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The Great British Retrofit

The scaling of the supply chain to achieve home decarbonisation in the UK

February 2024

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About Baringa, TrustMark & Travis Perkins plc



Baringa is a globally leading advisory business. We help organisations to navigate the energy transition. We analyse and design markets and policy, determine strategy and investment decisions, identify new commercial opportunities, and manage risk, structure and run more effective businesses, all underpinned by a world-leading energy market modelling capability.

With over 800 energy experts and 130+ partners, working globally from 4 hubs in Europe, the US, Asia and Australia we have held leading status in the FT's

management consultancy rankings for 5 years running, are a B Corporation, and have retained Great Places to Work status for the last 15 years.

What sets us apart is that we are deep energy experts, who achieve real commercial value for our clients while putting citizens, customers, and employees at the centre of our approach.

Find out more at www.baringa.com



We are TrustMark, a not-for-profit, social enterprise and the only UK Government-Endorsed Quality Scheme for home improvements.

We work with our Scheme Providers to create a Retrofit Supply Chain committed to delivering high levels of quality and maintaining the required standards of technical competence, trading practices and customer service.

TrustMark is the custodian of the retrofit standard PAS 2035 – where TrustMark registration is mandated for Government funded and capital schemes for energy efficiency and Energy Company Obligation

(ECO) schemes. For these schemes, and other retrofit funding models such as those provided by Banks, TrustMark provides quality assurance oversight.

Information on retrofit improvements captured on the TrustMark Data Warehouse is used by OFGEM, policy makers, energy companies and other organisations to monitor quality of rollout, provide customer protection and make decisions to help scale retrofit across the UK.

TrustMark collaborates across the Retrofit value chain to support meeting the UK's Net Zero ambitions.

Travis Perkins

Travis Perkins plc is a leading partner to the construction industry and the UK's largest distributor of building materials to trade customers.

The Group operates a number of market leading businesses, including Travis Perkins general merchant, Toolstation and specialists in civils (Keyline), heating and ventilation (BSS) and drylining and insulation (CCF). With annual revenues of around £5bn, the Group employs nearly 20,000 colleagues across the UK, but also in France and Benelux through Toolstation. The company has a proud

heritage that spans over 200 years. For more information, please visit www.travisperkinsplc.co.uk

Travis Perkins plc remains focused on ensuring the Group is at the forefront of driving sustainability in its operations and supply chain, supporting customers with sustainable products and services and addressing the construction sector skills gap to enable net zero construction and retrofit. The Group continues to make good progress against its Science Based Targets initiative ('SBTi') accredited, 1.5 degree-aligned carbon reduction targets.

With special thanks to the WMG from the University of Warwick

WMG is a world leading research and education group, transforming organisations and driving innovation through a unique combination of collaborative research and development, and pioneering education programmes.

As an international role model for successful partnerships between academia and the private and public sectors, WMG develops advancements

nationally and globally, in applied science, technology and engineering, to deliver real impact to economic growth, society and the environment. An academic department of the University of Warwick, and a centre for the HVM Catapult, WMG was founded by the late Professor Lord Kumar Bhattacharyya in 1980 to help reinvigorate UK manufacturing and improve competitiveness through innovation and skills development.



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Executive summary



Decarbonising the UK's housing stock plays a critical role in helping the UK meet its net zero targets, with inefficient housing being a major part of the problem. Only 85,914 new homes were registered in the UK in the first three quarters of 2023¹, representing a tiny proportion of the UK total of c.28.2 million households.² Additionally, the UK has one of western Europe's oldest and leakiest housing stocks, equating to approximately 19 million homes being rated EPC D and below, according to the Green Building Council, highlighting the critical need for retrofit to support the energy transition.

Nestled within the built environment, heating systems are one of the UK's largest carbon emitters, responsible for nearly a third of the nation's annual carbon footprint.³ The domestic heating sector alone contributes an eye-opening 17% of this total, a

statistic that rivals the emissions generated by the entire fleet of the country's petrol and diesel vehicles^{4,5} When indirect emissions are factored in, this figure increases to 23%.⁶

Given this context, high-quality green retrofitting can substantially contribute towards reducing the country's environmental footprint⁷ and achieving its net zero targets.

While a great deal of research has been conducted into driving green retrofit, it has primarily focused on how to create demand among homeowners and finance upgrades, including through government initiatives. This leaves an important gap – ensuring we have the supply chain to meet growing demand.

This research seeks to address that gap, looking at the challenges facing the green retrofit supply chain and how to overcome them.

What's holding back the green retrofit supply chain?

The green retrofit industry supply chain can be categorised into four primary segments:⁸

- ▲ manufacturers of green home technologies
- ▲ merchants
- ▲ installers (with particular focus on Small to Medium sized Enterprises (SMEs)⁹)
- ▲ lead contractors.

Currently, these segments are not positioned to deliver at the scale required to achieve the nation's net zero targets. The supply chain continues to face a trifecta of interconnected challenges, which are slowing delivery of the green retrofit program:

- ▲ **green skills gap**
- ▲ **difficulty harnessing standards** to support quality delivery
- ▲ complex issues surrounding the sourcing, logistics, and installation of **green retrofit technologies and materials**.

Green skills gap

The construction industry is grappling with a green skills gap of approximately 270,000 tradespeople. While there are many reasons for this, the primary contributor is the **capability gap** – not enough people have the basic green skills required to undertake retrofitting with proficiency. This is compounded by a **volume gap** – a demographic problem in which the aging workforce is retiring and not enough people are entering the sector via the traditional apprenticeship route.

Filling these gaps requires policy certainty and a phased approach, leveraging lessons from the mass upskilling success surrounding the roll-out of new health and safety standards. It requires a standardised training program integrating green retrofit skills into Level 2 to 4 qualifications, as well as continuing professional development. This needs to be considered alongside a wider education and

awareness piece around the perception and value of green skills as a long-term career choice. Importantly, it also involves the engagement, collaboration, and cooperation of multiple trades and government – because green retrofitting skills uniquely bridge traditional skillsets from various trades and require incentives rooted in clear regulatory targets.

Difficulty harnessing standards to support quality delivery

Sustainable, practical retrofit projects require appropriate standards and certifications because customers and lenders need assurance that workers have the necessary competencies and the outcome will be of high quality.

However, the standards landscape is far from simple. While some progress has been made through the Social Housing Decarbonisation Fund (SHDF), Local Authority Delivery (LAD) and Energy Company Obligation (ECO) schemes, certification initiatives have struggled to achieve key goals, namely:

- ▲ instilling consumer confidence in green retrofit technologies
- ▲ driving involvement from service providers.

The challenge lies in addressing the perceived complexity, high certification costs, and lack of incentives for industry players to participate. Inconsistent monitoring between all sectors, inspections, and data sharing practices compound these challenges.

