Book Section:
Macrorie, R. orcid.org/0000-0002-4148-7463, Arbabi, H. orcid.org/0000-0001-8518-9022, Eadson, W. orcid.org/0000-0002-2158-7205 et al. (4 more authors) (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

https://doi.org/10.1007/978-3-031-66481-6_6

CHAPTER 6

Support Place-Based and Inclusive Supply Chain, Employment and Skills Strategies for Housing-Energy Retrofit

Rachel Macrorie, Hadi Arbabi, Will Eadson, Richard Hanna, Kaylen Camacho McCluskey, Kate Simpson, and Faye Wade

Policy Highlights To achieve the recommendation stated in the chapter title, we propose the following:

- Member States should empower municipalities with resources and training to develop Building Renovation Plans supported by One-Stop Shops focused on inclusive local supply chain development, employment and skills priorities, as well as serving housing retrofit consumers.

R. Macrorie · W. Eadson
Centre for Regional Economic and Social Research, Sheffield Hallam University, Sheffield, UK
e-mail: r.macrorie@shu.ac.uk

W. Eadson
e-mail: w.eadson@shu.ac.uk

A. Crowther et al. (eds.), *Strengthening European Energy Policy*,
https://doi.org/10.1007/978-3-031-66481-6_6

- Municipalities should use procurement frameworks and Direct Labour Organisations to ensure a pipeline of retrofit work and support training for good quality employment.
- Member States should implement licensing or minimum competency standards for housing retrofit professionals, ensuring certification schemes encompass a wider range of skills.
- Retrofit is an opportunity to enable new groups to enter the construction sector. Municipalities should co-create partnerships alongside employees, and support unionisation, to promote training and work opportunities for women and minorities.
- Developing inclusive pathways to a skilled housing-energy retrofit workforce is a socio-technical problem, requiring insights from social, policy, building and engineering disciplines, because retrofit interweaves human and technical practices and processes.

Keywords Renovation governance · Local-area planning · Construction skills · Capabilities · Energy efficiency

H. Arbabi
School of Mechanical, Aerospace, and Civil Engineering, University of Sheffield, Sheffield, UK
e-mail: h.arbabi@sheffield.ac.uk

R. Hanna
Centre for Environmental Policy, Imperial College London, London, UK
e-mail: r.hanna@imperial.ac.uk

K. C. McCluskey
Energy Futures Lab, Imperial College London, London, UK
e-mail: kaylen.camacho-mccluskey22@imperial.ac.uk

K. Simpson (✉)
Centre for Sustainable Construction and Retrofit, Nottingham Trent University, Nottingham, UK
e-mail: kate.simpson@ntu.ac.uk

F. Wade
School of Social and Political Science, University of Edinburgh, Edinburgh, UK
e-mail: Faye.Wade@ed.ac.uk

6.1 Introduction

The European Union's (EU) building stock is responsible for 36% of its greenhouse gas emissions (EEA, 2023), partly due to poor energy efficiency: a third was built before the introduction of thermal insulation regulations in the 1970s (European Commission, 2020). Most of these buildings will still be in use in 2050. Energy retrofitting residential buildings, which includes improving building fabric and moving to zero carbon heating, cooling, ventilation and electricity services, is therefore essential. However, across the EU, retrofits achieving at least 60% energy reduction are performed in only 1.2% of the building stock per year (European Commission, 2020). To address this, the revised Energy Performance of Buildings Directive (EPBD) requires Member States to create national targets for reducing energy use in domestic buildings and establish Building Renovation Plans to attain a zero-emission building stock by 2050 (European Union, 2024). However, a 'retrofit revolution' will not be achieved unless significant supply-side challenges, including labour and skills shortages, are addressed (European Commission, 2021).

EU supply chains for building energy retrofits are fragmented, typified by micro-enterprises, and insufficient workers with the requisite skills and competences to perform high-quality renovations (Renovate Europe & E3G, 2022). Instead, low skills, low demand for training, and low quality predominate in building trades where profit margins are small (Killip, 2020). The construction sector has an inadequate supply of vocational education and training (VET) and, where available, such training can lack quality and accessibility (European Construction Sector Observatory, 2020). However, it is unhelpful to focus on skills training without considering policies that shape how the VET system functions (Stroud et al., 2024).

