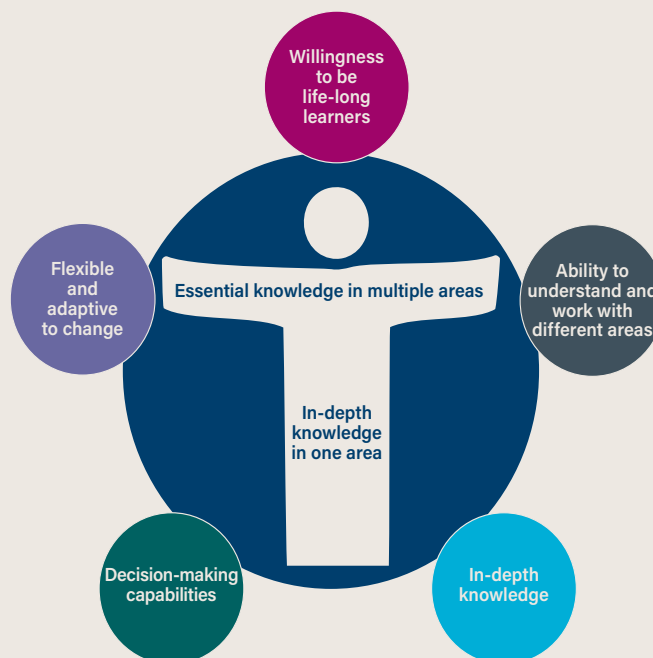


Figure 8: A model of the T-shaped professional⁵²

50. CLC (2024) Roadmap of skills for Net Zero: Competences for domestic retrofit. Available: https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2024/05/CLC-Roadmap-of-Skills-for-Net-Zero-Report_07-May-2024.pdf

51. Clarke, L., Gleeson, C., & Winch, C. (2016). What kind of expertise is needed for low energy construction? *Construction Management and Economics*, 35(3): 78–89. <https://doi.org/10.1080/01446193.2016.1248988>

52. Ninan et al. (2022) Educating engineers of the future: T-shaped professionals for managing infrastructure projects, *Project Leadership and Society*, 3:100071, <https://doi.org/10.1016/j.plas.2022.100071>

An example of where the T-shaped professional can be applied to the training system is on interfaces – the physical junctions between elements of a building (e.g. floor/wall), the connections between systems operating in a building (e.g. heating systems, controls and users), and the interactions between different professionals and craft trades. The need to understand interfaces and the wider context of a specific task can be seen in this example of the job of fitting or replacing windows:



We need to know that the person [who] is installing the structure around the window and the window openings [...] Is also understanding the air tightness seals and the thermal breaks that go in around that window, so that that's all done and installed [...] Properly [...] Those interfaces of where each trade starts and finishes are critical. (I15)

DEVELOPING A T-SHAPED RETROFIT/RMI WORKFORCE

For the development of an RMI Sector Skills Plan, the model of the T-shaped professional prompts consideration of the shared elements of competence, which could be the subject of a new kind of foundational training across all trades and professions.

It is beyond the remit of this report to provide definitive descriptions of shared elements of competence for retrofit/RMI, but the research team suggest an initial list of topics to inform debate and further development work (Table 8). →

Topic area	Rationale
Communication	Key to team-working, customer care and minimising design-performance gaps
Assessment of the existing building	A key step in the retrofit wheel (see chapter 3)
Roles and responsibilities within a team	Key to team-working and minimising design-performance gaps
Taking account of outcomes and building performance	Key to team-working and minimising design-performance gaps
Customer care	Retrofit/RMI work takes place in people's homes, not on unoccupied building sites; customer care is important
The existing building stock	Underlying knowledge of the existing stock to support the development of competence for assessment
Applied building physics	Many technical risks of poor performance and structural damage link to building physics
Interfaces	Key to team-working and minimising design-performance gaps
Sustainability impacts of buildings	Underlying knowledge to support decision-making for design and installation: 'know-why'; not just 'know-how' and 'know-what'
Assessing and managing risks	Linked to building assessment and project management; taking account of risks in decision-making
Self-evaluation	Knowing one's limits, learning to seek expert help where necessary
Self-behaving with integrity	Essential to well-managed teams and projects

Table 8: Suggested topic areas for developing shared competence in a T-shaped retrofit/RMI workforce



There is recognition of the need for cross-cutting knowledge, such as building physics, digital construction, and heritage skills, to break down traditional trade silos and support integrated approaches like retrofit. Alongside technical training, there is also a focus on soft skills (or “meta skills”) such as communication and innovation, though these are currently tailored to each apprenticeship framework rather than delivered as standardised modules. Overall, [...] The challenge [is] balancing technical, cross-disciplinary, and interpersonal training within existing systems and resources. (111)

COMPETENCE, QUALITY ASSURANCE AND CONTINUOUS IMPROVEMENT

Competence needs to be kept under review – both in terms of how it is defined and how it is demonstrated on retrofit projects. Some kind of feedback mechanism is needed between what we expect to observe, what we actually observe, and any possible remedial steps that might be necessary in the light of what we

observe. The CLC envisages a feedback mechanism to achieve this between training, accreditation and compliance (Figure 9). It is worth emphasising that the compliance element of this feedback mechanism refers to compliance checking of actual building works via Building Control. It would require new structures to be put in place between the training sector, accreditation bodies and building inspectors. →

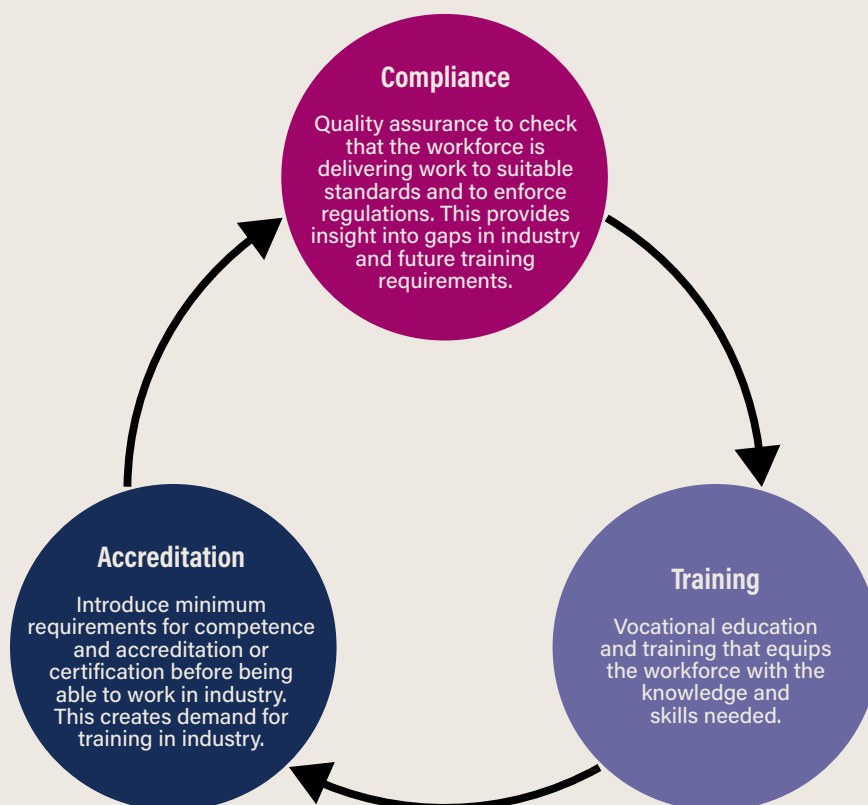


Figure 9: A proposed mechanism for feedback and quality assurance combining training, accreditation and on-site compliance-checking⁵³

53. CLC (2024) Roadmap of skills for Net Zero: Competences for domestic retrofit. Available: https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2024/05/CLC-Roadmap-of-Skills-for-Net-Zero-Report_07-May-2024.pdf

The detail of policy design is important, including how competence for an individual worker relates to management and supervision on projects and in firms. It is surely unrealistic to expect all workers to be equally competent in all conditions, so there are questions to resolve about how to ensure sufficient competence and supervision are in place:

“**Relying on just one qualified person per company is ineffective, as directors can easily re-form businesses, leaving unqualified workers on site. Instead, the industry needs a clear, formal discussion about multiple legitimate pathways into competence, balancing flexibility with robust standards to avoid a grey market of under-qualified workers. (I11)**

CRITICISMS OF CURRENT PRACTICE

While the industry has made progress in terms of defining competence and the high-level roadmap that gives direction, there is still a lot of work to do to translate these ideas into specific changes in the design and practice of training, accreditation and compliance checking. Concerns were raised by several interviewees about the operation of accreditation and ‘competent person’ schemes, where there can be conflicts of interest in the design of systems, and where sanctions for non-compliant work lead to arguments about the strictness of the regime, rather than lessons being learned and remedial steps being taken:

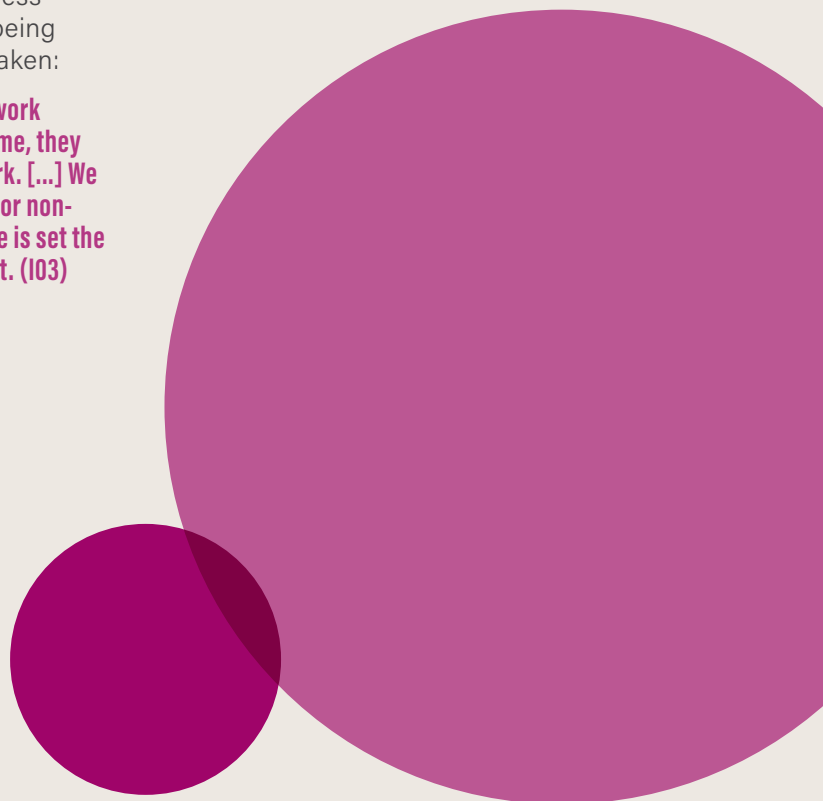
“**If somebody's certified or they work under a competent person scheme, they should be delivering quality work. [...] We shouldn't find [...] Repeated major non-compliance. So, what that's done is set the cat among the pigeons a little bit. (I03)**

From the perspective of historic and traditional buildings, several interviewees expressed concern about the risks of using inappropriate materials and not understanding the relevant principles of temperature, relative humidity and other aspects of building physics. Practical skills and theoretical knowledge should develop hand-in-hand, with both being necessary for practical installation tasks:

“**You have to understand why you might use a lime mortar or plaster [...] You have to support people with understanding why you're suggesting one method over another. (I02)**

A number of interviewees expressed frustration with the sector's poor reputation, high-profile failures, and its apparent inability to improve standards of competence. As one participant noted:

“**Is it going to be cheaper than doing it all twice, you know [...] Going back to the 'Fishwick's' [...] Stuff that's been done in a really shoddy and bad way because it hasn't been designed right [...] You know, it might end up saving in the long run. (I09) ●**



A background image showing a person's hands using a green pencil and a wooden spirit level to mark a wall. The wall is light blue and has some white plaster or tape on it. A large, semi-transparent white circle is overlaid on the image, containing the text.

Skills and jobs

Pages 41 to 45

A widely used classification system for 'green' skills and jobs is helpful when thinking about the work and workforce training required for the decarbonisation of the housing stock (Table 9).

The first two types of 'green' jobs are especially relevant for retrofit. The retrofit coordinator typifies a new role that can help raise standards, but retrofit coordinators are not sufficient on their own. For the RMI sector, the key challenge is in relation to the 'Green enhanced skills' occupations. This covers the large number of existing workers in the sector, who have some or all of the skills needed to carry out RMI tasks, but who lack the cross-cutting, shared skills and understanding of the process needed to carry out retrofit work sufficiently well. The additional learning required is captured in the concept of the T-shaped professional.



We need to show that retrofit is part of the future of construction, not a side hustle. (120)

Discussions about future jobs and skills are, by definition, framed by uncertainty. No-one can know exactly how the economy and job markets will develop. It is helpful to distinguish between the need for change, in line with one or more policy goals, and the real demand for new jobs and skills

that are observable on the ground. Policy need and market demand are not the same. Government targets for meeting net zero by 2050 indicate a need, but additional policy support and funding are required before the climate imperative is reflected in an increased market demand.

SUPPLY, DEMAND AND USE OF SKILLS

Several reports and research studies have highlighted the need to think about jobs and skills together, not separately. The New Economics Foundation argues that 'jobs and skills are two sides of the same coin – you can't solve one without addressing the other.⁵⁵ This echoes an argument about the supply and demand for skills training needing to be in alignment, and the observation that the alignment is the thing that is missing. One interviewee summed it up:



There is no skills gap. At any given time, there are about 200,000 trainees in the construction sector looking for work. The problem is a disjointed system between skills training and employment. The skills that get taught don't necessarily lead to graduates getting jobs. Or the jobs that exist don't necessarily get offered to the people with skills training. (106) →

Type of occupation	Description	Example
Green new/emerging occupations (GNE)	New occupations, new tasks, and new skills requirements within existing sectors or in wholly new sectors	Retrofit coordinator
Green enhanced skills occupations (GES)	Existing occupations that could contribute positively to green objectives if new skills are learned and integrated into practice	Many construction trades - if they become T-shaped professionals with shared, foundational learning
Green increased demand occupations (GID)	Where growth in a given sector will lead to more jobs and more need for skills training, but without significant changes to tasks or skills needs	Solar installer

Table 9: Types of 'green' occupations and skills requirements⁵⁴

⁵⁴. James Relly, S. et al. (2022) Greening construction: a complex challenge for jobs, skills and training. London: The Edge Foundation. Available: <https://www.edge.co.uk/research/projects/research-reports/greening-construction-a-complex-challenge-for-jobs-skills-and-training/> [accessed 07/08/25]

⁵⁵. Balata, F., Chapman, A., Yunda, P., Diski, R. (2023) Skills for a new economy: investing in workers and closing the green skills gap, New Economics Foundation. Available at: <https://neweconomics.org/2023/02/skills-for-a-new-economy> [accessed 15/6/25]

A simple conceptual model of possibilities maps the supply of skills (high or low) on to demand for those same skills (high or low), leading to four possible system states (Table 10).

The mismatches are attested in reality. For example, a report for the Organisation for Economic Co-operation and Development (OECD) in 2017 estimated that 25% of workers were under-qualified for their job and 15% were over-qualified (across the whole UK economy, not just construction). These mismatches can have negative consequences for productivity, pay progression and job satisfaction.⁵⁷

It is common in debates about skills for the discussion to focus exclusively on the provision of new courses and the resources needed to increase training activity. In other words, the focus is solely on supply, not on demand, nor on the reality of jobs markets where trainees might go to find employment. There is a commonplace discourse about 'skills gaps' in construction, leading to a focus on new training provision to fill the gap. However, research in applied educational studies

questions the logic of focusing narrowly on new skills supply, arguing that vocational training needs to be considered in the context of labour markets and the realities of jobs and workplaces in the economy.⁵⁸



If you can think upstream and start developing the skills and creating more trained workforce that is something. But FE colleges then have to [...] provide courses that are commercially viable and have a pipeline. Everything's based on the pipeline. (I17)

To be effective in the labour market, new training provision needs to align with a genuine demand for skills training in the workplace. The industry itself commonly cites the need for a pipeline of work (not just a few projects, but several years' worth of work) as a necessary incentive for firms to be investing in training and taking time away from gainful employment. Without a genuine demand for skills in the labour market, new courses may struggle to recruit enough trainees, leading to courses that ultimately do not last. →

	Low supply	High supply
High demand	Mismatch (under-qualification)	Match (professionalism)
Low demand	Match (low-skills equilibrium)	Mismatch (over-qualification)

Table 10: Matches and mismatches for skills supply and demand⁵⁶

⁵⁶. Killip, G. (2020) 'A reform agenda for UK construction education and practice', *Buildings and Cities*, 1(1), pp. 525–537.