It will take collaborative efforts to boost awareness, bring clarity, strengthen audit controls, and enable data transparency. These efforts will, in turn, drive up installation quality and demand.

Complex issues surrounding the sourcing, logistics, and installation of green retrofit technologies and materials

The supply chain plays a pivotal role in offering the materials, technologies, and services required to enhance the energy efficiency of buildings. It must be agile and fully prepared to cater to a rapidly growing market.

However, it faces a series of roadblocks – including high technology and operational costs, fragmentation, and difficulties with availability and accessibility. These impede economies of scale and drive up costs for consumers, which in turn stymies demand.

To overcome these roadblocks, we must consolidate and integrate offerings and business models, which will simplify the supply chain, create end-to-end solutions, and foster collaboration among suppliers and service providers. The industry also needs SME programs with tailored financial instruments, as well as standardisation across retrofit materials and technologies.

At the same time, the supply chain needs a backdrop of new innovation hubs, investment in circular economy approaches, integration of best practices from other countries, and a stable regulatory landscape. Finally, data and technology integration are crucial – with digital platforms that connect suppliers, merchants, contractors, and homeowners and facilitate data sharing and management.

How can we bridge the green retrofit supply chain gap?

There are clearly significant challenges in accessing the capability to deliver energy efficiency and low carbon improvements across the UK's housing stock. However, because those challenges are so intertwined, there are economies of scale when addressing them. The country needs a coordinated and innovative program that can:

- ▲ **Facilitate collaboration and provide policy certainty to overcome siloed and short-term thinking** – this will effectively catalyse the supply chain to develop essential skills, products and solutions and work with standards.
- ▲ **Promote a whole-house approach to retrofit** – across training programs and standards.
- ▲ **Prioritise design** – because the design element has been underplayed in retrofit thinking to date, and thoughtful design informs the industry's



needs around skills, quality, materials, and technologies.

- ▲ **Help the supply chain coalesce around simple, easy-to-access solutions** – that works with the range of customers and building types across the UK's complex housing stock.
- ▲ **Provide assurance to self-funding customers and lenders** – to drive demand for quality retrofit work to take place at scale.
- ▲ **Deliver consistent auditing and monitoring** – to ensure ongoing compliance with standards.
- ▲ **Enable data sharing across the sector** – including a central repository where retrofit data is captured and available.

It is vital that we overcome the challenges outlined in this report – and create a viable economic model enabling the supply chain to support the shift towards more energy-, cost- and carbon-efficient UK households.

By implementing the recommendations, the UK can create a more supportive environment for carrying out green retrofit and capitalising on the significant business opportunity it creates. This, in turn, will contribute to reducing carbon emissions, enhancing energy efficiency, and creating a sustainable built environment for future generations.

Tackling the green skills gap



The supply chain recognises the growing demand and potential of green retrofit opportunities, which some estimates put at £300 billion across all tenure. A Travis Perkins survey showed that 85% of SMEs working in the repair, maintenance, and improvement sector expect to be working in the energy efficiency and thermal retrofitting sector within the next five years. For comparison, 54% work in the sector today.¹⁰

However, there is a significant green skills gap impeding this transition.

Lack of expertise, lack of workers

There are two components to the green skills gap. Both must be addressed for the UK to have the skills needed to meet green retrofit demand:

- ▲ **Capability gap:** There are two elements to this. First of all, many in the construction industry lack the skills required to undertake green retrofit work to expected standards. Secondly, they need training so they can take a holistic, whole-house approach where they can effectively communicate the benefits of low carbon solutions; demystify design, installation, and optimisation processes; and drive further demand.
- ▲ **Volume gap:** The workforce's average age is increasing – a fifth¹¹ is over the age of 55, and recruitment is not keeping pace with retirements meaning over a quarter of a million extra construction workers may be needed by 2026.¹² There is an estimated skills shortage of 350,000¹³ new roles needed to meet our overall net zero aims in the green retrofit sector specifically.

Challenges holding back green skills development at scale

The next step is understanding how to break down the problem so the constituent challenges can be addressed. Here are the priority challenges:

There's low awareness of regulations and policies – and not enough incentive or mandate to upskill

Energy efficiency regulations in Part L of the Building Regulations are not driving demand because they only apply to new buildings or buildings where additional work is taking place voluntarily, for example a kitchen extension. This means there is no energy efficiency requirement for the vast majority of home improvements.¹⁴

Regulations for work on existing dwellings are significantly less stringent than those for new homes. The specific works should not worsen energy efficiency, but there is no requirement for a holistic retrofit measure to be implemented.¹⁵

To qualify for funded schemes such as ECO and SHDF, works must comply with more stringent retrofit standards such as PAS 2035. However, compliance is voluntary for self-funded work, and there is low awareness of the standards – 78% of tradespeople in our survey were unaware of PAS 2035. Furthermore, PAS 2035's increased stringency makes it more expensive to follow, which decreases uptake.

Additionally, SMEs are especially vulnerable to sudden policy changes, such as the abrupt discontinuation of the Green Homes Grant. This has made them more cautious about making long-term commitments to green retrofit.¹⁶

Green skills span a wide range of industries

Green retrofit skills don't fit neatly into any one category, as all areas of design, construction, installation, and assessment are affected, including both domestic and commercial buildings. For example, the critical role of design is underplayed in retrofit thinking to date, yet it is thoughtful design that informs the right outcomes – and the industry's skill needs.



Because there is no standardisation across green retrofit training requirements, it is hard for businesses to identify their gaps and map out upskilling requirements. Addressing the green skills gap will involve the engagement, collaboration, and cooperation of multiple trades and professions.

Lack of commercial benefit for sole traders and SMEs

Our survey showed that 85% of respondents expect to be doing green retrofit work in five years' time, but SME trades in particular want help understanding the opportunity and finding work in the space.

Respondents consistently cited cost as a barrier to undertaking further retrofit work, including for training and upskilling, certification requirements as well as overall supply chain material costs. Currently, training and certification is expensive and not mandated by law. And with substantial demand for 'traditional' retrofit work, there is not yet a commercial impetus to explore these new revenue streams. Therefore, additional incentives such as funding and increased access to finance are needed to provide a more robust business case for investing in training.

We must develop clear, phased, and incentivised training pathways

These challenges have created an ecosystem of underinvestment in green skills compared to other countries. They need to be addressed individually for the industry to be able to go to market and scale successfully.

In our opinion, here are key steps that must be taken:

Leverage the lessons from deploying health and safety standards

The government-commissioned *Each Home Counts* review¹⁷ noted that the construction industry previously met the challenge of a mass-level upskilling when new health and safety standards came into effect. This was driven by:

- ▲ legislation
- ▲ industry desire to meet standards
- ▲ penalties for non-compliance.