In addition, there is a need to tackle acute diversity and inclusion challenges within the sector. Women, minority ethnic groups, and people with disabilities are hugely under-represented in the construction and retrofitting workforce, which is ageing and struggles to attract younger generations (CEDEFOP, 2023). For example, just 10% of the EU construction sector is classed as female (European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2023), while in the United Kingdom (UK), only 6% are categorised as Black or minority ethnic groups and 6% are people with disabilities (CITB, 2024). Consequently, construction cultures remain

male-dominated and characterised by masculine values, narratives and norms (Clegg et al., 2023). This, coupled with poor job security, challenging working conditions and health and safety concerns, can make construction careers unappealing to historically under-represented groups (European Construction Sector Observatory, 2020). A greatly expanded, more diverse and competent labour force is required to meet EPBD objectives (Renovate Europe & E3G, 2022).

This chapter therefore focuses on developing inclusive pathways to a skilled retrofit workforce. This is fundamentally a socio-technical problem: understanding the nature of the challenge and producing recommendations for change requires insights from social, policy, building, and engineering disciplines, because retrofit interweaves human and technical inputs and processes. Further, retrofitting at scale requires knowledge of interlinked social and technical systems across varied systems of provision, distinct geographies, and built environments. As such the chapter draws together academic and industry literature with insights from a workshop with academics and practitioners from the UK and EU. Participants included representatives from municipalities, not-for-profit cooperatives, charities, standards bodies, and tradespeople. The workshop structure was developed using interdisciplinary perspectives spanning Civil and Structural Engineering, Construction Management, Human Geography and Sociology. It was designed to explore multiple aspects of supply chain development including: funding and delivery models, multi-actor partnerships, and geographical scales for intervention. Workshop materials including summary notes and participant expertise are available open access (Macrorie et al., 2024).

The chapter is structured according to two themes emerging from the workshop: (1) supply-side coordination through place-based organisations, networks and One-Stop Shops (OSS) ; and (2) ensuring quality through workforce regulation and training. Both themes focus on how different approaches can be used to support inclusivity in skills provision and employment outcomes. Using these themes, the chapter develops policy recommendations for (re)training programmes and initiatives to enable the growth of a diverse, skilled building retrofit workforce.

6.2 Initiatives to Support Workforce Development

6.2.1 Supply-Side Coordination Through Place-Based Action

Place-based approaches and local partnerships are needed to mobilise and organise the supply chain for energy retrofit (Brocklehurst et al., 2022).

Municipalities and social housing landlords have housing portfolios that are geographically co-located and can act as a test bed for growing supply chain capacity (Cauvain et al., 2018). Municipalities, with their knowledge of local building stock and visibility, are well-placed to create local Building Renovation Plans but this requires resource and training to develop capabilities in, for example, analysing building stock data (Wade et al., 2022). The capacity building programme *Renocally*, for example, supports Bulgarian, Romanian, and Slovakian municipalities through technical assistance and increasing overall knowledge (BPIE, 2024). Building Renovation Plans can provide a reliable pipeline of work, which is crucial for local tradespeople and SMEs to justify investment in training. They can also be used to align local training initiatives with expected retrofitting tasks, to ensure a steady flow of appropriate on-the-job training (Topriska et al., 2018).

Where they own building stock, municipalities can procure contractors to deliver large volumes of retrofitting work and require quality guarantees. Procurement frameworks can be used to support apprenticeships, raise quality standards through setting training requirements, and support involvement from a range of contractors (Green, 2016). The public sector can also develop supply chains through Direct Labour Organisations (DLOs), like *City Building* in Scotland which directly employs 2,200 workers. DLOs can support good working conditions and inclusivity, but also create a well-trained workforce with sufficient capacity to perform retrofitting at scale.

Local intermediaries can connect formal retrofit skills and informal knowledge. For example, builders' and plumbers' merchants can support knowledge sharing among tradespeople (Wade et al., 2016). Informal and voluntary networks, like *Civic Square* in the UK, can support 'beyond-market' pathways (Galvin & Sunikka-Blank, 2014) through skills development for community-led retrofit or reciprocal repair and maintenance. These alternative networks should be supported, for instance through finance and facilitation linked to OSS initiatives. The recast

EPBD includes provision for OSSs across Europe: these initiatives can act as crucial intermediaries between supply and demand, supporting skills development (see Table 6.1). However, there is a risk that OSSs will tend towards becoming consumer-focused hubs and not realise their full potential in tackling supply-side challenges: OSS design should be equally focused on inclusive supply chain, employment, and skills priorities.