⁵⁷. Balata et al. op. cit.

⁵⁸. Keep, E. (2016). Improving skills utilisation in the UK — Some reflections on what, who and how? (Research Paper 124, August). Centre on Skills, Knowledge and Organisational Performance (SKOPE), University of Oxford. Available: <https://skope.ox.ac.uk/publications/improving-skills-utilisation-in-the-uk-some-reflections-on-what-who-and-how/> [accessed 08/08/25]

Construction trades operate in conditions that have many of the features of a 'low-skills equilibrium' – labour markets with low rates of educational attainment, where low skills go hand-in-hand with low job prestige, low innovation rates, and low job security. The low-skills equilibrium can be conceived as a cycle of influences, which reinforce each other, and which are not quick or easy to change (Figure 10).

For example, where an individual does invest in improving their own skills, they may be able to find better work elsewhere, rather than remaining in the same job or even remaining in the same sector. Where workers with increased skills do leave, the net effect is towards perpetuating the low-skills equilibrium among the workforce who remain.

Research suggests that a low-skills equilibrium can be changed over time, but it requires a concerted effort on multiple fronts, not simply the setting up of new courses. Interventions to shift the system away from the low-skills equilibrium state include:

- **Strategic local partnerships:** Local and regional partnerships should bring together industry, training providers, local authorities, and housing associations to better align the supply, demand, and use of skills. Collaboration between these actors ensures training provision reflects real market needs and local retrofit priorities
- **Flexible training provision:** Training providers, colleges, and industry bodies must innovate in where, when, and how training is delivered — through modular, on-site, or blended learning — so that SMEs and sole traders can participate without losing income or productivity
- **Engage universities and colleges:** working with higher and further education institutions in developing and delivering interdisciplinary, applied retrofit training, using competence frameworks for building outcomes and the T-shaped professional →



Figure 10: Simplified 'low-skills equilibrium' showing how different factors interact to create a stable low-skills state⁵⁹

⁵⁹. Adapted from: Green, A. (2016) Low skill traps in sectors and geographies: underlying factors and means of escape, Institute for Employment Research, University of Warwick, September 2016

- **Innovative working practices:** Construction firms, professional bodies, and trade associations should promote collaborative business models that encourage knowledge sharing, multi-trade coordination, and continuous professional development, rather than subcontracting in isolation
- **Public procurement:** Government and public-sector can drive higher standards by embedding quality, competence, and training requirements in contracts. Leveraging the public retrofit pipeline provides an incentive for firms to invest in workforce capability and accreditation
- **Steer local economic development:** Regional and national policymakers should link retrofit and RMI workforce investment to local economic, social, and environmental objectives, recognising that skills development underpins productivity, resilience, improved health, and place-based regeneration.

Some of these interventions can be found in different places and different parts of the market already. For example, the Social Housing Decarbonisation Fund includes a requirement for retrofit coordinators (trained to PAS 2035). This procurement programme has had an impact on the scale of work and the kinds of companies getting involved:



The funding from Government and client demand from housing associations ... to utilise that funding brought those [bigger] general contractors in. (I01)

However, the currency of PAS 2035 standards is mostly limited to Government-funded programmes (in the social housing sector, and for vulnerable groups) where the standards are a condition of grant funding. In the private RMI market and college-based training, it is less well-established, reflecting the much less mature market for retrofit in private homes:



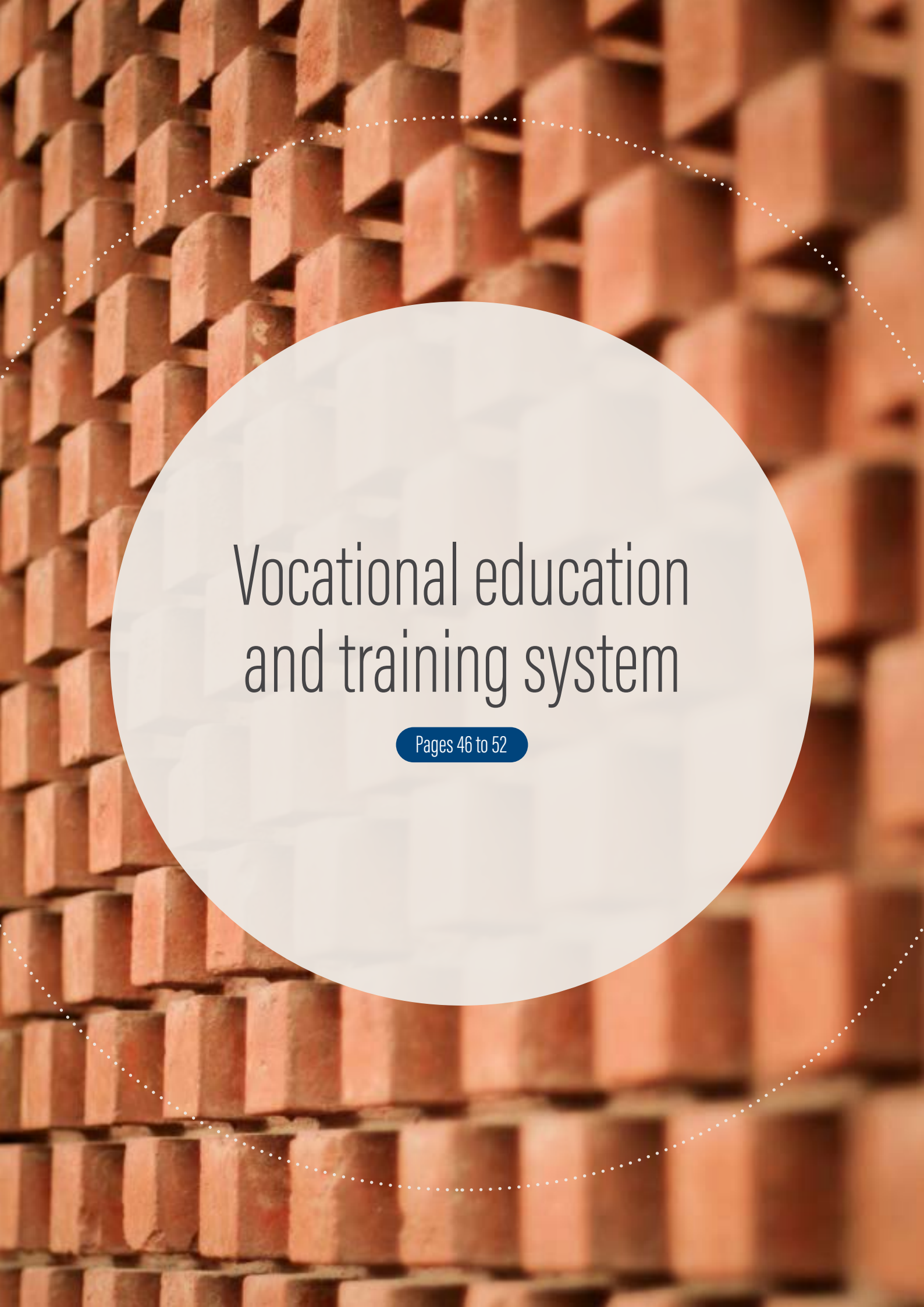
...I would say generally across curriculums [...] if I'm honest, I don't think PAS 2035 is well recognised. (I03)

TRADE LICENSING

The FMB have argued for a 'licence to trade' as a key policy for raising standards across the sector.⁶⁰ The logic of the argument is that the demand for skills training would be increased by making it illegal to operate without a licence, and the granting of the licence could stipulate a formal certification based on minimum competence. Exactly how the licence would be applied would need to be worked out in detail (E.g. Should it apply to company directors only? Or to all workers? Could firms be certified with a minimum number of certified workers and good supervision of untrained staff). The transition from the current unregulated labour market would also need careful policy design, including questions about the timeframe granted for workers to become trained, the capacity in the sector to do the training and assessment, support for company directors and other supervision roles.

In the context of construction manual trades this idea may sound draconian, but it is worth remembering that many occupations and professions have minimum requirements for competence, from motor mechanics to nurses and many others. These occupations operate on the principle that a minimum standard is needed to be safe and effective in the role. Construction could be the same. ●

60. Federation of Master Builders (2018) Licence to build: A pathway to licensing UK construction, July. Available at: <https://www.fmb.org.uk/resource/licence-to-build-a-pathway-to-licensing-uk-construction.html> (accessed Oct 2025)



Vocational education and training system

Pages 46 to 52

The VET system in the UK is designed around individual tasks and conventional job roles, which means that changes in the system are easier to accommodate when they fit with the job categories (carpenter, bricklayer, etc). The system adapts much less readily to changes which cut across these task-related classifications, for example where training needs are identified for new roles, multiple roles, the interfaces between roles, or other important topics such as the measured performance of the resulting building and the outcomes for residents or building users. Other countries operate different kinds of VET systems, which prepare workers for being members of the whole industry, where specialist training is set in the wider context of shared understanding, career progression and working practices. UK training organisations and policy makers could usefully learn from comparison with these other countries when contemplating possible reforms.⁶¹

INITIAL VERSUS CONTINUING VET

A distinction needs to be made between the initial education and training needed to join an industry and the continuing education and training that keeps knowledge and skills topped up through CPD. CPD courses, often short in duration and targeted at specific topics, should work on the principle that trainees have already learned through their initial education and training, with competence gained through experience. CPD should not be seen as a substitute for initial training.

DATA AND REPORTING

At the start of this research project, it was clear that data on VET is not published by Government or its agencies in a form that allows for a good understanding of activity relevant to construction or its sub-sectors. Where published VET data exists (for example, on apprenticeships) it tends not to be disaggregated in sufficient detail to aid the understanding of how the system works for retrofit/RMI in housing.



We need better data on who's doing what - and where the gaps are. (I11)

Several different kinds of gaps in training provision can be identified (Table 11). When 'skills gaps' are discussed, one or more of these different types may be relevant. Several workshop participants identified data-related process gaps that, if addressed, could improve the coordination and management of key barriers — particularly the distance to training centres and the limited capacity for local delivery — which continue to pose a challenge. They also highlighted that funding constraints and the lack of travel subsidies can create barriers to participation, particularly for learners from lower-income backgrounds, reinforcing social mobility issues within training access. →

Type of gap	Description
Quantity	Are the numbers of courses, trainees, trainers, facilities and assessors sufficient to meet demand?
Quality	Are courses sufficiently quality-assured - in terms of enrolment, course content, training delivery and assessment/certification?
Competence-related	Does a course cover all aspects of competence sufficiently, e.g. missing one or more of the SKEB elements: skills, knowledge, experience and behaviour?
Location	Is training accessible enough? The distance to travel to the training course may be an issue in terms of additional cost, time, and the commitment required to be absent from work or home.

Table 11: Gaps in our knowledge of training provision

⁶¹. For example, the European Construction Industry Federation commissioned a comparison across several European countries: <https://www.fiec.eu/our-projects/completed-projects/vet4lec>

In the absence of published data being available, a survey was conducted with the aim of securing enough disaggregated training data from relevant stakeholders to give some useful pointers on current provision for construction generally and/or housing retrofit/RMI as a specific sub-sector. Within the resource constraints of the research, the aim was to provide an indication of activity, not a full and comprehensive account.

A key finding from the 43 stakeholders who responded to the survey is that training-related data is rarely shareable. Although all respondents confirmed that they collect data on training activities, over 90% reported being unable to share it for the purposes of this report. (See Appendix A for full survey results)

There is a strong case for Governments in England, Scotland and Wales to take responsibility for collection, analysis and publication of training data with finer granularity than is currently made available. Analysis of training by industry sectoral and sub-sector are currently not well served by available Government statistics.

ENTRY ONTO COURSES

For training to be effective and have a lasting positive impact, there needs to be a means of selecting trainees who are ready for the course and who can reasonably be expected to benefit from it — building on their existing knowledge and supporting the development of their career pathways. There need to be some criteria and a fair process for selection, otherwise students will be out of their depth (under-qualified for the new course) or feel that they are wasting their time on things they already understand (over-qualified for the new course). This principle is widely understood and applied. However, the research conducted for this report revealed some evidence to suggest that course entry criteria are not always being specified and applied rigorously for retrofit/RMI training.

It is not possible to say how widespread a problem this is from the evidence gathered and the checks made. It may be that the accounts reported to the research team were exceptional. However, these reported practices in course recruitment do fit with evidence found elsewhere of the whole

system being unregulated, often led by short-term funding opportunities and a need to spend budgets by a tight deadline. In this context, it is possible to imagine that the imperative to fill training places might lead to reduced rigour in candidate selection. It would be useful to understand this issue more fully with further research.

FUNDING FOR TRAINING

Funding has been described by interviewees as the key determining factor for training provision in FE colleges:



Across the nations from the qualification perspective, funding is everything. So we [could] write [...] the best qualification in the world. If it doesn't attract any funding, no one will probably deliver it. (113)

The allocation of funding and 'success' of courses is based on the number of students enrolled on and completing courses, not on graduate employment or employability outcomes:



The funding goes [...] to deliver the number of bums on seats for those courses. It doesn't look at the person going through the system to say when that person leaves [...] are there jobs for them? (114)

Practical, hands-on construction training is expensive compared with other courses that a training provider might consider running because it uses large areas (e.g. workshops) and consumes materials. Sometimes this can lead to providers choosing to offer courses other than construction because the finances are more manageable.

TRAINING PROVISION

On-the-job learning

Entry into the construction industry is largely unregulated, so it is commonplace for people to be recruited without any formal training and to learn by being immersed in the workplace, picking things up on the job, working alongside more experienced workers and learning by doing. This kind of learning may never be formalised. Alternatively, where workers or their employers see benefit in formalising things, it is possible to undergo formal skills assessment without having done any formal skills training: →

“...they basically learn from other people who are working with them as they get recruited in as a junior, [...] And then eventually [...] they will apply for a qualification that someone will come out and assess their skills. How much of that is real training? [...] A lot of the spend in the industry gets spent in that way because of the CSCS card scheme. (I13)

The preference for on-the-job training is problematic, however. There will be some recruits, working with competent and helpful colleagues, who are able to learn well in these conditions, have the resources for complementary learning away from site, and who will become genuinely competent themselves as a result. But there is no guarantee that this will always work out. Where a recruit lacks the resources or motivation to learn, or who has unhelpful colleagues who begrudge the time given to helping their junior colleague learn, the results may be less positive. The more experienced colleagues who provide this on-the-job assistance may themselves lack full competence, meaning that what they are teaching may not be accurate or up to date. The process depends too heavily on a fortunate combination of circumstances for successful outcomes, making it an unreliable means of developing a competent workforce.