The experience from health and safety standards shows it is possible to tackle the upskilling challenge within required timescales – so long as there is concentrated effort across industry and government. Although incentives are not yet strong enough, they do exist. There is significant opportunity for companies to invest in green skills to benefit from first mover advantage, creating brand loyalty that positions them as a market leader. This has already been seen with Octopus Energy’s provision of flexibility services. In addition, educational organisations offering green skills courses are likely to attract young talent interested in developing the required qualifications.

Define a clear approach to training

This must address two key groups:

- ▲ existing professionals looking to upskill
- ▲ new entrants, for example, through apprenticeships.

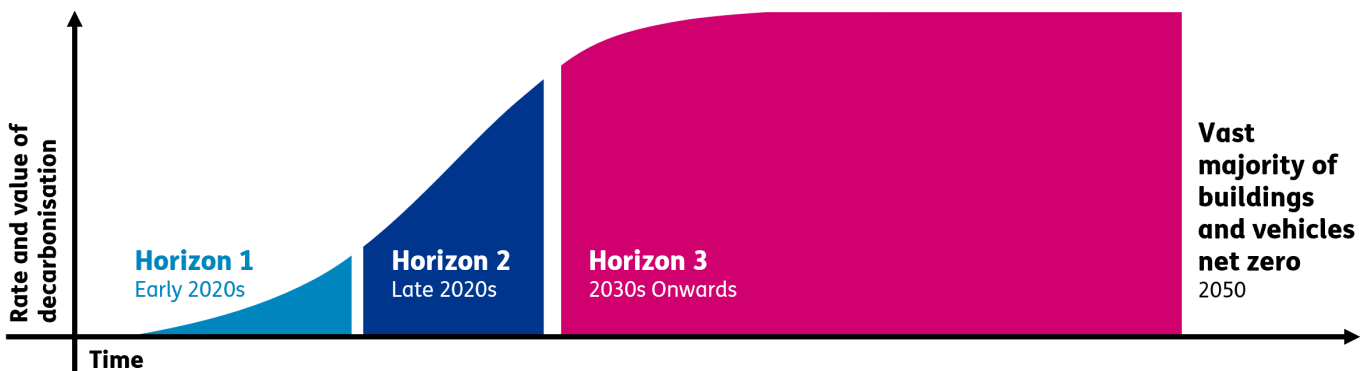
Retrofit skills must be embedded into all Level 2 to 4 qualifications and continuing professional development programs. They should be aligned with career pathways and progression routes, recognising adjacent trades to account for the interdisciplinary nature of green retrofit work. Cost-of-living support should be available to ensure apprenticeships are financially viable, and schools should receive structured career advice to encourage young people to take up a green trade career.

Some organisations such as the Retrofit Academy and The Green Construction Board have outlined training guides which set out what such training could look like, providing a baseline that stakeholders can adjust to meet their specific requirements.¹⁶

Phase training ramp-up to align with growing demand for green skills

It is important to time upskilling – and the associated scaling-up of supply – with expected growth in demand for green services. Baringa’s previous Green Homes Report outlines the three phases on the path to green homes, with indicative timelines:¹⁹

- ▲ **Horizon 1** looks at monetising the here and now opportunity, focusing on building fabric upgrades and leveraging learnings from the funded market.
- ▲ **Horizon 2** prepares for evolving market conditions with rising EV adoption and upcoming mandatory half-hourly settlement.²⁰
- ▲ **Horizon 3** focuses on building capability for mass market conditions, with heat and transport decarbonisation a priority.



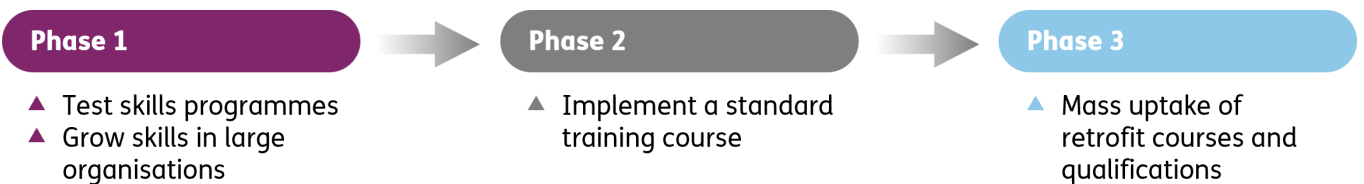
Green skills must be developed to fit the evolving needs of each horizon. By integrating retrofit skills modules into existing qualifications, we can address the capability and volume gaps to meet growing demand, without having to incentivise people to take additional training. This will benefit further education colleges, training bodies, and large companies with the capital to upskill their workforce. The three training phases should therefore cover the following:

- ▲ **Phase 1:** Define the training required for apprenticeships and continuing professional development. PAS 2035, although still evolving, sets out clear retrofitting standards that can be used to build required qualifications.²¹ Additional learnings can be taken from the large energy retailers that have set up green home skills academies.
- ▲ **Phase 2:** Create standardised training courses that can be easily integrated into all apprenticeships and continuing professional

development courses. This training should be rolled out across all further education colleges that do not yet offer retrofit training, as well as larger construction and retrofit businesses.

- ▲ **Phase 3:** Ensure broader take-up of retrofit training by:
 - a) Incorporating whole-house assessment and retrofit skills into existing training and retraining programs aimed at trades. That way, their training investments can pay off by way of additional revenue.
 - b) Implementing regulation to mandate specific training for maintaining professional qualifications, along the lines of the health and safety regulations. This would impose costs, but the demand for these skills should be significant enough to make this commercially viable.

To improve overall awareness of green retrofit, this training approach can be targeted across all relevant professions, not just the construction industry.



Define clear regulatory targets to incentivise skill transformation



Targets provide certainty there is a clear, long-term, and strategic policy on the importance of green retrofit. They need to be incentivised or enforced by penalties to have an effect. Although the government pushed back certain net zero-related targets, interim targets remain – such as 600,000 heat pumps

installed every year by 2028. Targets are critical and it is integral that these skills enable a technology agnostic approach, developing a workforce that can deliver the right solutions for each bespoke property. Examples of incentivisation that could enable change at scale include:

- ▲ Regulation similar to the recently scrapped requirement for all private landlords to upgrade their properties to an EPC C rating.
- ▲ Having all lenders require a buyer or re-mortgager to present a plan for achieving a minimum of EPC C. The same requirement should be applied to cash buyers.

When there are properly incentivised targets, businesses will invest in upskilling – because they have confidence the demand will generate a return on their training investments.

Harnessing the power of standards to uphold quality



The green skills gap is closely linked to challenges with standards and certifications. Standards around retrofit have developed slowly, only recently focusing on a whole-house approach, and a general lack of awareness of standards makes it harder for suppliers to understand their gaps and plan training.