To address diversity, more tailored trade networks like *Her Own Space* (UK) and Tradeswomen Building Bridges (North America; see CIOB, 2022) can provide access to construction careers, business opportunities, and knowledge sharing for under-represented groups. More formally, trade unions can work to support diversity, protect employees, and ensure job quality and health and safety (Clarke et al., 2017). For example, the *Union of Construction, Allied Trades Technicians* (UCATT) set up a *Women's Network Forum* and a *Women in Construction Newsletter* in 2014 (Clarke et al., 2017). Trade unions could also be actively included in retrofit planning (e.g. through representation on OSS boards), and opportunities for dedicated worker networks and unionisation should be encouraged as part of place-based action.

Table 6.1 Examples of supply chain support in One-Stop Shops

One-stop shop name	*Country*	*Business structure*	*Engagement with supply chains*	*Further information*
BetterHome OSS	Denmark	Industry-led	Delivers training to existing contractors and ensures quality of service	Marmolejo-Duarte et al. (2022)
Pass Renovation	France	Regional authority	Provides access to training and facilitates business networks	www.pass-renovation.hautsdefrance.fr
OSS Oktave	France	Regional authority	Requires clients to hire certified retrofit tradespeople	Oktave (2024)
Retrofit Skills Centre	United Kingdom	Partnership of municipalities	OSS focused on retrofit skills and training	https://retrofitskills.org
RetrofitWorks	United Kingdom	SME cooperative	Sharing knowledge and skills among contractors	https://retrofitworks.co.uk

6.2.2 *Ensuring Quality in the Supply Chain: Regulation and Training*

Overall competence for effective energy retrofit requires a combination of manual skills, theoretical and applied knowledge, and ethical conduct (Killip, 2020). This includes competency to consider the whole building and mitigate any potential cause of poor energy performance (CORDIS, 2023), and in-depth theoretical, technical, and interdisciplinary knowledge is often needed (Clarke et al., 2020).

Sitting alongside EPBD, the EU Energy Efficiency Directive requires Member States to develop certification schemes and/or equivalent qualification for workers providing energy efficiency audits, improvements or services (European Union, 2023). These schemes could be strengthened by detailing trading licence requirements and minimum qualification standards, updated frequently (Killip, 2020). There are already examples of licensing to trade and minimum training requirements, including certification schemes that are integrated within OSSs. For example, in Czechia, energy auditors are legally mandated to complete Ministry of Industry and Trade training courses on an ongoing basis to retain their licence to practise, while in Austria a professional network of energy consultants is self-regulated, in close cooperation with regional further education authorities and a national working group (Renovate Europe & E3G, 2022). Active support of accreditation, which can build consumer confidence, should grow as technologies like heat pumps and batteries increase the need for more complex whole-system approaches and installations (Regnier et al., 2023).

However, inconsistent training content and curricula for retrofit across Europe means that skills and competencies vary. The *EU Skills Registry* (Geonardo, 2024) allows comparison of skills and competency profiles for different jobs in construction and building energy efficiency and attempts to show international equivalence of qualification and training schemes. While standards-based curricula for VET that acknowledge a more holistic perspective are developed in some regions, e.g. in Belgium and Ireland, these are rare and the majority of training still focuses on imparting siloed skillsets (Clarke et al., 2020).

A further challenge exists with frequent mismatches between the duration of apprenticeships, or on-the-job training modules, and project timelines. There is need for innovative solutions such as employers sharing responsibility for apprenticeships and vocational training through shared

apprenticeship schemes (Bieler et al., 2019). Creating learning opportunities that suit worker schedules and practices is essential, especially since 93% of EU construction organisations are micro-enterprises (fewer than 10 employees) which have little flexibility to take time out of work (European Commission, 2023). Examples of best practice include *The Green Register* and *People Powered Retrofit* (both UK), which include training costs when bidding for retrofit works, while *Your Energy Your Way* (UK) ensures training is paid for in line with the UK Living Wage.