Short courses

Many construction firms regard training as something that should be done quickly (if at all) because training is viewed as a double cost: the cost of the training course itself, and the opportunity cost of spending time away from the workplace earning money. This leads to strong preferences for short training sessions of minutes or hours (not days), taking place at the beginning or end of the working day, and conducted as close to the workplace as possible so as to minimise travel time (i.e. time away from earning). This strong industry preference is reflected in positive accounts among interviewees of innovative modes of training delivery, bringing trainers to sites or convenient locations and focusing on specific topics that can be taught in a short amount of time:

“Training in rugby clubs, early morning, so they could go back to site... that was fantastic. (I17)

“We did masterclasses on site... if you're doing it wrong in the morning, you should be doing it right in the afternoon. (I13)

However, short courses are not suitable in all contexts. Where the existing competence of the trainees and the subject matter of the short course are in alignment, the training may be effective. But they are not a reliable pathway to competence for all trainees, all circumstance or for all training topics:

“Short courses may look good on paper, but they don't ensure competence. (I11)

Embedded learning versus stand-alone courses

The need for shared foundational learning on sustainability issues is not a new topic for debate, but there are differing views about how best to achieve it. The principle of 'embedding' is to add the necessary course content to all relevant existing courses. In theory, this would ensure that all trainees receive the same training on cross-cutting topics without having to sign up to an extra course. The counter-argument to this approach is that it is too onerous and time-consuming to amend every single course curriculum in this way, so the practical alternative – at least in the short term – is to create focused new courses on 'green' training topics:

“A lot of the drive is to embed these new ... green skills [...] So every qualification that's now written has to have some green skills put into it. [...] I think that's the wrong approach. I think short, stand-alone quality qualifications standing in their own right certainly needs to be the transition piece rather than just throwing stuff into existing qualifications. (I13)

The risk of taking this more modular approach is that trainees pick and choose only the courses they think are most relevant, leaving out the optional 'green skills' courses. This brings the discussion back to the questions of available funding and the real demand in the labour market for the courses on offer. →

There are several components of the system where quality assurance is important. For awarding organisations, the focus is on the quality of the course content; but quality assurance is also needed in training delivery and assessment. As one interviewee observed:

“The quality of that delivery isn’t about embedding it in a two-year programme elsewhere. To raise delivery standards, it needs to be explicitly taught – delivered, covered, and assessed against outcomes – not simply embedded. (I13)

Supply chain training

Many manufacturers, whether their products and systems are low carbon, energy efficient, or not, run training centres for installers of their products. Manufacturers are aware of the important role that installers play in the quality of installation and, ultimately, the reputation of the manufacturers’ brand. Installers are also influential over customer product choices, so manufacturers may seek to create brand loyalty among the installer workforce as part of their sales and marketing strategy.⁶² While it is in the manufacturers’ interests to do this training as well as possible, the approach has been criticised for focusing too narrowly on a limited range of products, materials and systems - not on general principles or broad technical understanding and the performance of the building as-a-whole:

“There was manufacturer training which was insufficient and inadequate [...] it was more about selling their products and their own brand rather than actually showing people how to do [...] a good job from a holistic perspective. (I13)

Some positive innovations are found with supply chain training. Partnership working between different training providers can help to overcome some of the hurdles to putting on good training courses. In this example, independent training providers negotiate access to training facilities owned by manufacturers in order to carry out workshop sessions:

“We’ve set up [...] an alliance of people with the infrastructure to deliver the practical. So for example, system designers, material manufacturers, they have all these bays set up in their training [centres] because they do material training. (I19)

ASSESSMENT AND CERTIFICATION

Assessment is an important part of the training system, as it underpins the certification of a person as ‘competent’. Like training and CPD, assessment needs to match changing needs and innovations by being repeated periodically: it is not sufficient for a competent person to pass an assessment once and never be re-trained or re-assessed.

Independence of assessment is needed to avoid possible conflicts of interest where, for example, a training provider is assessing their own trainees, while also having attainment targets to achieve. The assessment needs to be independent of such pressures. The introduction of independent assessment is expected to enhance other aspects of the system, such as training quality, learner preparation, and overall readiness for assessment:

“The independence of the assessment really has made the learning providers, and the employers make sure that [...] the apprentice absolutely knows enough to go into the endpoint assessment [...]. So, it’s improved drastically as an apprenticeship. You don’t tend to get that too much in other qualifications. (I13)

There are many different forms that assessment can take, including evaluation of written work, observation of practical tasks and questioning. The methods of assessment need to be consistent with the type of assessment tasks being assessed.

Assessment needs to be independently quality assured. There are many potential conflicts of interest between learners, individual trainers, training organisations or employers. For example, a trainer may be so familiar with a trainee’s background, that it deflects them from making a suitably objective assessment of the trainee’s competence. →

62. Killip, G., Owen, A. M., Topouzi, M. (2020) Exploring the practices and roles of UK construction manufacturers and merchants in relation to housing energy retrofit, Journal of Cleaner Production, 251:119205, doi.org/10.1016/j.jclepro.2019.119205

Similarly, a training provider who is under pressure to meet targets for successful completions may not make the same judgement as a person without that pressure. Timing and funding pressures may lead training providers to put learners forward for assessment before they are really ready. Assessors themselves need to be suitably competent in the assessment role, and the assessment process should be kept under review.

Interviewees with experience of assessment suggest that current practice is mixed, with some examples of good practice co-existing with situations where clear conflicts of interest do exist. The importance of assessment in assuring the quality of training is sometimes lost in industry and policy debates. The primary focus is mostly on training provision (running courses) and student numbers (linked to the estimates of skills and labour shortages) rather than on VET as a system. And yet, the numbers of people in training or the numbers of providers running courses tell us little or nothing about quality:



The training is totally unregulated [...] And there is the crux of your challenges. Even if you've got qualification data, it's not really telling you the whole story of the training quality that's going on within it. (I13)

From the evidence gathered for this report it seems that there are a range of practices on the ground, showing different levels of independence, completeness and rigour in providing assessment of competence. If the SKEB model of competence is to be extended throughout construction training, then independent assessment methods need to be identified, used and kept under review for all four components of SKEB – skills, knowledge, experience and behaviour. Further, more detailed research is needed to understand the assessment issue in detail, investigating these issues (among others):

- the suitability of methods of assessment in use, the recruitment and training of assessors themselves
- the employment conditions of assessors and any difficulties with recruitment and retention of assessors

- the rigour and independence of assessments being made.

Apprenticeships

An apprenticeship combines classroom teaching with real-world work experience, which in theory should provide a good foundation for developing competence. Traditionally, apprenticeships were intended for young people (with little or no work experience) as an entry-level route to qualification and employment. With the advent of Modern Apprenticeships at higher qualification levels the term 'apprenticeship' covers a wider range of age and previous work experience than it used to. Even so, in construction generally (not housing retrofit/RMI specifically), some 80% of apprentices are aged 24 or under.⁶³

The success of an apprenticeship relies on good alignment between the motivations, interests and actions of the apprentice, training provider and employer – all within a policy context set by Government. During the course of conducting the research, an example was given of an apprentice arriving on site to gain practical work experience, only to find that all of the relevant work had already been completed by other workers, so the apprentice had nothing meaningful to do for their work experience. If employers do not prioritise the learning opportunities of apprentices and arrange for them to have constructive on-site experiences, then the principle of combining classroom teaching with work experience is undermined.

Other informants commented on the mixed quality of college teaching, with the pay and conditions of college teachers being identified as a barrier to recruitment.

In the worst possible combination of poor teaching and poor employer support, the apprenticeship may achieve little or nothing of value:



So you can have an apprenticeship that's got lousy training and a lousy supervisor looking after the apprentice and the apprentice doesn't learn anything. (I13) →

63. Hasting-Evans, G., & Shorter, H. (2024). Construction Apprenticeship Achievement Rates Crisis: Good Practice Solutions. NOCN Group & British Association of Construction Heads (BACH). Retrieved October 20, 2025, from https://www.nocn.org.uk/data/News_Downloads/ConstructionAchievementRates.pdf

Learners' reasons for non-completion of apprenticeship	Construction only	All sectors
Salary was too low	44%	22%
Fired or made redundant	37%	17%
Learner, employer or provider thought the learner would not pass the end point assessment (EPA)	18%	9%
Learner 'very satisfied' with the quality of learning from the provider	26%	45%
Learner believed that any support would have helped them remain on the apprenticeship	19%	38%

Table 12: Frequency of learners' reasons for non-completion of apprenticeships comparing construction sector with all sectors^{64, 68}

In a study on construction apprenticeship achievement rates, statistics for construction were compared with data for apprenticeships across all sectors (Table 12). Here, it should be remembered that 'construction' is broader than just housing RMI.

The picture that emerges from this study is of construction apprentices being relatively young, inexperienced, poorly paid, insecure in their employment, and unsatisfied with the quality of their training. Of course, some apprentices do learn and thrive, just as some employers and training providers give high quality teaching and support. But, at an aggregate level, the figures in Table 1 indicate more causes for concern about apprenticeships in construction than in other sectors.

For employers, the decision to take on an apprentice is often seen as risky, because it is time-consuming and has no guarantee of a successful outcome. The SMEs and micro-businesses which dominate in the retrofit/RMI sub-sector, are less likely than larger firms to have the resources to support taking on an apprentice:



It's a major commitment to take on an apprenticeship and [...] there's some very logical reasons why employers wouldn't necessarily choose to do that. They might be quite happy with the size of their business, they might not want to train somebody who could ultimately end up being a competitor, which is probably more true in the smaller micro space than in the bigger space [and] there's costs associated with it. (I11)

UPSKILLING THE EXISTING WORKFORCE

The need to upskill the existing workforce in construction means that there needs to be a fair and rigorous way of recognising prior experience and learning. Each person in the existing workforce will have their own skills, knowledge, experience and behaviour. Some may require no new training to be deemed to be 'competent', whereas others may show gaps and need some form of training first. Upskilling needs to involve targeted training interventions for each individual's situation, and that requires a fair method of assessment and recognition of prior learning.

Assessment has to be adapted to the particular circumstances of each person and the competence criteria that they are being assessed against. It may be necessary to have more than one assessor to cover different aspects of assessment before a learner can be deemed to be competent:



I need two different kinds of assessors. I need people with lots of experience in external wall insulation to do the practical assessment [...] but then I also need assessors that can do the knowledge questions in the witness testimonies. (I19)

The essential role of assessment demonstrates the need to think of VET as a system with many 'moving parts.' Raising standards requires a systemic approach, which involves much more than putting on new courses. ●



Devolution, institutions and funding arrangements

Pages 53 to 62

Retrofit/RMI services are delivered by firms working in local areas, taking account of variations in building stocks, climate and geography. Local labour and property markets also vary from place to place, as do the economic, social and environmental priorities of local policy. Some technological solutions for the decarbonisation of heating operate at local scale (e.g. district heating). These are all reasons why the local and regional context are important for retrofit/RMI.

The UK remains one of the most centralised advanced economies in the OECD, with political, fiscal, and administrative power concentrated in Westminster. Limited regional authority and spending have contributed to deep territorial inequalities. The devolution agenda, introduced by the Labour Government in the late 1990s, transferred powers to Scotland, Wales, and Northern Ireland to promote more democratic and responsive governance. Housing policy and regulation are fully devolved in Scotland and Wales, covering all aspects from building standards to retrofit policy, whereas in England these functions remain centralised under Westminster, led by the Ministry of Housing, Communities and Local Government (MHCLG) and the Department for Energy Security and Net Zero (DESNZ).

The following discussion focuses on the GB nations (England, Scotland, and Wales), highlighting opportunities for shared learning across administrations, institutions, and nations on how retrofit/RMI skills training is governed, funded, and delivered.

DEVOLVED GOVERNANCE IN HOUSING

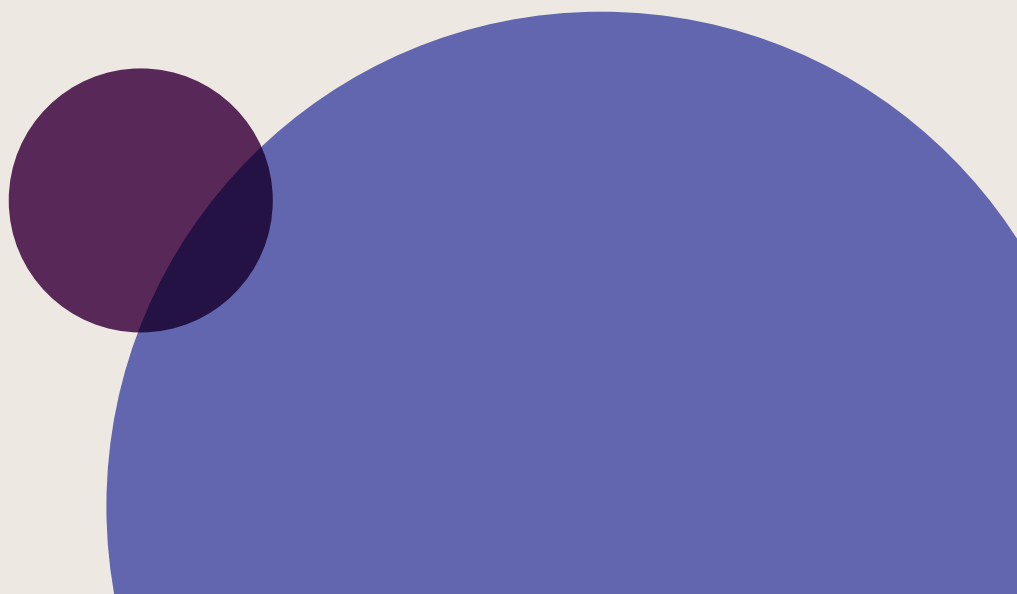
Both the Scottish Parliament and Government and the Senedd Cymru (Welsh Parliament) and Welsh Government have full control over housing-related matters. Their devolved powers include:

- Housing law and regulation
- Building regulations, safety, and planning
- Tenancy law (social and private)
- Local Government housing functions, including affordable and social housing, supported housing, fuel poverty reduction, and homelessness prevention
- Housing quality standards
- Energy efficiency and retrofit policy.

In contrast, housing remains a reserved competence for England, legislated by Westminster. This policy area is led by the MHCLG, with shared responsibilities across departments — notably DESNZ, which oversees the energy efficiency and retrofit aspects of housing policy.

HOUSING ENERGY EFFICIENCY RETROFIT PROGRAMMES

England, Scotland and Wales have each developed different retrofit programmes, with variation in funding allocations and approaches (see Appendix B). England's approach aims at delivering scale through a social housing decarbonisation focus and by targeting fuel poverty; a co-funding approach is also in place to enable market mobilisation through industry-led improvements. →



Scotland provides a strong integrated regulatory and standards-led model, whilst Wales is adopting an innovation and system-learning approach through the ORP. The 'State of the Nation Review' provides a clear summary of different programmes, funding schemes and coordination initiatives by nation and by housing tenure type.⁶⁵ The CCC's Annual Progress Reports analyse carbon emissions reductions in England,

Scotland and Wales respectively, including contributions made through retrofit.

VET SYSTEMS AND DEVOLUTION

As shown in Table 13, each devolved nation has developed its own distinct VET system, differing in philosophy, governance structures, qualifications frameworks, and vocational standards. →

Nation	England	Scotland	Wales
Core philosophy	Market-led Productivity Employer standards Choice	Publicly coordinated Unified 'Scottish tertiary education system'	Social partnership model (linking education, industry, and unions)
Distinctive focus/vision	Technical education	Integrated 'lifelong learning system'	Foundational economy and regional development
Framework	Regulated Qualifications Framework (RQF)	Scottish Credit and Qualifications Framework (SCQF)	Credit and Qualifications Framework for Wales (CQFW)
Flagship initiatives	T Levels (from 2020) Apprenticeship Levy Local Skills Improvement Plans (LSIPs) Institutes of Technology (IoTs) Employer-led colleges	SCQF links all levels and types of learning Apprenticeship Family	Personal Learning Accounts (PLA) (free courses for adults) Regional Skills Partnerships Net Zero Skills Action Plan (2023)
Vocational qualifications	T Levels (16-19) Apprenticeships (Levy) Higher Technical Qualifications (HTQs)	Scottish Vocational Qualifications (SVQs) Modern, Foundation and Graduate Apprenticeships Colleges provide integrated vocational routes	Vocational Qualifications (VQs) Apprenticeships in Wales (separate from England's Levy system)
Lead authority	DfE (not devolved within England)	Scottish Government – via Scottish Funding Council (SFC) and Skills Development Scotland (SDS)	Welsh Government – Education and Skills Directorate Also via Medr (Commission for Tertiary Education and Research)
Qualification regulator	Ofqual Institute for Apprenticeships and Technical Education (IfATE)	Scottish Qualifications Authority (SQA) Transitioning to a new body from 2025	Qualifications Wales
Quality assurance body	Ofsted inspects FE colleges and training providers	Education Scotland and SQA quality frameworks	Estyn inspects post-16 providers

Table 13: Comparison of devolved national systems for VET within the UK

⁶⁵. NRH (2024) The State of the Nation Review: Delivery Approaches. The National Retrofit Hub. Available at: <https://nationalretrofithub.org.uk/wp-content/uploads/2024/08/NRH-State-of-the-Nation-Review.pdf>

England's VET system is centrally organised through the DfE and follows a market- and employer-led model, focused on productivity and technical skills (via T Levels, HTQs, and apprenticeships). The Skills for Jobs White Paper and Skills and Post-16 Education Act (2022) introduced major reforms around employer involvement, local skills planning, funding, and accountability. In 2024, Skills England was established to identify national skills priorities and align training with economic growth. Its Assessment of Priority Skills to 2030 outlines future workforce needs across ten critical sectors, though its emphasis remains on housebuilding and clean energy industries, rather than retrofit/RMI and energy-efficiency skills.