Standards and certifications give suppliers frameworks to abide by – in terms of their team’s capability, quality of work, customer service, and consumer protection. They also give assurance to customers and lenders that projects will be delivered to the right level of quality and sustainability.

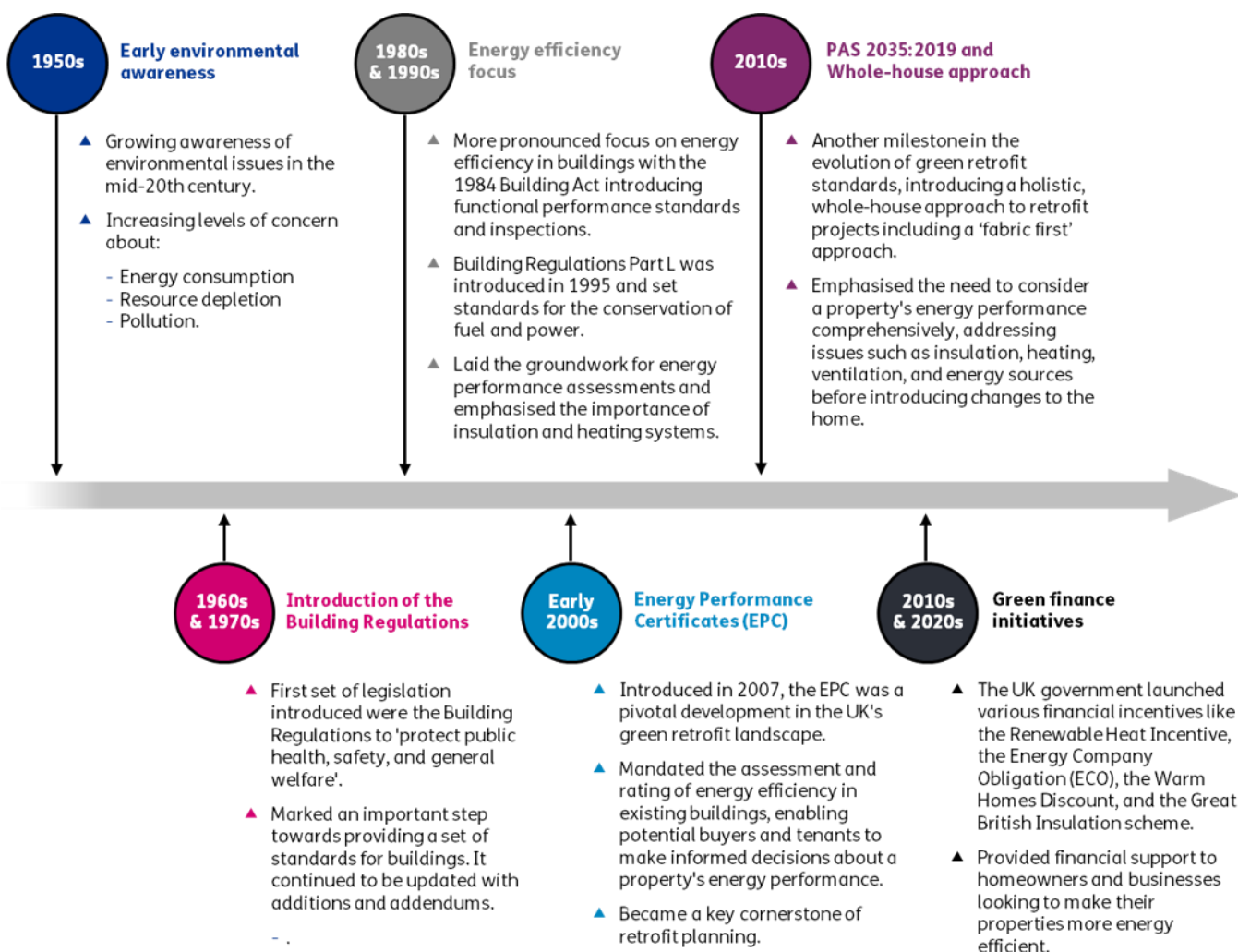
However, to date, standards in combination with skills and supply chain are not providing the assurance needed to drive work at scale. Unless mandated, the incentive to work to the most stringent standards is not there. The lack of

knowledge, skills and competency needed to implement these correctly and consistently, as well as the desire or ability to pay for them adds to the challenge.

Government policy continues to evolve in this space, and schemes such as TrustMark and MCS have helped provide that assurance. However, application of standards has been significantly impacted by the cost-of-living crisis, difficulty finding information, and confusion around the end-to-end process.

Slow development, lacklustre demand

The UK’s journey towards sustainable construction practices and regulations began with growing environmental awareness during the 1950s and culminated in recent green finance initiatives.



While the Energy Company Obligation (ECO) schemes were introduced to help tackle fuel poverty amongst vulnerable households and the earlier Green Deal targeted other households, neither have led to green retrofit at the scale required, in part because of concerns over installation quality and failure to deliver promised savings (despite the Green Deal Quality Mark certification scheme).

The initial ECO schemes have only encouraged piecemeal installation of home improvement measures rather than a whole-house approach that would take advantage of retrofitting disruption to carry out a holistic remedial process. Over 3.5 million retrofitting measures have been installed through ECO schemes since 2013 – mainly cavity wall insulation (29%), boiler upgrades (23%), and loft insulation (19%). Other micro-generation technologies like heat pumps and biomass boilers

have represented only 0.4% of installed retrofitting measures.²² However, installations of all measures have stalled since mid-2015.²³

The Green Deal, launched in parallel to ECO, suffered due to inconsistent installation quality,²⁴ complex processes, costly assessments, and high interest rates on offered loans. Out of the 300,259 Green Deal assessments undertaken between January 2013 and July 2014, only 1,815 homes opted to utilise it – a trivial 0.6% conversion rate.²⁵ Furthermore, the pay-as-you-save loan repayment plans were based on estimated energy savings that did not materialise partly due to poor-quality installations.²⁶

After the Green Deal was discontinued in 2015, an independent review was commissioned to look at 'consumer advice, protection, standards, and enforcement for home energy efficiency and

renewable energy measures in the United Kingdom'.²⁷ This review recommended a comprehensive set of measures to improve the consumer experience, including establishing a quality mark for installers, improving access to advice and guidance, and strengthening compliance and enforcement. In 2018, TrustMark became that quality mark.

Although there has been progress, slow and fragmented standards development has made it difficult for suppliers to understand best practices, plan training, or adopt a whole-house approach to green retrofit – which means they have continued to focus on familiar ‘traditional’ projects.

Challenges holding back the effectiveness of standards

A vicious cycle exists for the green retrofit supply chain. Lack of clarity means there is little knowledge of or adherence to standards. Lack of consumer trust in low carbon solutions dampens demand. And lack of demand means there is little incentive for the supply chain to invest in accreditation, because there is no guaranteed return on investment. As there is no clear commercial benefit to certification, the supply chain then is not focused on improving their understanding of standards.

Despite many attempts to break this cycle over various interventions and schemes, the standards landscape faces many evolving challenges. Here, we outline the major ones.

Too many complicated standards and schemes

For contractors and retrofitting service providers, navigating the intricacies of various standards leads to confusion and potential non-compliance, especially for micro businesses and SMEs. For instance, only 22% of SMEs that Travis Perkins surveyed for its RMI Index reported being aware of PAS 2035.²⁸

PAS 2030 and MCS certification are two of the more widely known installer certification processes, but they are complex. Certification to these standards

helps make a tradesperson eligible to work on retrofit projects funded through ECO schemes or subsidised through government-funded schemes. They require certifications/qualifications based on the work type the business wants to deliver.

PAS 2030 must be used in conjunction with PAS 2035 and this brings additional requirements. For example, a ‘retrofit assessor’, as defined by PAS 2035:2023, should be a domestic energy assessor certified and registered by an assessor body and must also hold the required Level 3 award in energy efficiency for older and traditional buildings, where relevant. Complying with this process requires independent assessment from multiple qualification authorities and educational institutions.

Additionally, financial institutions issuing loans supporting green retrofitting investment often require separate certifications from various private organisations, further complicating the landscape. MCS has recognised this complexity challenge in low carbon technology and recently completed a public consultation on how to reduce it – as a way of increasing scheme effectiveness and boosting customer confidence in small-scale renewables.²⁹ However, further progress needs to be made.

High cost of entry

Depending on the certification sought, applicants need to invest in training, fees, and costs associated with adapting business practices to deliver the new service offering. For example, a PAS 2030 certification assessment can cost close to £1k with additional fees required based on the number of individual measures the installer wants to be assessed for. Many installers are deterred by the initial expenses and perceive pursuing retrofitting certification as financially burdensome.³⁰ As an example, the timescale for the Green Homes Grant Voucher Scheme was shortened (six months), meaning there was little incentive for installers to pursue certification given the high cost of installer eligibility.³¹

As demand for retrofitting work is still nascent, the potential for additional revenue and return on investment for certification remains low. The ‘*what’s in it for me*’ question needs to be answered.

Localised operations

SMEs and micro businesses play a vital role in the UK's green retrofit market, overshadowing the presence of larger companies that typically focus on specialised areas like solar PV and broader energy efficiency.^{32, 33}

Due to their localised operations, SMEs can capitalise on regional schemes and incentives which do not necessarily join up with national retrofit policies, meaning services cannot be uniformly provided nationwide.³⁴ The geographic fragmentation calls for more centralised coordination to ensure quality, profitability, and effectiveness.

Lack of historical data

Data related to a building's retrofit plans and historical home improvements are of significant value to the industry, complimentary sectors, and consumers. For example, lenders face a challenge when there is no record of works or the quality standard adhered to for completed works.

As schemes and government regulations change, the lack of historical data means it will require additional effort to assess and certify properties. As a result, the process becomes more expensive and difficult for designers, tradespeople, consumers, insurers, lenders, and lawyers involved in improving a property.

Initiatives such as the methodology that TrustMark is developing to scan and assess property at scale will support decarbonisation and provide consumers with access to the relevant, up to date information about their homes, enabling them to make informed decisions about home improvements including energy efficiency and low carbon heating.

Inconsistent monitoring, inspections, and data sharing

The requirement (or not) for standards monitoring and auditing varies across the retrofit landscape, which muddies the waters and adds inconsistency. For example:



- ▲ Retrofit work funded under ECO or government schemes – such as the Home Upgrade Grant or Social Housing Decarbonisation Fund – requires businesses to be TrustMark registered, certified under PAS 2030 for energy efficiency measures, and MCS certified for low carbon and renewable technologies. All work must be completed in accordance with PAS 2035. This work then falls under the TrustMark Quality Assurance Process and the inspection processes of the PAS 2030 and MCS certification bodies.
- ▲ Work under the Boiler Upgrade Scheme requires MCS certification only.
- ▲ Outside of these funding schemes, there is no overall mandate for TrustMark registration, PAS 2030 certification, MCS certification or compliance with PAS 2035 (although it is advisable).
- ▲ Oversight can apply where work is carried out in compliance with the Building Regulations, Competent Person Schemes, and Local Authority Building Control.
- ▲ For 'unregulated trades', no quality assurance or inspection processes automatically apply.

Because there is no single, consistent approach to monitoring and auditing, there is additional bureaucracy and potential duplication of effort. Additionally, findings are not always shared between compliance organisations, meaning poor performers are not routinely identified and failure rate trends are not consistently recognised or addressed.

We need assurance for a whole-house approach – with appropriate monitoring and data sharing

The nature of retrofit is that often multiple measures are required together; a result of when a single measure creates knock-on impacts (e.g. heat pumps installation requiring changes to radiators and insulation). Retrofit assurance brings a higher level of quality assurance to bear because it needs to consider the consequential impacts of a single-measure approach. Today the RMI sector often involves trades addressing one issue - changing only the heating, only the bathroom, only the roof, only the windows, etc. Whilst this work is completed in line with the regulations and building control for that single measure, it doesn't take whole house retrofit into account and therefore does not require that trades person to consider consequential change.

This complexity demands a different approach that creates awareness, simplifies the method for consumers and installers, strengthens audit controls and enforcement and enables data transparency.

We recommend an approach that prioritises the following areas.

Account for a whole-house approach

To address the complexity of green retrofit standards and regulations, the government and relevant authorities must simplify the landscape by providing clear and consistent direction to the private sector. There needs to be a way of ensuring quality of work

and consumer protection to enable retrofit work at scale – involving a whole-house approach encompassing all aspects of energy efficiency and recognising the need for a bespoke approach to each property.

This whole-house approach is essential because there is a significant yet untapped potential in coupling retrofitting measures with general home repairs and renovations.³⁵ An estimated 45% of the home repair, maintenance, and improvement market offers a prime opportunity for implementing retrofitting measures. This equates to roughly £11 billion annually for all homes and over £7 billion for owner-occupied homes. When executed concurrently, cost and disruption can be minimised.³⁶

Provide assurance for self-funded retrofit work

Standards development must also introduce alternative ways of providing assurance to homeowners and lenders who self-fund retrofit work. This will ensure the quality and competence required for work to take place at scale.

This could be an alternative point of entry to the green retrofit sector for contractors, particularly if they are undertaking simplified energy efficiency measures rather than whole-house work.