Scotland has developed a publicly coordinated and integrated lifelong learning system that seeks parity between academic and vocational pathways and supports economic transformation, including the transition to net zero and the digital economy. The system is led by SDS and the SFC, working with colleges, universities, and employers. Vocational training is embedded within the SCQF, offering Foundation, Modern, and Graduate Apprenticeships.

The SDS Strategic Plan promotes agility, inclusivity, and employer-led provision, while the National Strategy for Economic Transformation (NSET) aligns skills development with Scotland's climate and digital ambitions. The OECD's 2022 Review of the Apprenticeship System commends Scotland's flexible, wide-ranging model but recommends greater employer involvement and more demand-led apprenticeship funding.^{66, 70}

Wales, meanwhile, is developing a new VET strategy as part of its wider Tertiary Education agenda. A 2025 ministerial statement outlines five future delivery strands: planning future demand, sustainability, opportunity and progression, alignment with employers, and equity. This co-production process reflects Wales's partnership and equity-driven approach,

embedding skills within broader social and economic goals such as the foundational economy and the just transition. Colleges Wales has also drawn on Finland's VET model to inform recommendations for a coordinated yet flexible Welsh system.⁶⁷

DEVOLUTION AND RETROFIT/RMI SKILLS GOVERNANCE

The devolution agenda directly shapes the governance, funding, and delivery of retrofit/RMI training and skills across the UK (see Table 14). There are clear opportunities to evaluate and share learning from the differing approaches to institutional governance, funding, and retrofit/RMI skills training delivery adopted by the devolved nations.

The Construction Skills Mission Board (CSMB), established in June 2025 as a Government–industry partnership led by the CLC, aims to address skills shortages across the construction and built environment sector. Its goal is to recruit an additional 100,000 workers per year by the end of the Parliament through workstreams focused on skills and inclusion, building safety, net zero, and business models. Although primarily geared toward new housing delivery (1.5 million homes), its remit also includes retrofitting five million existing homes. Insights from devolved retrofit/RMI VET systems should therefore inform the CSMB's UK-wide strategy.

England, Scotland, and Wales have adopted distinct approaches to retrofit/RMI skills. England follows a market-driven, short-term model focused on rapid capacity growth but hampered by fragmentation. Scotland takes a strategic, coordinated approach with stable investment and strong competence standards. Wales integrates retrofit training with housing and social policy, promoting inclusivity but limited by smaller scale and generalist funding. Together, these models highlight the need for a more coherent, UK-wide strategy for retrofit skills development (Table 14). →

66. OECD (2022) Strengthening apprenticeship in Scotland, United Kingdom. Available at: https://www.oecd.org/en/publications/strengthening-apprenticeship-in-scotland-united-kingdom_2db395dd-en/full-report/component-4.html#execsumm-d1e678 (Accessed: Oct 2025)

67. Colleges Wales (2024) 'Strategies for Moving Freely: The Finnish Approach to Vocational Education and Training (VET) - learning points for Wales'. Available: <https://www.colleges.wales/image/publications/Strategies%20for%20Moving%20Freely%20report/Strategies%20for%20Moving%20Freely%20-%20The%20Finnish%20Approach%20to%20Vocational%20Education%20and%20Training.pdf>

Nation	England	Scotland	Wales
Philosophy/approach	Market-led scale-up tied to national retrofit schemes and consumer protection Emphasis on rapid capacity growth	Mission-oriented programmatic build-out of Heat in Buildings supply chains Explicit workforce planning (CESAP) and place-based training assets (BE-ST)	Wales integrates retrofit and RMI training within a centralised programme and framework Qualifications Wales and a strong whole-house philosophy
Retrofit skills programmes	Warm Homes Skills Programme	Heat in Buildings National Skills Strategy (linked to regional delivery)	ORP
Governance and policy lead	DESNZ (retrofit policy) DfE (skills) Ofgem (administers ECO4/GBIS delivery) TrustMark (quality/assurance for Government-supported retrofit)	Scottish Government's Heat in Buildings SDS	Welsh Government (ORP in social housing) Qualifications Wales (regulates non-degree qualifications) Medr
Additional key institutions (CITB operates across all nations)	DfE/Skills England for apprenticeship standards Ofqual regulates qualifications TrustMark schemes MCS	National Retrofit Centre (BE-ST) TrustMark MCS	Construction Wales Innovation Centre (CWIC) Regional partners TrustMark MCS
Funding	UK-wide CITB Skills and Training Fund (£3m) Warm Homes Skills Programme (£8m to train 9,000 learners, time limited to July 2026, phase 1) DfE Skills Bootcamps (including retrofit): 100% support for independent learners and percentage contributions for employers	Public investment aligned to Heat in Buildings, plus SDS programmes (CESAP, Green Jobs Workforce Academy) Targeted market entry grants (e.g., MCS) New funded initiatives delivered with BE-ST/colleges	Welsh Government funding tied to Optimised Retrofit and Warm Homes Dedicated national retrofit skills and training map to guide funded provision
Delivery	Colleges Private providers	Colleges and SDS-backed apprenticeships Specialist providers	Regional providers Specialist programmes
Qualification regulator	Ofqual and Institute for Apprenticeships and Technical Education (IfATE)	SQA, transitioning to a new body from 2025	Qualifications Wales
Quality assurance body	Ofsted inspects FE colleges and training providers	Education Scotland and SQA quality frameworks	Estyn inspects post-16 providers

Table 14: Comparison of devolved national systems for retrofit/RMI VET within the UK

England

In England, responsibility for retrofit/RMI skills and training is shared between DESNZ and DfE. Ofgem administers delivery under ECO4 and the Great British Insulation Scheme (GBIS), while TrustMark provides the national quality assurance framework via PAS 2035/2030.

Funding combines dedicated retrofit schemes with broader skills mechanisms. Since 2022, DESNZ has invested around £26 million through the Home Decarbonisation Skills Training Competition (Phases 1–2) and a further £8 million through the Warm Homes Skills Programme (2025–26), supporting accredited training for up to 9,000 participants. These sit alongside DfE Skills Bootcamps (fully funded for the self-employed and 70–90% subsidised for employees), apprenticeships (£1.5k–£27k bands), and CITB grants that offset short-course costs. Training is delivered primarily by FE colleges and independent providers, with Ofqual-accredited qualifications aligned to PAS and MCS standards.

Evidence highlights fragmentation within England's system, particularly across apprenticeships, with multiple overlapping routes to competence and limited coordination. As one interview participant noted:



Across the construction apprenticeships... England did end up a lot more fragmented and there was a point when there was a lot of different apprenticeships. There's lots of different routes to competence that started coming through... so you could have ten different ways of becoming a joiner. If anything, in England there's work by Construction Leadership Council to try and pull that back into a bit more of a structure... because competence has become a bigger issue... (I11).

Skills Bootcamps, though flexible and accessible, were described as variable in quality and weakly linked to recognised qualifications:



The concept behind bootcamps is that the Department for Education just want to see some kind of progression in skills training, not linked to formal qualifications. A key requirement of bootcamp funding is that each learner should have an employment interview by the end of the programme. (I07)

Overall, England's market-driven, scale-oriented approach has expanded participation and capacity but relies heavily on short-term, piecemeal funding and variable local delivery, limiting continuity, strategic alignment, and long-term workforce planning. There is not yet a stable or coherent national framework for retrofit training and competence development.

Scotland

Scotland's retrofit and RMI skills system is coordinated through the Scottish Government's Heat in Buildings Programme and Supply Chains Delivery Plan, with SDS leading on workforce planning and the SQA overseeing qualification design and regulation. The approach is strategic and mission-oriented, focusing on stable workforce development and practical competence.

Core funding is provided through centralised Modern Apprenticeships, with SDS contributions typically between £3,300 and £8,700 per apprentice, supported by targeted schemes such as the MCS Certification Fund (covering 75% of fees up to £1,000 per firm, open until March 2026) and capital investment of around £1.2m in BE-ST and the National Retrofit Centre. Training is delivered through FE colleges, national centres of excellence (with implications for access), and initiatives such as Retrofit Scotland, integrating PAS 2035/2030 standards with local practice. →

“ In Scotland I'd say [organisation of construction apprenticeships] stayed much more centralised. But for all that could be a plus, it's also negative at times because it means you don't have the flexibility of pathways... but certainly in Scotland overall the figure [of construction apprenticeship completions] have stayed higher...(around 80%) compared to England's fragmented model, though some trades still struggle. (I11)

A useful innovation developed in Scotland, is the Installers Skills Matrix for Energy Efficiency Measures,⁶⁸ in support of BSI: PAS 2030 installer retrofit standards. The matrix came out of the 2019 Energy Efficiency Scotland Action Plan, targeting social housing. It outlines the recommended minimum qualifications, with Recognition of Prior Learning (RPL) for trades (e.g. electricians, plumbers, heating engineers) broken down by measure (e.g. air source heat pumps). Not mandated in Scotland, there is concern however that it is difficult to maintain this matrix.

“ Construction training is expensive because it uses lots of material and equipment. Colleges prefer to run shorter, cheaper courses instead. Scotland is therefore considering a Centres of Excellence model, so a small number of centres would be equipped to do the training, but not all colleges would offer all subjects. (I04).

Scotland's model benefits from policy coherence, long-term investment, and an emphasis on hands-on competence, though it has fewer ring-fenced retrofit-specific funding streams than England. The withdrawal of employer upskilling funds, such as the Flexible Workforce Development Fund, also poses challenges for CPD.

“ The Installers Skills Matrix illustrates the tension between simplicity and inclusivity: while easy to navigate, it is seen as too narrow, excluding competent specialists who don't fit traditional trade categories. This raises a wider dilemma about whether training should be based on existing trades (e.g., only plumbers installing heat pumps) or on the future skills and workforce actually needed. Ultimately, the discussion highlights a balancing act between ensuring clarity and structure, while allowing enough flexibility to recognise alternative pathways and new competencies. (I11)

Wales

In Wales, retrofit and RMI skills are governed by the Welsh Government through the ORP, with Qualifications Wales acting as the qualifications regulator. The Welsh model adopts a whole-house retrofit philosophy, integrating training with publicly funded retrofit delivery and emphasising building performance and social equity.

Funding is primarily channelled through PLAs, offering fully-funded courses for eligible adults via the FE network, and the Flexible Skills Programme (FSP), which subsidises up to 50% of training costs (capped at £50,000) for employers.

The ORP's Skills and Training Map aligns Welsh qualifications to PAS 2035/2030 roles and supports delivery of both traditional building and energy efficiency competences, ensuring alignment with UK standards while reflecting Welsh housing stock and delivery contexts. Evidence suggests this allows for a focus on historic building retrofit/RMI skills:

“ ...We have delivered seminars [on retrofitting historic buildings] for the members of the Optimised Retrofit Programme, which is the Welsh Government's support programme for all housing associations to undertake appropriate retrofit. With the ORP there is a growing swell of information and knowledge in that direction, so that is positive. (I02) →

68. Installers Skills Matrix. Available at: <https://esp-scotland.ac.uk/scottish-installer-skills-matrix/>

This approach is accessible, socially inclusive, and closely aligned with housing policy, ensuring continuity of learning opportunities. However, Wales' smaller training provider base and reliance on generalist funding levers limit capacity and transparency compared with England's scale or Scotland's capital investment model.

REGIONAL DEVOLUTION AND PLACE-BASED APPROACHES TO RETROFIT/RMI SKILLS IN ENGLAND

Since the early 2000s, England's devolution agenda has shifted from Regional Development Agencies to Local Enterprise Partnerships (LEPs) and now to Mayoral Combined Authorities (MCAs) under the Cities and Local Government Devolution Act (2016). These city-regional arrangements aim to localise economic development through Devolution, City, and Growth Deals, though their scope and funding remain uneven, leading to inconsistent powers and responsibilities across regions. The 2024 English Devolution White Paper seeks to address this fragmentation by setting out a clearer framework to "widen and deepen devolution across England," promising mayors greater powers, funding, and accountability.

For the retrofit/RMI skills agenda, years of fiscal constraint have left local authorities with limited capacity to invest in workforce development, yet MCAs and emerging Combined County Authorities (CCAs) now hold increasing responsibility for economic growth and net zero delivery. This creates opportunities for locally tailored retrofit and green skills initiatives, though progress varies due to differences in regional scale, institutional maturity, and funding capacity.

Retrofit is inherently place-based, requiring locally tailored decarbonisation strategies that national, one-size-fits-all approaches cannot deliver. Local and regional authorities are best positioned to lead this agenda, given their proximity to communities, understanding of housing stock, supply-chain access, and planning and regulatory responsibilities.⁶⁹ In partnership with industry, MCAs, CCAs, and local authorities will be key to mapping, planning and arranging partnerships to address regional retrofit/RMI skills needs and opportunities.



I think we used to have [resources and the ability to plan at a local/regional level], but I think they're probably all being shed to save cost. But then again, do I think it should all be based in Whitehall? No... I think we need to invest in our local devolved regions to make sure we have one stop shops and retrofit clinics and that type of thing. (109)

Place-based approaches and local partnerships are needed to mobilise and organise the supply chain for energy retrofit⁷⁰ and neighbourhood approaches (such as One Stop Shops or Local Area Energy Plans) can be used to ensure a scaled reliable pipeline of work, which is crucial for local tradespeople and SMEs to justify investment in training.⁷¹

Additionally, LSIPs are used to plan local/regional training programmes in England (these cover a wider remit than construction). However, the majority of these plans do not include quantified estimates of the retrofit roles or skills required regionally and are inconsistent across geographies.⁷² →

70. Brocklehurst F. et al. (2021) Domestic retrofit supply chain initiatives and business innovations: an international review, *Buildings and Cities*, 2(1), pp. 533–549. DOI: <https://doi.org/10.5334/bc.95>

71. Macrorie R. et al. (2024) Support place-based and inclusive supply chain, employment and skills strategies for housing-energy retrofit. In: Crowther, A., Foulds, C., Robison, R. and Gladkykh, G., (eds.) *Strengthening European Energy Policy: Governance Recommendations from Innovative Interdisciplinary Collaborations*. Palgrave Macmillan Cham, pp. 73–85. ISBN 9783031664809

72. Ravenscroft, C. (2024) 'Ready for retrofit? An analysis of Local Skills Improvement Plans in England' A report to the Gatsby Foundation. June 2024. Available at: <https://www.gatsby.org.uk/app/uploads/sites/2/2025/07/2024-06-26-retrofit-report-finalpdf.pdf>

In parallel with local/regional planning steered by MCAs and CCAs and recognising the absence of a national retrofit strategy for the UK, a range of innovative bottom-up initiatives for retrofit/RMI training are emerging. These include proactive initiatives such as:

- **The MCS Foundation Local Area Retrofit Accelerator (LARA) scheme**⁷³: a local/regional co-design approach to develop a local retrofit strategy and retrofit skills development in four areas of England
- **Civic Square**: a grassroots civic organisation operating in the West Midlands which is reframing retrofit as a means to create a more civic economy and teaching citizens retrofit skills
- **The Green Skills Advisory Panel (GSAP)**⁷⁴: originating in the South West – which promotes awareness, outreach and careers initiatives, partnerships and collaboration, and education and training programmes for retrofit.