Strengthen audit controls

Expanding more consistent inspection mandates across other registration schemes could enable data sharing between compliance organisations, unlocking economies of scale and avoiding non-value-added duplication of effort.

To achieve this, we need investment in additional resources for inspecting and monitoring retrofit projects for non-funded schemes, so the industry can provide a higher level of quality assurance.

Create accessible databases

The government should foster a standardised methodology and framework for data collection so there can be a centralised, open-source repository for buildings information. This repository will then enable collaboration across the industry.

Initiatives such as the Green Building Passport³⁷ and other data capture and sharing methodologies

should be strongly encouraged, with public policy guiding the industry towards centralising and sharing data. This would minimise the need for surveys and assessments – and provide transparency to insurers, lenders, tradespeople, and end customers – because information can be aggregated to quantify quality of work.

Figure 1: An example Green Building Passport³⁸

Building Renovation Passports

A dynamic system to help property owners on their retrofit journey



Benefits per sector



Financial institutions, valuers and surveyors

- ▲ New opportunities for customer engagement
- ▲ Prepare for changing regulations and reporting
- ▲ Identify risks
- ▲ Verify environmental credentials



Retrofit and energy professionals

- ▲ Connection to customers
- ▲ Saves time and cost on property surveys
- ▲ Performance monitoring



Private rented sector

- ▲ Compliance with energy efficiency obligations
- ▲ Attractive to new tenants
- ▲ Supports new business models



Data and academic institutions

- ▲ Increased transparency, consistency and accountability



Local authorities and residential social landlords

- ▲ Standardised data collection and analysis to unlock deeper insights
- ▲ Supports future planning to reach climate and social goals
- ▲ Engage with citizens

Enabling the supply chain for green retrofit technologies and materials



The supply chain provides the technologies and materials required to make existing buildings more energy efficient and environmentally sustainable. The right skills and standards are required to design and deliver low carbon solutions leveraging those technologies and materials. Yet there is another, related roadblock to scaling the supply chain for net zero – there are complex issues surrounding sourcing, logistics, and installation.

In this final section, we look those challenges and how the industry, government, standards bodies, and other stakeholders can collaborate to overcome them.

Rising costs, limited low-hanging fruit

Supply chains have evolved to address demand for piecemeal retrofitting measures such as double and triple glazed windows, cavity wall insulation, smart controls, and solar panels. However, these ‘low-hanging fruit’ opportunities will soon run out. ECO, the UK’s main energy efficiency scheme, targets whole home measures aiming to reduce fuel poverty. As these schemes are utilised, and the appropriate measures are installed, the number of eligible households reduces and remaining homes are those which are harder to treat, ineligible for support schemes or typically need more expensive improvements.

Thus, the rate of energy efficiency installations has fallen compared to ECO's predecessor schemes, the Carbon Emissions Reduction Target (CERT) and Community Energy Savings Programme (CESP). The cost per tonne of carbon saved has also risen. ECO initiatives from 2013 to 2015 cost £94 per CO2 tonne saved, compared to the £34 per CO2 tonne experienced during CERT³⁹, which ran from 2008 to 2013.

With increasing inflation and the cost-of-living crisis, further progress towards emissions reduction targets will be increasingly expensive and dependent on nascent technologies.⁴⁰ This makes it harder to source technologies and materials at scale.

Challenges holding back the green materials supply chain

The symbiotic relationship between supply and demand in the green retrofitting industry is complex and nuanced. For the industry to scale successfully, there must be a positive feedback loop between these supply and demand forces. However, this loop is encountering several barriers that range from systemic issues to operational complexities.

These are the priority barriers identified in our research.

- ▲ [Low carbon technologies and materials make cash flow management more challenging](#)
- ▲ [Availability and accessibility](#)
- ▲ [High operational costs](#)
- ▲ [Industry fragmentation](#)
- ▲ [Short-term thinking](#)
- ▲ [Policy uncertainty](#)

Low carbon technologies and materials make cash flow management more challenging

Maintaining stock and materials for new, more expensive technologies and materials like heat pumps or external wall insulation requires an initial capital outlay and careful supply chain management.

This presents a particular challenge for SMEs because, as we have seen in the previous two

chapters, limited cash liquidity also hampers their ability to invest in long-term projects such as research, skills development, and accreditation.

Although we discussed the advantage of being a first mover from a green skills investment perspective, this is counteracted by a first mover disadvantage from a technology perspective. The prevailing perception is that technology prices will eventually decrease as they become more widespread. For example, there has been a remarkable 90% reduction in the cost of solar PV modules over the past decade.⁴¹ This is leading many to adopt a wait-and-see approach, further stalling the rate at which costs could be reduced through broader adoption.

Availability and accessibility

Sustainable retrofit materials and technologies are not always readily available and accessible to contractors, builders, and design consultants, as some materials and technologies in the retrofit 'basket of goods' are not widely available, and because few in the industry can supply the full retrofit material and technology needs. This includes the logistics and distribution side, because products must reach their destinations in a timely and cost-effective manner to avoid delays and disruptions.

Retrofit will require the sector to enable innovation far more effectively than it does now, evolving its supply chains to support the growth and uptake of new technologies and materials. Besides the work needed on the approval process for these to be recognised in SAP and EPC ratings (which is already under review), the supply chain, which leans towards low-cost distribution of high-volume products, needs to find ways of enabling and driving forward innovation.

It is estimated that the retrofit industry must amplify its scale by a factor of 10 to attain the 2050 net zero emissions objective. Hence, supply chain efficiency becomes vital in addressing the large-scale changes required.⁴²

High operational costs

The UK industry's dependence on artisanal, labour-intensive techniques inherently leads to high operational costs.⁴³ Because SMEs in particular are

uncertain about the profitability of the green retrofit opportunity, they are hesitant to depart from traditional yet increasingly obsolete methods.⁴⁴ These elevated costs are then passed on to the consumer, making green retrofitting a less attractive option for many. This exacerbates the already low consumer demand, which prevents the industry from benefiting from economies of scale that would naturally bring down prices for everyone.

Legal barriers add another layer of cost. Insurance companies often find it difficult to provide coverage for certain retrofit solutions, constraining the options available to consumers and industry players.⁴⁵ This not only limits the types of retrofitting projects that can be undertaken, but it also leads to higher insurance premiums – adding to the overall economic burden.

Advancements in automation and digital technology offer an opportunity to bring down costs significantly.^{46, 47} For instance, leveraging artificial intelligence for design optimisation or using robotics for material installations could create more cost-effective solutions, thereby catalysing consumer adoption.