There is a question around how to capitalise on learnings from these initiatives, scale best practice, and join up effectively with more centralised policy to achieve scale and momentum.

RETROFIT SKILLS FUNDING LANDSCAPE

Of the devolved nations, England has the largest budget for housing retrofit/RMI skills development and training, notably the Warm Homes Skills Programme commits £8 million to train up 9,000 learners (although this is time limited, July 2026, phase 1). Additionally, DfE Skills Bootcamps (including retrofit) provide 100% support for independent learners and percentage contributions for employers. England's funding relies on short-term, competitive schemes and market-led mechanisms that expand capacity quickly but risk fragmentation and limited continuity, threatening the ability to scale retrofit training. There is a need to protect the supply chain, FE colleges, independent training providers and importantly learners from such 'boom and bust' cycles of funding.



Training is the first thing that goes into decline when retrofit goes into decline. It's the bit that people decide they can level down. (I01)

Scotland offers a stable, apprenticeship-based system with targeted grants and investment in training infrastructure, prioritising long-term competence development. A significant, steady pipeline is provided through the Heat in Buildings programme, with strong social housing and area-based fabric work and explicit budget for supply chain skills growth.

Wales provides a socially inclusive, publicly-funded model through PLAs and FSP support, which is aligned to the ORP and underpinned by WHQS, ensuring accessibility and policy alignment but operating at a smaller scale. Stakeholders note however that the ORP timelines outstrip available funding, and that allocations for PLAs are being reformed.

Across all devolved nations, the Apprenticeship Levy is a UK-wide tax paid by employers with a total annual pay bill of over £3 million. Whilst employers in Scotland, Wales (and Northern Ireland) pay the Levy as well as those in England, and a portion of the money is devolved to these countries for their own skills and apprenticeship programs, the research found that a majority of the Levy funds are allocated to and spent exclusively on apprenticeships in England. Across all devolved nations, it was also recognised that funds can be poorly targeted to those most in need (i.e. micro businesses, self-employed installers). The CITB Skills and Training Fund (around £3 million) plays a valuable supporting role by improving affordability and access for construction employers and helping to integrate retrofit competences into mainstream trade training. However, evidence suggested that its allocation suffers from a lack of representation of SME retrofit/RMI contractors compared to large new build housing companies. →

73. MCS Foundation (2025). Local Area Retrofit Accelerator (LARA). Available at: <https://mcsfoundation.org.uk/projects/local-area-retrofit-accelerator-lara/>

74. Green Skills Advisory Panel (2025). Available at: <https://gsap.org.uk/about-us/>

It was recognised that the diversity of qualifications, pilots and evolving standards can present increasing costs for providers and learners. This needs to be taken into account in budgetary allocations. It was also noted that there are potential issues of waste and inefficiency in how funds can be spent.

Together, these approaches highlight the need for a more coordinated UK-wide funding strategy that balances stability, inclusivity, and long-term workforce planning. A more effective UK-wide strategy could combine Scotland's structured coordination, Wales's inclusivity and policy alignment, and England's innovation and local flexibility — ensuring stable funding, equitable access, and consistent competence standards across nations. ●



CITB is largely funded by the biggest Levy payers and the majority of income. And the Levy payers make their money largely from new building, the majority do, and so their interest is in supporting skills to support their labour chain and that's absolutely not a surprise. But the majority of contractors who might look after your or my house are much more small scale. (I02)





Skills for digitisation, innovation and uncertainty

Pages 63 to 66

The process of retrofit needs to be seen in a wider context beyond the construction industry. There are many innovations already under way, which may have a direct impact on the way that the RMI sector operates in future, especially as new electrified and digital services enter the household market (e.g. electric vehicle charging, 'heat as a service' business models). Conversely, the culture, custom and practice of the RMI sector may hold back or undermine innovations to service delivery in households.

The process of decarbonisation can also be seen as a process of decentralisation and digitisation. We are moving away from sole reliance on large-scale, remote power stations to a much more dynamic and localised energy system. The end user of energy (especially of electricity) has new opportunities to be an active participant in the system and its infrastructure. A building with solar panels on the roof (or other forms of renewable energy generation) has a two-way connection to the grid, and the energy bill-payer now has the potential to be a 'prosumer' – a producer as well as a consumer of energy. Similarly, electric vehicle (EV) technology uses batteries which can be charged by the grid, but which can also operate in reverse,

providing valuable services when the grid is stretched, especially at peak times. For these services to work effectively, many new business model innovations have been proposed to coordinate the consumption, generation, storage, and time flexibility of energy use. Smart meters and other digital technologies are needed to enable these new business models to work.



We've got to understand that we're not a brick and block only house building industry anymore, reliant on gas boilers. There's a lot of changes, different technologies and diversity out there now. (I15)

Rather little attention has so far been paid to the implications of decentralisation and digitisation for the RMI workforce. If and when homes become more active participants in the energy system, a new set of issues will have to be understood and managed in order to keep the system operating properly. The role of the RMI workforce in this is not clear yet, but it is possible to offer some speculative (and non-exhaustive) business opportunities and threats (Table 15). →

Opportunities	Threats
A source of leads for new work in partnership with digital service providers	Service contracts are kept in-house by energy providers, squeezing out RMI firms
Firms could diversify into new areas of work, build resilience	RMI works could inadvertently alter the operation of digital systems and invalidate consumers' contracts or warranties
New technologies create new markets for installation and maintenance	Reducing relevance of fossil heating systems and the skills needed to install or maintain them

Table 15: Possible opportunities and threats for RMI firms from the growing market for decentralised, digitised energy systems

Interviewee I15 gave two examples of this from experience in the sector. Firstly, the installation and servicing of solar panels on different types of roof construction could, in theory, be an opportunity for roofing contractors as well as solar fitters. However, the lack of understanding of different solar panel mounting systems for different types of roof construction is seen as a risk by some roofing contractors. The second example relates to the rise in popularity of EV charging points. Some training is available but Interviewee I15 was concerned about the lack of standards on what are mostly short courses:



I don't think we have specific training courses on managing EVs. It's more CPD-based knowledge and I think that's probably a concern. (I15)

Anecdotally, some heating engineers (with traditional skills and experience with fossil heating systems) are being contracted by heat pump businesses to install heat pumps. This work may be limited to the physical tasks of fixing components to the building and connecting the relevant pipes and wires. In this case, the other necessary tasks of surveying the building, and design/specification of the new heating system are carried out by someone else. The only task delegated to the installer is the physical installation. However, with appropriate training, that same installer might play a bigger role in the survey/assessment and design/specification of such systems, thereby securing more work and possibly better career prospects.

BUILDING PASSPORTS

In policy debates for building decarbonisation, energy rating systems (such as Energy Performance Certificates) are important instruments to support the setting of policy and financial incentives. Regulated minimum standards are typically expressed in terms of buildings having to achieve a certain rating by a certain

date, giving building owners and installer firms time to prepare for this new market development. For building passports to work in practice, there needs to be a new energy rating calculated and recorded each time there are significant material changes made to the building, otherwise the record of what a building is, and how it should perform, will start to become inaccurate and out of date. For the energy rating system to be updated effectively and efficiently, a new system of 'building passports' has been proposed, in which every building would have a record of its address, site, construction methods, property transactions, connected services and – importantly for the RMI industry – all maintenance and improvement works.⁷⁵

There are two ways in which the innovation of building passports could affect (and be affected by) the RMI industry. Firstly, for the system to work, every significant material alteration to the building needs to be recorded and verified. This places a responsibility on installers and maintenance contractors to update the records completely and accurately each time they complete a job. It also places a responsibility on them to understand when an RMI job constitutes a significant material alteration, and to use the information in the building passport to inform their design and installation choices. There needs to be a new kind of competence to 'write', 'edit' and 'read' information in a digital repository (Figure 11).

Secondly, the consequences of different kinds of RMI work on building energy performance need to be understood, including the risks of compromising performance inadvertently by carrying out tasks without understanding the risks and taking responsibility for mitigating the consequences. The classic example is making holes in structures and thereby compromising airtightness and the effectiveness of insulation. →

75, 79. Buchholz, M. and Lützkendorf, T. (2023) 'European building passports: developments, challenges and future roles', *Buildings and Cities*, 4(1): 902–919.

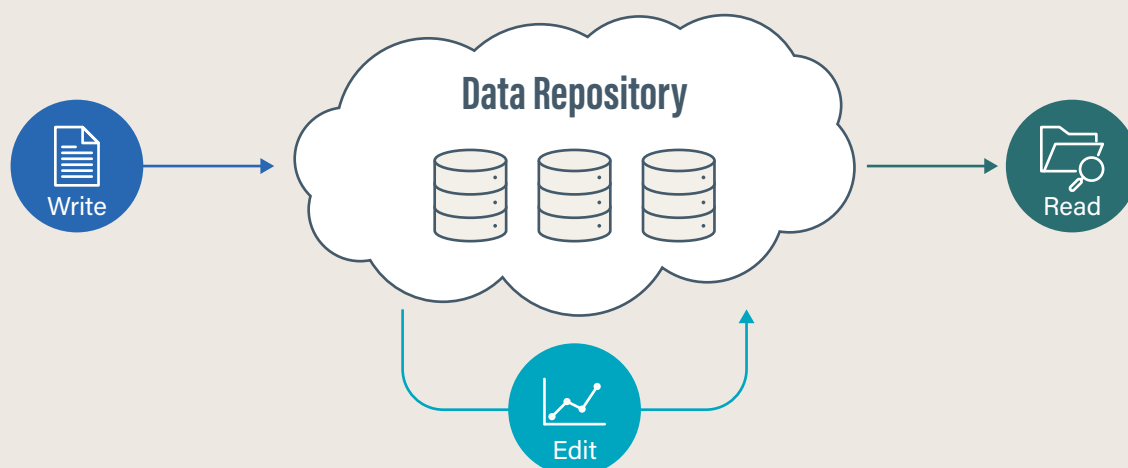


Figure 11: Basic operations performed on a data repository⁷⁹

There are potentially far-reaching consequences for RMI training of any proposed implementation of a system for building passports. With the right training in place, it is possible to imagine a future where RMI works are carried out to a consistently high standard, taking full account of the risks of retrofit, and recording the completed works fully in the building passport database. However, if the workforce is not working to these high standards, then each RMI project carried out has the potential to make the records in the building passport system inaccurate and unreliable.

TRAINING FOR AN UNCERTAIN FUTURE

The examples of energy system decentralisation/digitisation and building passports illustrate some of the possible ways in which the VET system for retrofit/RMI needs to become responsive to innovations from outside construction.

More broadly, the industry needs to be adaptable to changing technology, market and policy conditions, which are unknowable in advance. What role can education and training play in equipping the workforce to be able to navigate an inherently uncertain and unpredictable future?

Part of the answer lies in developing self-reflexivity among the workforce — the ability to self-evaluate and make (re-)training choices in the light of new technology and business models that may become commonplace in future. This requires a different kind of competence than can be defined by conventional job roles; it needs to be foundational across all roles. ●



Conclusions and recommendations

Pages 67 to 70

The repair, maintenance and improvement of existing homes represents some £41 billion of 'construction' turnover (18% of total), but it is something of a Cinderella topic in policy and industry debates. And yet the housing stock is a pillar of social, economic and environmental wellbeing. The condition of our homes has direct impacts on health, social welfare, community resilience, net zero policy, energy security and affordability. While social housing decarbonisation continues to be the focus of Government policy and funding programmes, the private market has not been so well served. In recent years there has been a succession of inconsistent initiatives that do not give businesses the long-term confidence they need in future markets.

Housing RMI is largely unregulated. Anyone, whether qualified or not, can set up in business to provide renovation services, especially in the private RMI market. This fundamental problem undermines attempts to improve quality. Good retrofit delivers multiple benefits, but poorly executed retrofit can create significant risks for both buildings and occupants. Ensuring quality — and robust quality assurance — is therefore essential. We need a retrofit/RMI workforce that is equipped to maximise benefits and minimise risks, guided by quality as the primary metric.

Improving quality means creating the conditions for better jobs, supported by better skills training. If the quality of employment and career opportunities remain as they are, then the sector will struggle to move beyond the current state of low skills equilibrium. Essential data for evaluation is not analysed or published at the level of detail needed to support efforts to improve quality in skills training and employment outcomes.

Joined-up policy is needed between the VET system and the reality of labour markets. Currently, the link between jobs and skills is too weak. Coordination is needed between Government departments and between

different levels of Government – national, devolved, regional and local. Regulation of the labour market could transform the prospects for the system providing VET by introducing a minimum level of competence for all workers, not only those working on Government-funded programmes. The detail of such a major policy shift is important to get right. It is also critical for the future of the RMI sector, which will need a highly competent workforce to meet the increasing volume of both new and retrofitted housing stock, ranging from minimum-level upgrades to more extensive interventions.

The policy context for housing retrofit/RMI is inadequate at present. Without policy change, the retrofit/RMI skills discussion is unlikely to move forward in any significant way. A first set of recommendations therefore addresses the UK Government and the broad policy context in which skills training takes place.

For CITB, who commissioned this research, there are two sets of recommendations: one addresses the need to widen stakeholder engagement and invest in CITB's own capability to understand the broad context of existing housing and to strategise for future skills; the other provides some ideas for the immediate challenge of deciding priorities for the new Sector Skills Plan.

KEY PRINCIPLES FOR RETROFIT/RMI TRAINING REFORM

- **Understand better:** specific context of retrofit/RMI (technical, market, institutional)
- **Foster collaboration:** across the training sector and with external partners – devolution and place-based approaches
- **Clarify goals:** define vision, mission, inclusive career pathways, quality standards and funding reform for retrofit/RMI. →

RECOMMENDATIONS FOR UK AND DEVOLVED GOVERNMENTS

This first set of recommendations covers the wider policy context of housing retrofit/RMI training. These things are outside CITB's direct control but would have a beneficial impact on CITB's work.

- Create a national retrofit strategy across Government jurisdictions and departments, taking account of devolved responsibilities (e.g. for housing and education)
- Develop effective, joined-up policy for the improvement of existing housing between Westminster Government and Devolved Administrations, learning from international comparisons
- Create delivery models for the national retrofit strategy with suitably allocated resources and responsibilities
- Work with industry to develop a policy framework for long-term investment in retrofit/RMI training and workforce development
- Strengthen coordination and knowledge exchange across nations through joint planning, shared data, and common competence and quality standards
- Publish a consultation paper on quality assurance in construction projects, to include the consideration of a licence to trade
- Collect, analyse and publish data on training and jobs in sufficient detail so that the system can be understood by sector (construction) and sub-sector (retrofit/RMI), with a focus on identifying underlying causes of challenges and successes rather than solely reporting numerical outcomes.

RECOMMENDATIONS FOR CITB GOVERNANCE AND STRATEGY

These recommendations are intended to strengthen CITB's strategic role by broadening and deepening its capability to work with a wide range of stakeholders working to improve existing housing.

- Revise the guiding principle of CITB to be 'quality-led' instead of 'industry-led'
- Better integrate advice on housing issues from outside of the construction industry into CITB's strategic decision-making (e.g. on health and social welfare, regional economic development)
- Develop a future skills capability within CITB to provide ongoing technical, market and policy expertise in support of the Sector Skills Plan at national and devolved/regional levels
- Commission and publish a programme of systematic research on quality assurance in relation to construction training and industry practice for housing retrofit/RMI
- Make a long-term commitment to ensuring that housing retrofit/RMI is represented fairly (alongside other sub-sectors) in policy, strategy and funding decisions
- Take active steps to learn from under-represented voices in housing retrofit/RMI debates (e.g. SMEs, trainees, ethnic minorities, women etc.). →

RECOMMENDATIONS FOR THE RMI SECTOR SKILLS PLAN

These recommendations address the specific task of how CITB should allocate funding for the first Sector Skills Plan for RMI. They are intended to create funded opportunities for innovative training-related projects that respond to some of the challenges highlighted in this report.

For the RMI Sector Skills Plan, CITB should prioritise the allocation of funds to projects that do one or more of the following:

- Focus on the quality of outcomes in retrofit/RMI work (e.g. integrating building performance, user satisfaction, quality assurance) in relation to training
- Promote and protect the principles of competence frameworks: skills, knowledge, experience, behaviour and independent assessment
- Focus on the shared knowledge and skills needed for collaborative working, not only specialist competence (as shown in the concept of the 'T-shaped professional')
- Combine existing qualifications with other resources (e.g. technological innovations, tools, networks, information, research) in ways that support a shift towards improved competence and better quality outcomes for residents, building owners and the retrofit/RMI workforce
- Identify and design out conflicts of interest in existing systems (e.g. by improving the quality and independence of assessment and certification). Seek to improve and coordinate all aspects of the VET system, not just training provision (e.g. recruitment, enrolment, pedagogy, assessment, completion rates, employment outcomes, career opportunities)
- Propose innovative ways to raise standards and competence, with a strategy for long-lasting impact of the work beyond the period of funding under the SSP
- Support place-based approaches using innovative delivery models and partnerships that build capability and enable quality-driven outcomes
- Coordinate and promote the sharing of good practice and continuous learning in the housing RMI sector. ●

The background is a dark blue gradient with a glowing DNA double helix structure. The helix is composed of cyan and orange segments. Several thin, glowing lines in cyan, orange, and yellow crisscross the background. A large, light gray circle is centered on the page, containing the text.

Appendices

Pages 71 to 83

Appendix A: Survey data

The size of respondents' organisation is a fairly even mix of micro, small, medium and larger organisations with around ten respondents from each of the four categories shown in Figure a1.

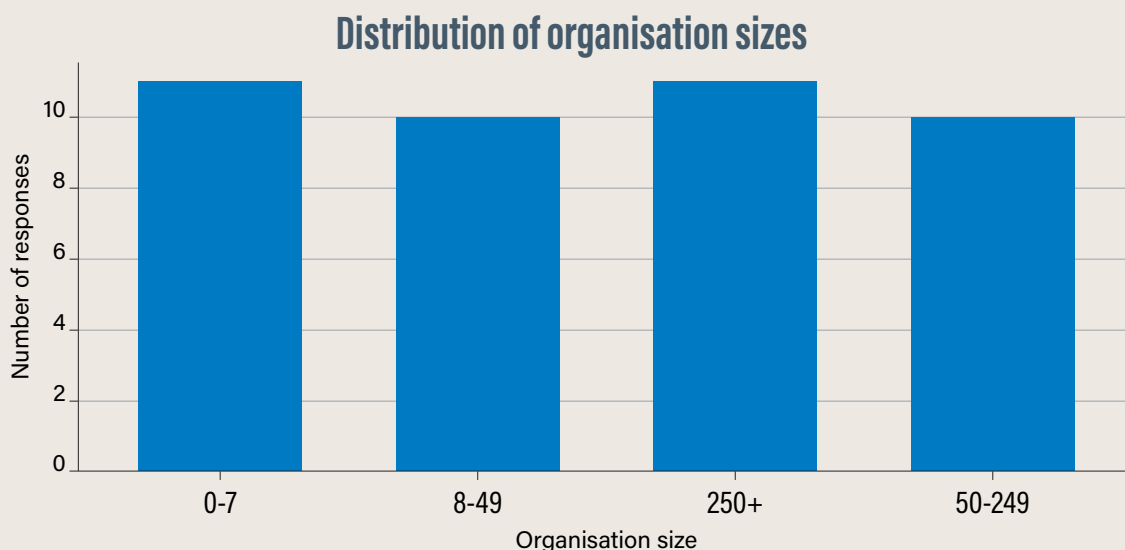


Figure a1: The respondents' organisation size by number of employees

The type of training provider that survey respondents represent includes FE colleges (24.4%), supply chain organisations (19.5%) and non-profit organisations (17.1%), 'other' represents 39% of respondents' and includes independent training providers, consultancies and local authority schemes, as shown in Figure a2.

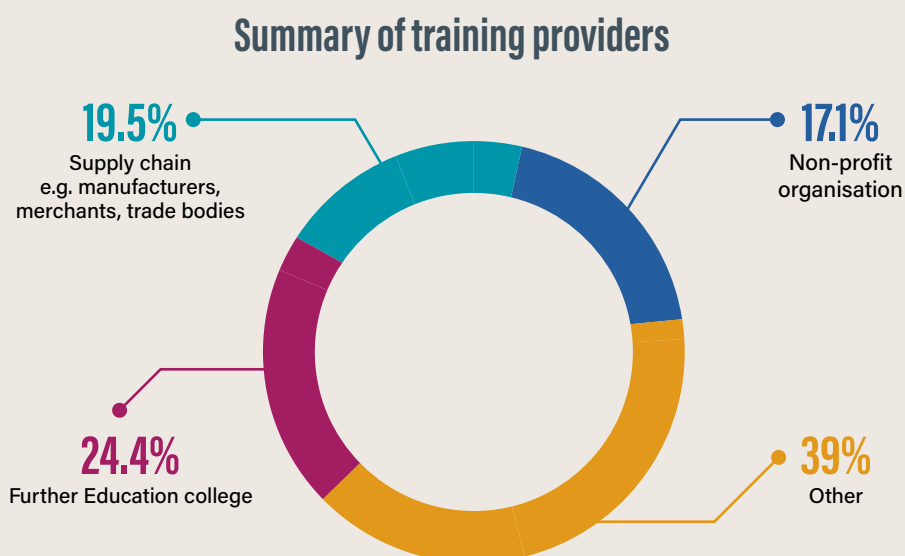


Figure a2: Summary of training provider types

The initial 43 survey respondents represent a good mix of geographic regions across England, Scotland and Wales, as shown in Figure a3. Attention will be given in the next phase to seek further responses from Scotland and Wales.

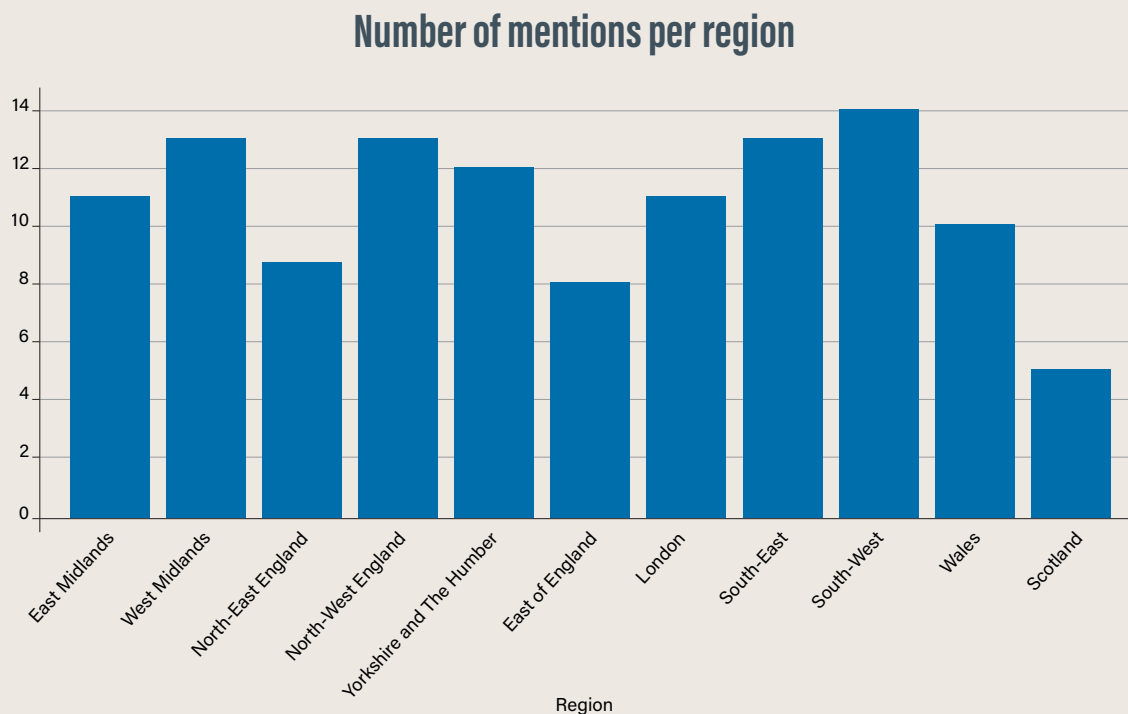


Figure a3: Regional locations of survey respondents

The survey respondent organisations primarily provide training themselves, as shown in Figure a4, closely followed by working with others to provide training.

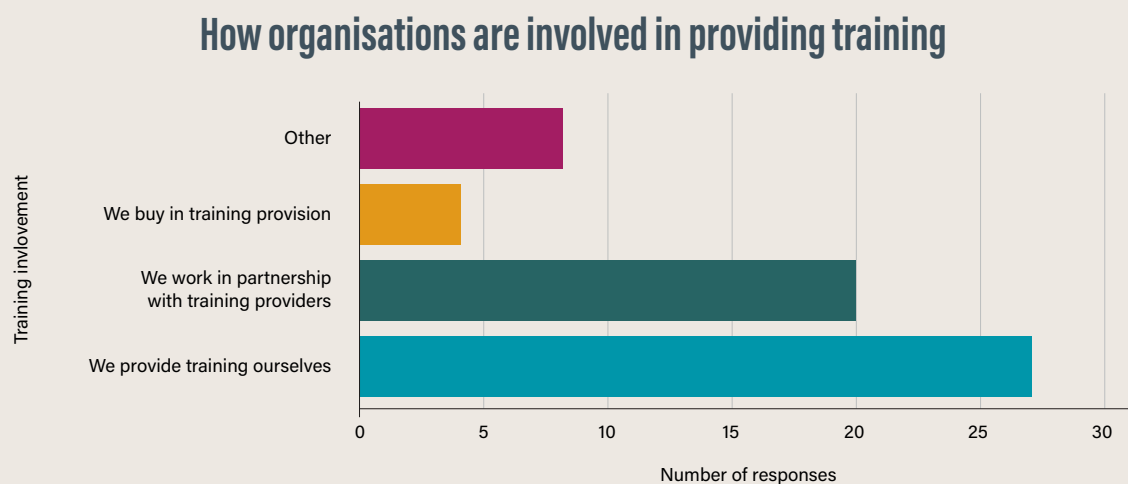


Figure a4: How survey respondents' organisations are involved in training

The survey respondents provide a mix of training including general construction, the installation of low-carbon technologies (primarily) through to general craft trades, heating and plumbing services, as shown in Figure a5. Please note that these categories require further editing but this initial overview offers some emerging insights.

Is your organisation involved in providing training for:

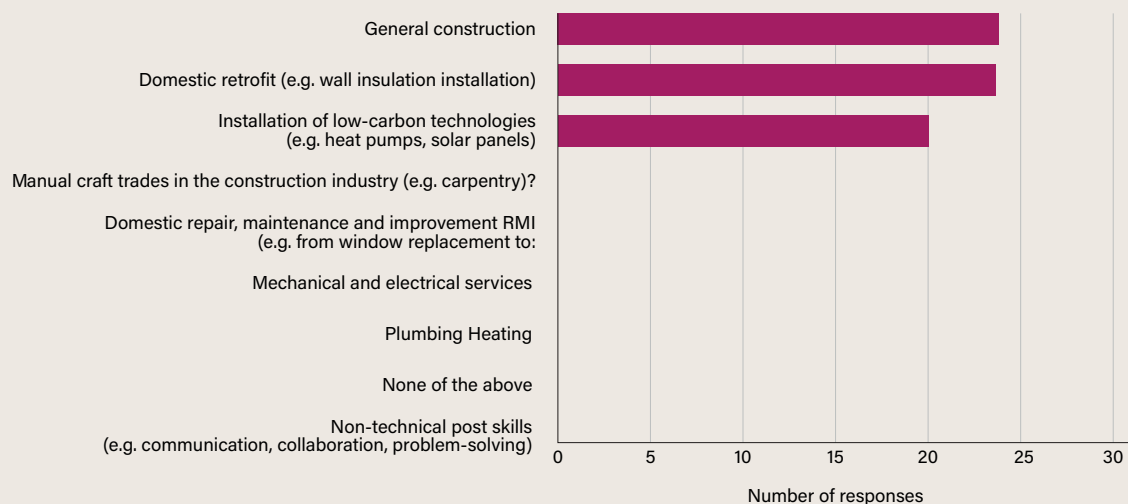


Figure a5: The survey respondents' training discipline areas

In terms of reporting on the training provided, almost two thirds (N=30) do report but approximately one third (13 respondents) do not report on the training they provide, as shown in Figure a6.

Do you have to report on your training provision to anyone, either inside your organisation or external to your institution?

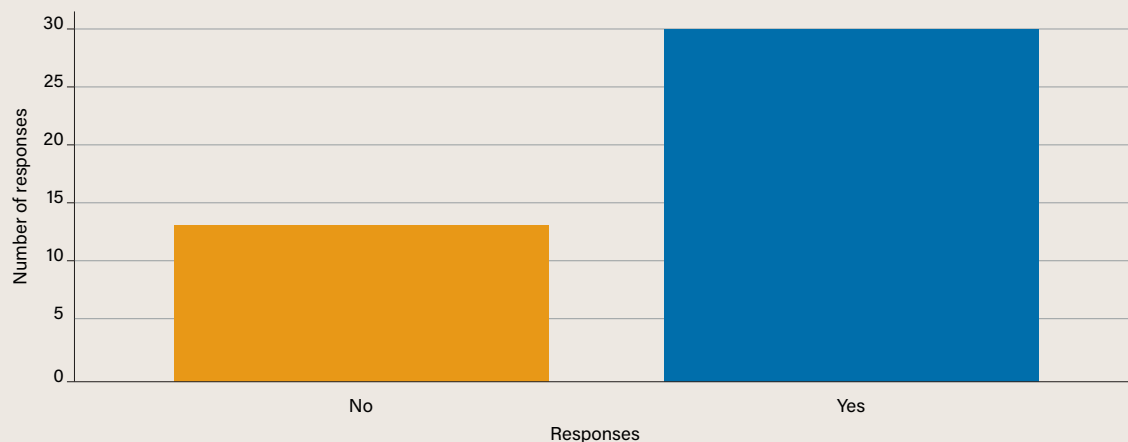


Figure a6: Do survey respondents have to report on their training provision?

The bodies that survey respondents report to include Government departments, funding, accreditation bodies and conducting internal monitoring (slight majority), as shown in Figure a7.

Number of mentions for each reporting body

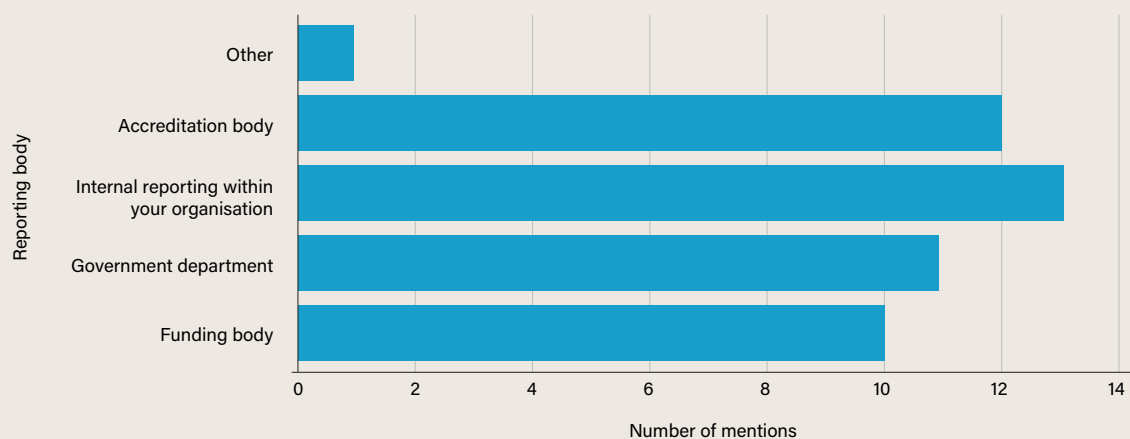


Figure a7: Reporting bodies

The reporting formats used by survey respondents' organisations include spreadsheets (31.2%), online database (28.1%), written reports (18.8%), paper records (12.5%) and verbal accounts (6.2%), as shown in Figure a8.