Industry fragmentation

The UK retrofit industry is much more fragmented than its European counterparts – it lacks businesses that can offer simple, end-to-end solutions. Consumers often find it hard to navigate the sea of providers, undermining the industry's credibility.⁴⁸ This fragmentation leads to logistical difficulties, as well as the risk of inconsistent workmanship. Without standardised protocols and coordinated efforts, the quality of retrofit projects can vary widely, thereby undermining their overall effectiveness and value.⁴⁹

Moreover, fragmented operations make it harder to collect accurate data on building performance. This lack of reliable information hampers the ability of contractors, consumers, and financial institutions to make well-informed decisions on potential retrofit investments.⁵⁰

The fragmented market also exacerbates social barriers. It contributes to low consumer awareness of the benefits of green retrofitting and reinforces the perception that the sector is not aspirational. This, in turn, affects consumer demand, making it even more

challenging for the industry to reach a critical mass and achieve economies of scale.⁵¹

Various initiatives – such as RetrofitWorks in South East England, Ty Gwyrddfai decarbonisation hub in North West Wales and The Retrofit Hub in South Manchester and South Cheshire – are making strides in consolidating this fragmented landscape, but much remains to be done.^{52, 53}

Short-term thinking

The conversation around retrofitting usually focuses on enhancing energy efficiency but rarely extends to the lifespan of retrofitted elements. This short-sightedness risks a legacy of waste and limited adaptability for future upgrades.

To truly revolutionise the sustainability of our built environment, we must look beyond the immediate horizon. We need a paradigm shift to integrate circular economy principles right from the planning stages of retrofitting projects.⁵⁴ Unlike the traditional linear 'take, make, dispose' model, a circular economy focuses on durability, reusability, and resource efficiency. It is an approach designed to create a virtuous cycle where materials and products are not consumed and discarded, but are reused, recycled, and restored.

Besides net zero, energy efficiency, affordability and circularity, there are other considerations in selecting retrofit technologies and materials which need to be taken into account to avoid unintended consequences including the health of the home, air quality, safety, and climate resilience. It is critical that retrofit design takes a whole-house approach and considers a wide variety of short- and long-term risks so that the supply chain that mobilises behind the demand is readying the right technologies and materials to make properties truly fit for the future.

Policy uncertainty

Frequent policy reversals, such as the abrupt discontinuation of the Green Homes Grant, have left businesses deeply sceptical about making long-term commitments.⁵⁵ This is particularly true among SMEs and is especially damaging in a sector that requires substantial upfront investment in new technologies and workforce training.

Focus on: Emerging business models

Offering consolidation and integration will be pivotal in simplifying the retrofitting process for consumers. First movers have already identified the need for specific roles and offerings that provide more holistic approaches to home improvement – and they have created innovative business models that address this.

Examples include:

- ▲ **One-stop shop⁵⁷:** One company operates the full turnkey solution over multiple assets, providing a simplified end-to-end service for the customer.
- ▲ **Strategic partnerships:** Collaboration between multiple players, leveraging their respective strengths to provide a seamless customer journey.
- ▲ **Asset ‘as a service’:** Where customers pay fixed monthly fees for all aspects related to an asset, including installation, maintenance, energy, and optimisation – with no upfront cost. At the end of the term, the customer owns the asset.
- ▲ **Rental model:** Similar to the ‘as a service’ offering, but the service provider owns the asset.
- ▲ **Install + management fee:** Where the customer pays for the asset outright and has a maintenance contract with the delivery partner.

These models are aimed at addressing a gap in the market – the need for simplification. Players offering these services will be uniquely positioned to educate customers on suitable retrofit measures and recommend cost-effective, whole-house approaches that help drive adoption of retrofitting technologies.

Recommendations

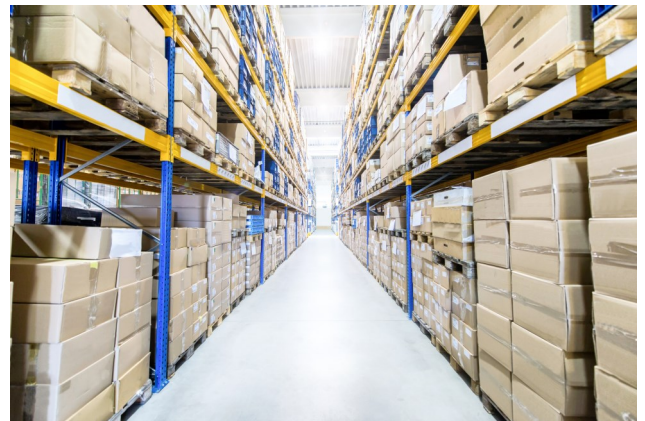
These barriers signal an industry entrenched in legacy business models that restrict expansion and self-reliance.⁵⁶ To accelerate the growth of the green retrofit industry amid these challenges, both government and the private sector should consider implementing the following recommendations to

scale the supply chain and enable adoption of circular economy principles.

Scaling the supply chain for green retrofit materials

Streamline offerings through consolidation and integration

- ▲ **Reimagine offerings and business models:** Enable players to leverage new opportunities that address industry needs and open access to routes to market. A prime example is the development of end-to-end solutions encompassing all aspects of green retrofitting from assessment and design to material procurement and installation. This will simplify the process and reduce the need for homeowners to coordinate multiple suppliers.



- ▲ **Supplier collaboration:** Foster collaboration and partnerships among suppliers and service providers to create integrated solutions. This can reduce fragmentation and improve efficiency – while creating opportunities for local (and less carbon-intensive) supply chains to emerge.

Create financial incentives tailored to SMEs

- ▲ **SME support programs:** Develop specific financial instruments and programs tailored to SMEs, a crucial but underserved segment in the green retrofit supply chain. These programs should address their unique capital and financing challenges.



Drive standardisation of retrofit materials and technologies

- ▲ **Materials standardisation:** Promote the standardisation of retrofit materials and technologies to ensure compatibility and ease of installation. Product ranges could be standardised to reduce costs and complexity while still being appropriately matched to property construction and characteristics.
- ▲ **Certification programs:** Establish industry-wide certification programs for green retrofit products and services. Certification can assure quality, performance, and compliance with sustainability standards.

Create and fund innovation hubs

- ▲ **Research and development funding:** Allocate funds for research and development in green retrofit technologies. This can lead to the creation of more efficient and cost-effective solutions.
- ▲ **Innovation hubs:** Establish innovation hubs or centres of excellence focused on green retrofitting. These hubs can facilitate collaboration between industry players, installers, researchers, start-ups, and training organisations to drive innovation. Tenants and homeowners could also visit them to understand more about what needs to change and why.