Distribution of reporting formats used by organisations

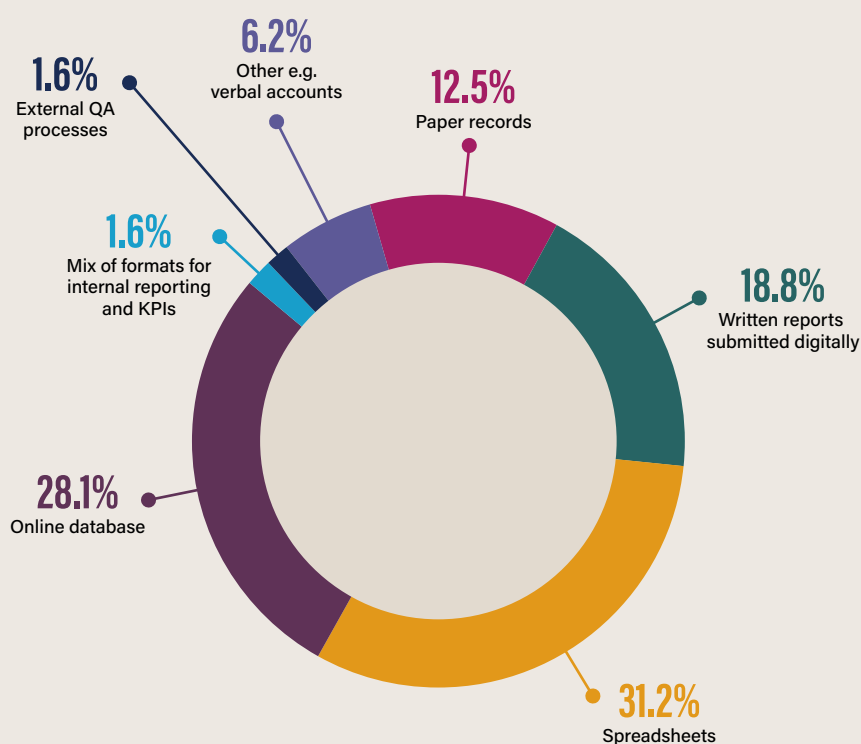


Figure a8: Reporting formats used by survey respondents' organisations

Of those collecting data, the majority of survey respondents cannot share data directly with the research team, as shown in Figure a9. This could be due to General Data Protection Regulations (GDPR) and will be further explored in follow-up interviews as some data might be available to be shared without trainees' contact details included. This result does however indicate the challenges associated with accessing and analysing data for the VET for RMI system. The majority of survey respondents are willing to participate in follow-up interviews – the research team have followed up with these respondents to organise interviews.

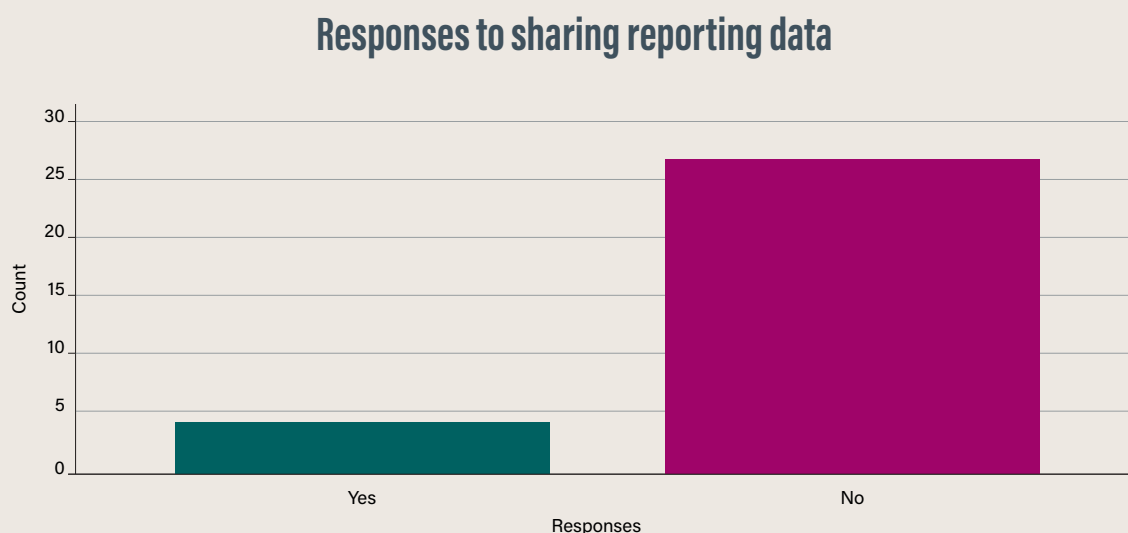


Figure a9: Willingness to share whole datasets relating to training provision

Appendix B: UK housing

This appendix brings together some of the detailed facts and figures mentioned in the report that help to understand the technical, market and policy context of retrofit/RMI.

Projected retrofit measures to 2050

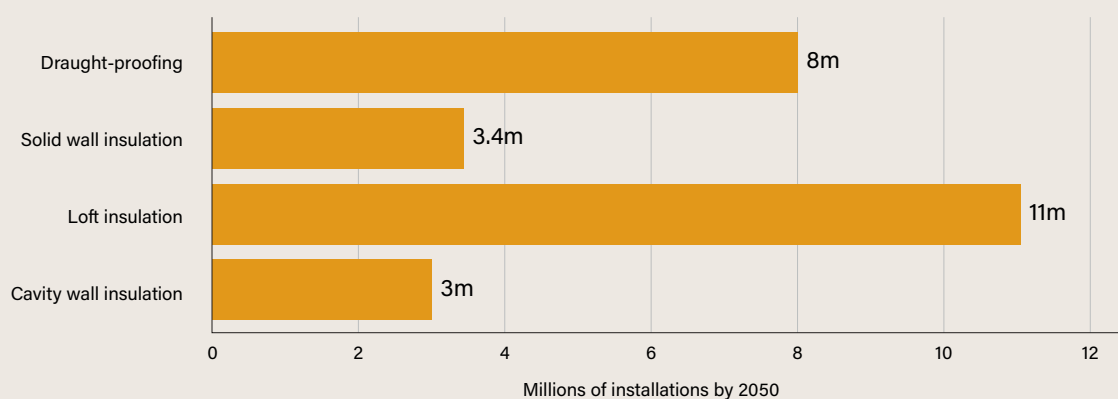


Figure b1: Key assumptions for existing homes in the Balanced Pathways scenario for Net Zero. [Data sourced from: Committee on Climate Change (2020). The Sixth Carbon Budget: The UK's path to Net Zero. London: CCC. Available at: <https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf> [Accessed 20 Oct. 2025]]

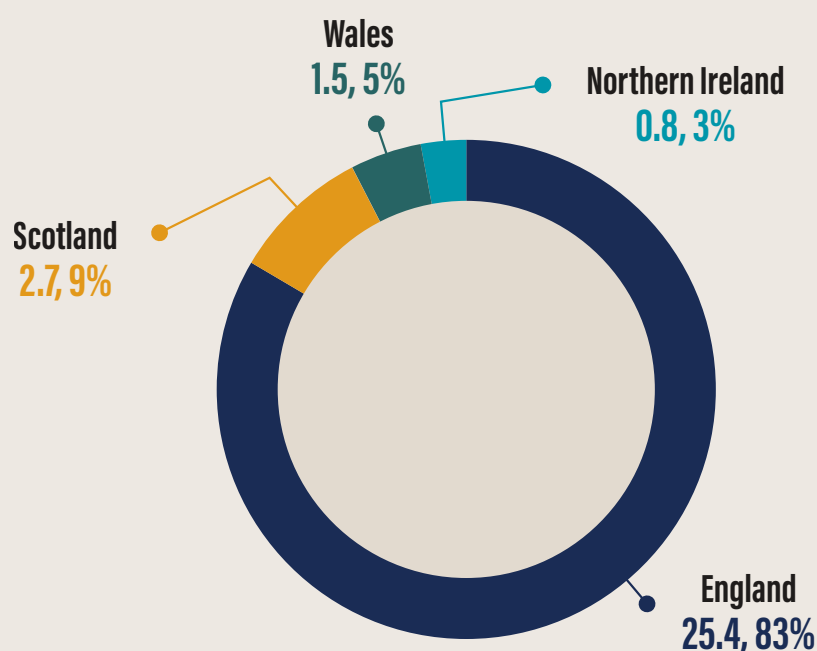


Figure b2: UK housing stock by nation, 2023. [Data sourced from: [1] ONS (2025) Dwelling stock by tenure, UK available: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/datasets/dwellingstockbytenureuk>

Tenure distribution of housing by nation (2023)

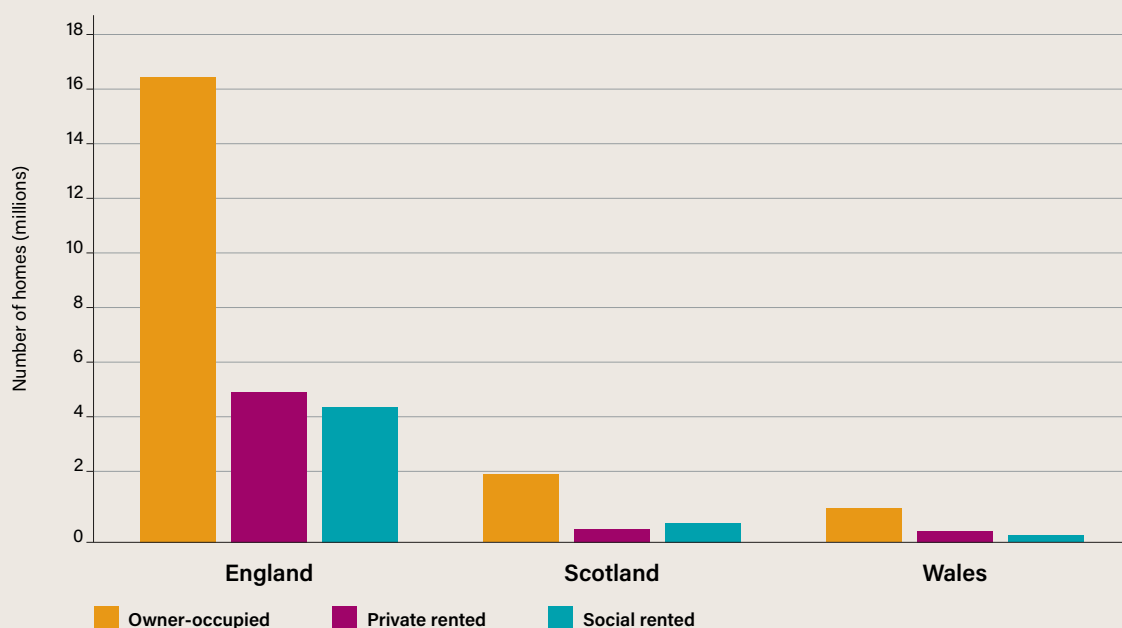


Figure b3. Housing stock by tenure type for England, Scotland and Wales in 2023, millions. Data sourced from: ONS (2025) Dwelling stock by tenure, UK available: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/datasets/dwellingstockbytenureuk>

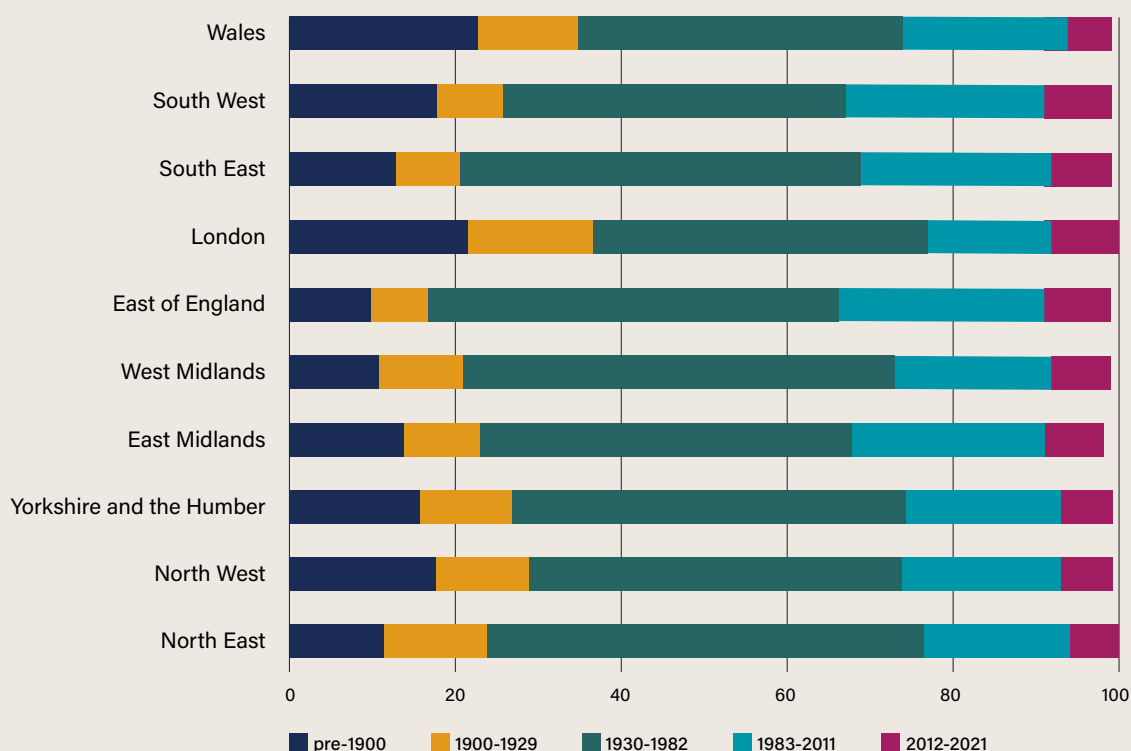


Figure b4: Regional variation of property age for homes in England and Wales [Data sourced from: Office for National Statistics. Age of the property is the biggest single factor in energy efficiency of homes. 1 November 2021. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/ageofthepropertyisthebiggestsinglefactorinenergyefficiencyofhomes/2021-11-01> (accessed Oct 2025)]

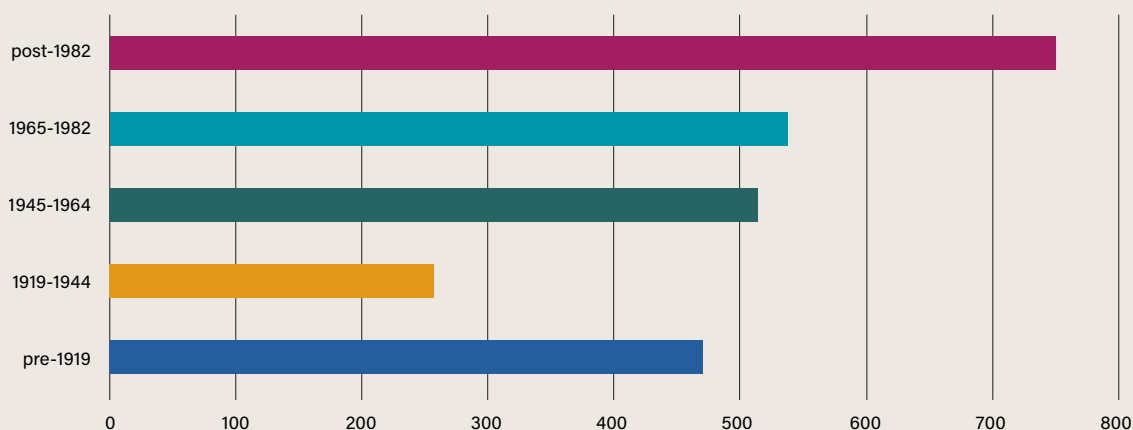


Figure b5: Variation of property age for homes in Scotland (separate to England and Wales due to different age brackets)
 [Data sourced from: Scottish Government. (2025, January 28). Scottish House Condition Survey: 2023 – Key findings – Tables KA1a and KA 1b: Occupied dwellings by age band and type [Data set]. <https://www.gov.scot/publications/scottish-house-condition-survey-2023-key-findings/documents/>]