Provide a policy and regulatory framework informed by international best practices

- ▲ **Learn from other countries:** Study and adopt successful strategies and best practices from other countries with thriving green retrofit programs. Examples include the Netherlands-born Energiesprong approach – which has already seen success in UK pilots – and Germany’s public policy successes in driving growth in the retrofit industry.
- ▲ **Comprehensive policy design:** We need all-inclusive policies that meet the specific needs of both large-scale firms and SMEs.⁵⁸
- ▲ **Long-term regulatory consistency:** Ensuring a stable regulatory landscape for a minimum of a decade is crucial for the industry to reach maturity.⁵⁹ Given the past unpredictability in policy support for green retrofitting, establishing a reliable policy framework is particularly urgent for SMEs, who have been historically hesitant to invest due to the risk of unforeseen policy changes.

Enable data and technology integration

- ▲ **Digital platforms:** Create digital platforms or marketplaces that connect suppliers, merchants, contractors, and homeowners. These platforms can streamline information flow, procurement, and project management and simplify management of the large volume of products that make up green retrofitting solutions.
- ▲ **Data transparency:** Information and data about sustainable retrofit materials and technologies should flow seamlessly through the supply chain. This enables informed decision-making by contractors, builders, and homeowners, allowing them to choose the most suitable products for their projects. Blockchain technology is an example of a solution that can increase transparency and information sharing.⁶⁰

Integrating circular economy principles into UK retrofit practices

Incorporating circular economy principles into the UK’s retrofitting landscape prompts us to move beyond mere energy efficiency towards considering the entire lifecycle of retrofitted components. By addressing the following strategic areas, we can foster a sustainable ecosystem that benefits both



businesses and consumers – and creates long-term economic value.

Develop new financial models

- ▲ **Service-based models:** Homeowners could opt for service subscriptions over product purchases. For example, instead of buying a heating system, they could pay a monthly fee for maintained heating efficiency.^{61, 62} Suppliers then have a vested interest in product longevity and performance, encouraging a closed-loop system.

Drive innovation

- ▲ **Upgradability and re-manufacturability:** The focus should be on retrofit solutions designed for future upgrades or re-manufacturing⁶³, for instance:
 - **External wall insulation:** Employ mechanical connections for easy removal, facilitating material reuse or recycling.
 - **Internal wall insulation:** Adopt panelised finishes that can be removed without damaging the underlying structure, making upgrades simpler and less wasteful.

Develop supply chain capabilities

- ▲ **Education and training:** Incorporate circular economy principles into skills development programs for the construction sector. Retrofit specialists should be trained in implementing circular, energy-efficient solutions.
- ▲ **End-of-life specialists:** An emerging role in the construction sector could be specialists who focus on the end-of-life stage of products, ensuring they are either upgraded, remanufactured, or properly recycled.

Implement policies, regulations, and incentives

Policy initiatives could include:

- ▲ discounts on stamp duty if circular economy retrofit measures are implemented before selling a home
- ▲ VAT discounts on circular economy-certified retrofit products
- ▲ legislation mandating that retrofit solutions have a minimum lifetime, for instance 30 years, with producers responsible for the end-of-life stage.

Engage consumers

- ▲ **Awareness and incentives:** Campaigns can stress the long-term benefits of circular economy-oriented retrofitting as a unique selling proposition. Financial rewards could further motivate homeowners to make this choice, such as through energy tax credits or rebates.

Conclusion: Bridging the gaps for a green retrofit future



From a supply chain perspective, the path to the UK's sustainable and energy-efficient future hinges on three fundamental pillars:

- ▲ **tackling the green skills gap**
- ▲ **harnessing the power of standards to uphold quality**
- ▲ **enabling the supply chain for green retrofit materials.**

Tackling the green skills gap

The foundation of any successful retrofit initiative lies in the workforce's capabilities. To close the green skills gap, we propose a series of key steps:

- ▲ **Leverage mass upskilling lessons from the health and safety standard experience:** The Each Home Counts review demonstrated that rapid upskilling is achievable when propelled by legislation, industry commitment, and non-compliance penalties.
- ▲ **Define a standardised training program:** Targeting existing professionals looking to upskill and aspiring talent, notably through apprenticeships. This training should integrate retrofit skills into existing Level 2 to 4 qualifications and continuing professional development programs to create clear career pathways.

- ▲ **Phase training ramp-up to align with growing demand for green skills:** Create the awareness around green skills, align supply and demand, and reduce the need for incentives.
- ▲ **Define clear regulatory targets:** Create assurance for workers in the construction industry and incentivises skills transformation.

Harnessing the power of standards to uphold quality

Standards and certifications are critical to ensuring the quality and effectiveness of green retrofit projects. But the current standards landscape is complex and inconsistent. This contributes to poor installation quality, which leads to low consumer uptake and then reduced participation from industry players. To enhance the role of standards and certifications, there are key concepts to implement:

- ▲ **Simplify and clarify standards:** To provide consistent guidance to the private sector.
- ▲ **Account for a whole-house approach:** With standards encompassing all aspects of energy efficiency.
- ▲ **Provide assurance for self-funded retrofit work:** For lenders and customers, which will ensure quality and competence to help work take place at scale.
- ▲ **Strengthen audit controls:** With investment in additional resources for inspection of retrofit projects and data sharing between compliance organisations.
- ▲ **Create accessible databases:** Through a centralised, open-source repository for building information, enabling industry-wide collaboration.

Enabling the supply chain for green retrofit materials

The right materials must be available at the right time and the right price for the UK to fulfil its green retrofit targets. Key recommendations for streamlining this complex system are to:

- ▲ **Consolidate and integrate offerings:** Simplifying the supply chain with reimagined offerings and business models, creating end-to-end solutions, and fostering collaboration among suppliers and service providers.
- ▲ **Create SME support programs:** Including tailored financial instruments for businesses in the green retrofit supply chain improving access to finance.
- ▲ **Standardise retrofit materials and technologies:** To ensure compatibility and ease of installation, thereby reducing costs and complexity.
- ▲ **Create innovation hubs:** With additional funding for research and development in green retrofit technologies.
- ▲ **Learn from others:** Finding successful strategies and best practices from countries with thriving green retrofit programs.
- ▲ **Ensure a stable regulatory landscape:** Together with all-inclusive policies that meet the specific needs of both large-scale firms and SMEs and confirm long-term vision.
- ▲ **Enable data and technology integration:** Creating digital platforms that connect suppliers, merchants, contractors, and homeowners and facilitate data sharing and management.
- ▲ **Integrate circular economy principles:** Into the retrofitting landscape, including through new service-based models, a focus on upgrades and re-manufacturing, and incentives that bring in end-of-life considerations.

Paving the way for a green retrofit future

By taking active decisions to implement and drive these solutions, the UK can reduce carbon emissions, enhance energy efficiency, and create a sustainable built environment. Importantly, it can also empower individuals and organisations to contribute to a brighter, greener tomorrow. With the right strategies and collective commitment, we can turn this vision into a reality.

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