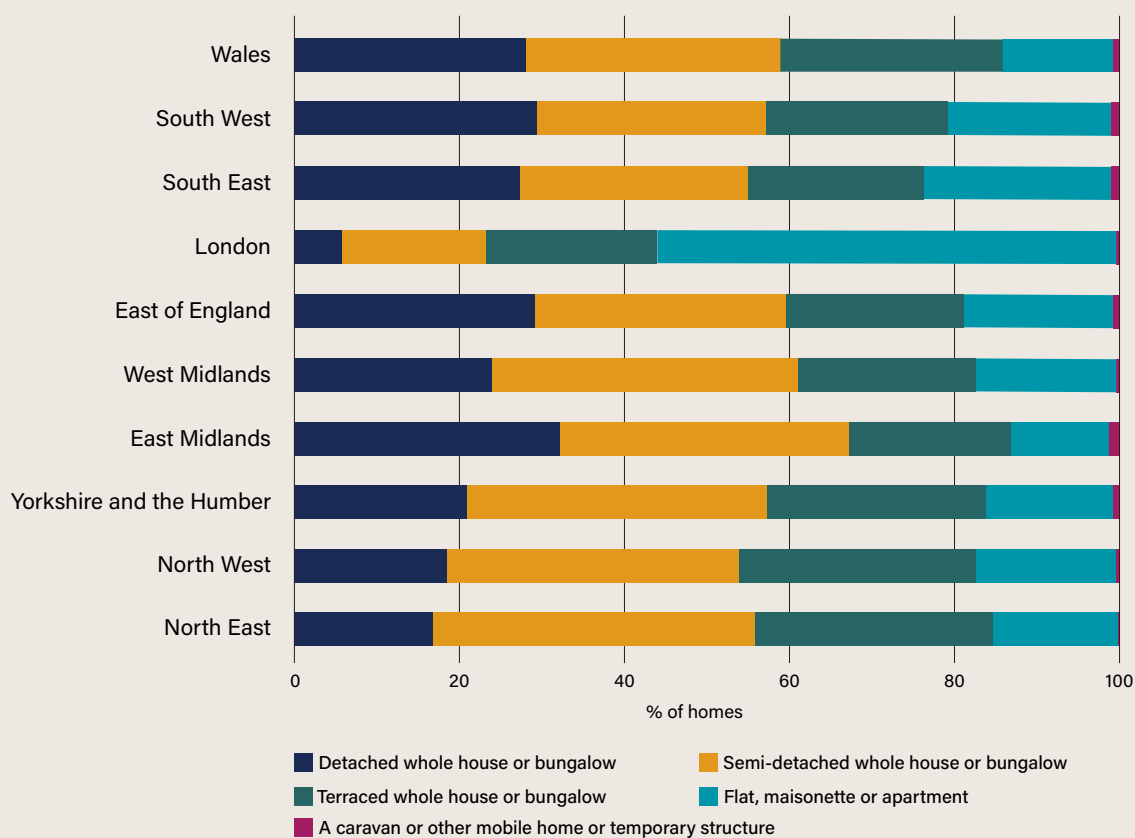


Figure b6: Housing stock by built form for the England and Wales (2023) [Data sourced from: Office for National Statistics. Age of the property is the biggest single factor in energy efficiency of homes. 1 November 2021. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/ageofthepropertyisthebiggestsinglefactorinenergyefficiencyofhomes/2021-11-01> (accessed Oct 2025)]

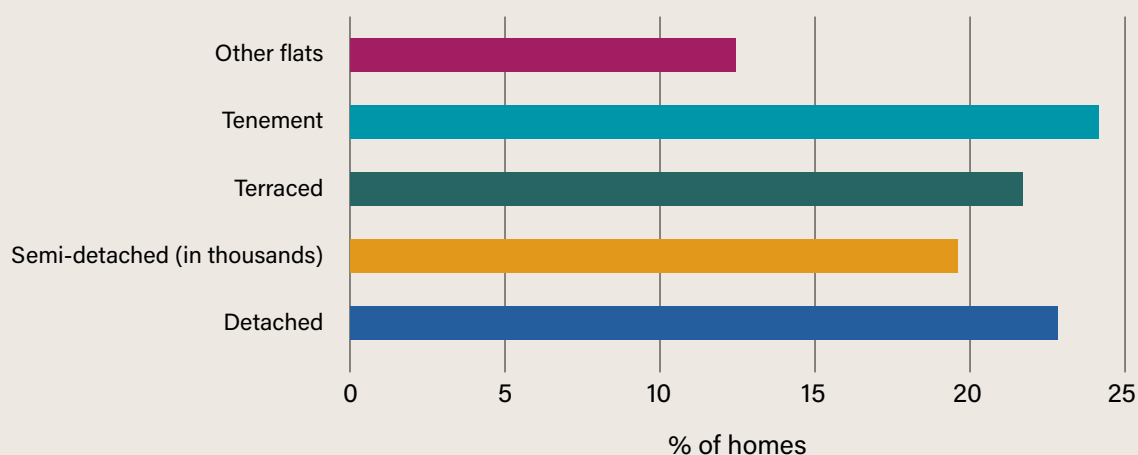


Figure b7: Housing stock by built form in Scotland (including tenements, excluding mobile homes). [Data sourced from: Scottish Government. (2025, January 28). Scottish House Condition Survey: 2023 – Key findings – Tables KA1a and KA1b: Occupied dwellings by age band and type [Data set]. <https://www.gov.scot/publications/scottish-house-condition-survey-2023-key-findings/documents/>]

Existing domestic stock by region and EPC rating (2025)

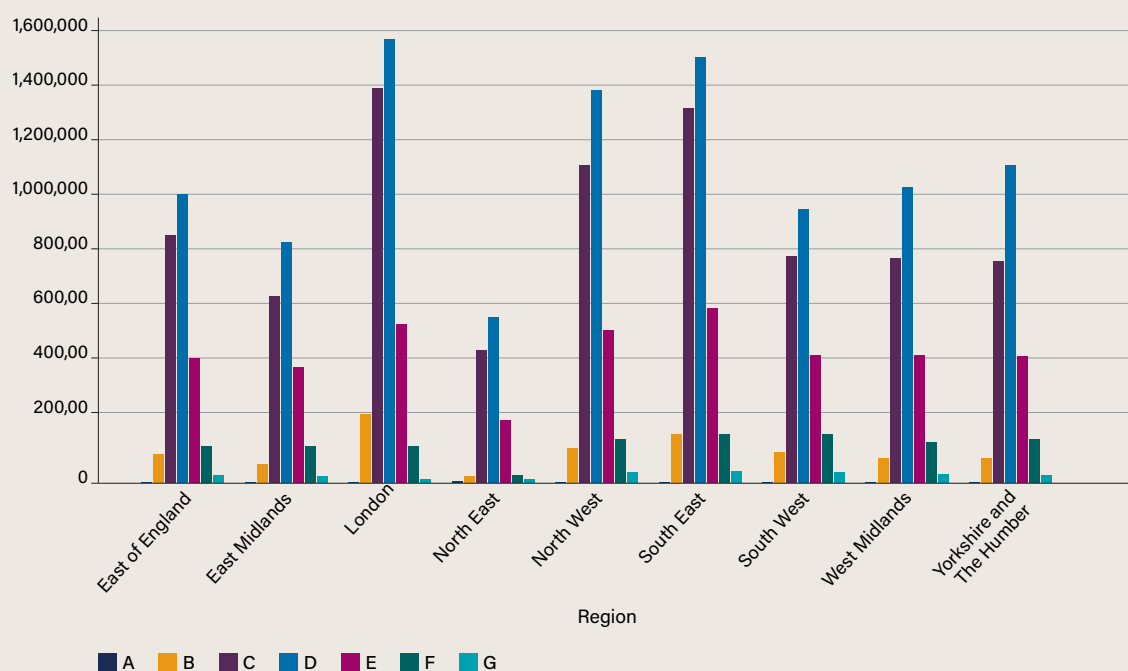


Figure b8: Housing stock per EPC rating (to 30 June 2025) [Data sourced from: UK Government. Live Tables on Energy Performance of Buildings: EPCs for Existing Domestic Properties. Available at: <https://www.gov.uk/Government/statistical-data-sets/live-tables-on-energy-performance-of-buildings-certificates#epcs-for-existing-domestic-properties> (Accessed Oct 2025)]

Primary heating fuels in Scottish homes 2019

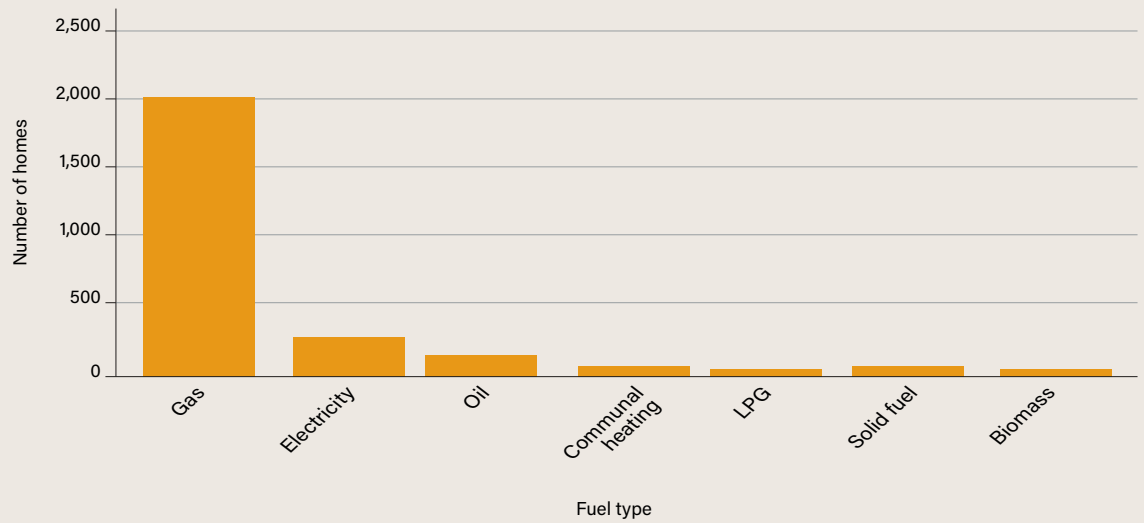


Figure b9: Primary heating fuels in Scottish homes, thousands, 2019 (Source: Scottish Housing Survey, 2019) [Data sourced from: Scottish Government. (2020, December 1). Scottish House Condition Survey: 2019 – Key findings [Statistical report]. <https://www.gov.scot/publications/scottish-house-condition-survey-2019-key-findings/pages/4/> [Accessed October 2025]]

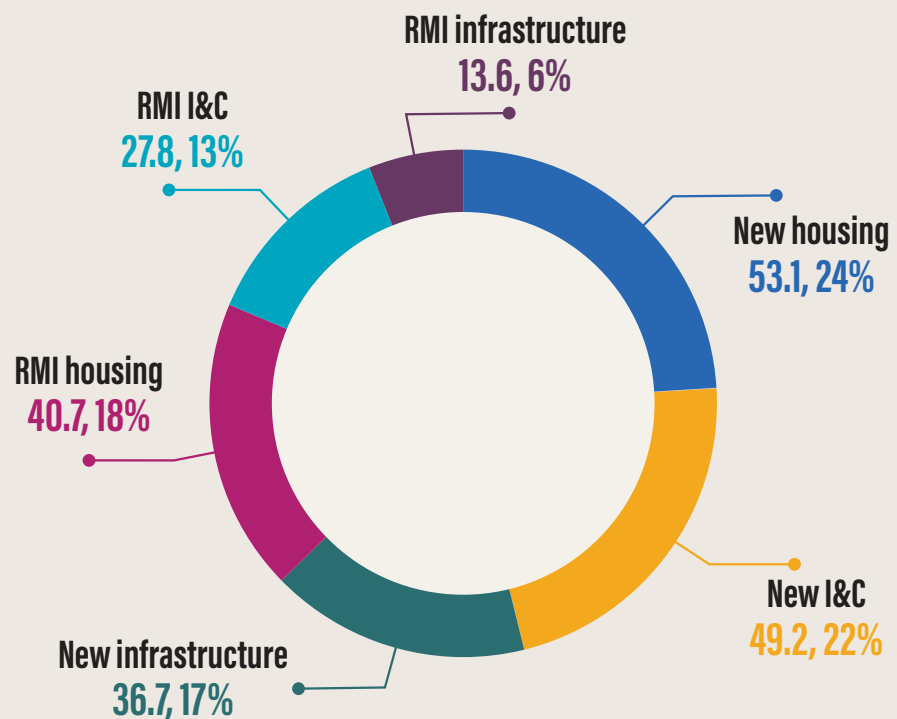


Figure b10: The RMI sector within the construction sector

The Tables b1, b2, b3 below provide detail of retrofit funding approaches in England, Scotland and Wales.

ENGLAND

Programme	Funding	Delivery/ target group	Purpose	Requirements/ key features	Focus
Energy Company Obligation 4 (ECO4)	Funded through energy supplier obligation	Private rented and owner-occupied homes in fuel poverty	Deliver energy efficiency and heating measures to low-income and vulnerable households	National scheme administered via energy suppliers	Long-standing programme tackling fuel poverty through insulation and heating upgrades
Great British Insulation Scheme (GBIS)	National energy supplier obligation	Low- and middle-income households	Provide affordable insulation upgrades	Delivered by obligated energy suppliers	Complements ECO4 by scaling affordable insulation across eligible homes
Warm Homes: Local Grant	£500 million (Autumn Budget 2024)	Low-income households in England with EPC D–G Owner-occupied or privately rented	Fund home energy upgrades and low-carbon heating via local authorities	100% grant-funded Begins 2025 No cost to occupants	Tailored measures including insulation, solar panels, and air-source heat pumps
Social Housing Decarbonisation Fund (SHDF/ Warm Homes Social Housing Fund	£3.8bn (2019–2030) Total investment ≈ £7.6bn	Social housing landlords and local authorities	Improve energy efficiency of social housing to EPC C	Must comply with PAS 2035:2019 Supported by SHRA and Technical Assistance Facility	Largest retrofit scheme in England Focuses on fabric-first upgrades, ventilation, and low-carbon heating Over 112,000 homes improved to date

Table b1: Retrofit funding approaches in England

SCOTLAND

Programme	Funding	Delivery/ target group	Purpose	Requirements/ key features	Focus
Energy Efficiency Standard for Social Housing (EESH / EESH2)	N/A (Regulatory Standard)	Social landlords and registered social housing providers	Improve energy efficiency of social housing Reduce emissions and fuel poverty	EPC C/D by 2020 (EESH1); EPC B or as efficient as practicable by 2032 (EESH2) Under review to align with Net Zero 2045	Clear long-term regulatory framework Paused pending review Proposals for a new Social Housing Net Zero Standard (SHNZS)
Social Housing Net Zero Heat Fund (SHNZHF)	£200 million (2020–2026)	Social landlords and local authorities	Support retrofit and installation of zero direct emissions heat (ZDEH) in social housing	Fabric-first focus 60% intervention rate; rural uplift of 11% and remote uplift of 22% Fair Work First principles	Strengthens capacity of social landlords Supports energy transition with targeted grants and reduced match funding
Heat Network Fund	£300 million	Public and private sector organisations	Expand zero-emission heat networks across Scotland	Capital grant funding for heat network projects supporting low-carbon transition	Enables large-scale decarbonisation and supports social housing integration with heat networks

Table b2: Retrofit funding approaches in Scotland

WALES

Programme	Funding	Delivery/ target group	Purpose	Requirements/ key features	Focus
ORP	£13 million (Welsh Government)	1,724 social homes 68 partners Including 26 social housing providers	Develop data Tools Supply chains to deliver tailored retrofit pathways	All works must comply with PAS 2035 standards Focus on modelling and digital tools	Innovation and learning-led programme Builds capacity and standardisation across Wales' social housing sector Emphasis on data-driven and PAS 2035-compliant retrofit

Table b3: Retrofit funding approaches in Wales