Furthermore, acceptable working conditions, including fair wages and job security, need to be enabled. For example, long hours, inaccessible sites and recruitment practices based on word-of-mouth rather than qualifications are not inclusive (Clarke et al., 2015). Outreach campaigns promoting the attractiveness of the industry and seeking to overcome cultural barriers to participation, as in the *European Construction Blueprint* and *Women Can Build* project (which runs across Spain, Germany, Portugal, Belgium, France and Italy), can provide a start in overcoming these challenges. Incorporating retrofit-related content into school curricula can also provide early exposure to the sector, influencing career decisions as early as primary school (Crespo Sánchez et al., 2023). Resources developed by the *Construction Blueprint* could be adopted for use in schools.

6.3 Achieving Our Recommendation

As per the title of this chapter, our core recommendation is that policy should *support place-based and inclusive supply chain, employment and skills strategies for housing-energy retrofit*.

The EU has adopted the revised EPBD, and Member States are required to deliver on its provisions. This chapter has emphasised the urgency and need to create a diverse, appropriately qualified retrofitting workforce to meet EPBD aims. The chapter opened with specific actions (see Policy highlights) to help achieve these based on academic and industry literature with insights from a workshop with academics and practitioners from the UK and EU.

Place-based networks and coalitions of organisations are important routes to skills development and can support diversity and inclusion in supply chains. Public sector-led approaches like DLOs, cooperatives and community-led initiatives should be supported to encourage broader

engagement in retrofit skills in and beyond formal employment and enterprise. OSSs can be a useful tool for meeting some of these goals but must have a shared focus on supply as well as demand, with principles for supply chain development, employment and skills embedded within their design.

Member States should develop an ongoing licence to trade, based on minimum competency standards and more standardised and comparable qualifications. This should be a requirement of certification schemes, encompassing a holistic concept and delivery of retrofit training, raising mutual understanding between separate trades. Retrofit includes multiple technology integration into existing buildings, plus the related social processes. Therefore, an understanding of both is required to deliver good training and enabling policy. The collaboration informing this chapter was enabled through social and technical researchers working together and was supported by the expertise of diverse workshop attendees.

Working and training opportunities in building retrofit have not supported diversity due to working conditions, insufficient promotion and formal recruitment opportunities and masculine cultures. Yet, diversity could enable quicker progress on creating a more sustainable built environment. Partnerships, unions and trade networks all offer potential to support women and minorities of all ages in construction by promoting diversity and supporting better working conditions. Sufficiently professionalising the workforce will involve creating pathways for ongoing learning and career advancement that fit with varied working practices and timetables. Offering clear, place-based trajectories, including influencing career decisions in schools, can contribute to developing a skilled and more diverse workforce.

Developing inclusive pathways to a skilled housing-energy retrofit workforce is fundamentally a socio-technical problem: understanding the nature of the challenge and producing recommendations for change requires insights from social, policy, building and engineering disciplines, because retrofit interweaves human and technical inputs, practices and processes. Further, retrofitting at scale requires knowledge of interlinked social and technical systems across varied systems of provision, distinct geographies and built environments.

Acknowledgements Thank you to the workshop attendees in Sheffield, January 2024: Linda Clarke, Westminster University; Gavin Killip and Richard Bull, Centre for Sustainable Construction and Retrofit, Nottingham Trent University; Charlotte Surrey, The Green Register; Sandy Rushton, People Powered Retrofit;

Cara Jenkinson, Ashden; Donal Brown, Ashden; Alastair Mumford, MCS; Ceri Batchelder, SYCA, Ellora Coupe, Her Own Space; Jenny Brierley, Breathable Homes; Leah Robson, Your Energy Your Way; Martin Fletcher, Leeds Beckett University; Alice Corovessi, INZEB; Gloria Callinan, TUS; Drogomir Tzanev, ENEffect and Vilislava Ivanova, E3G; and the chapter reviewers.

The contributions of authors were supported by the following funding sources: Hadi Arbabi, Will Eadson, and Rachel Macrorie—South Yorkshire Sustainability Centre (Research England Development Fund); Richard Hanna—UK Energy Research Centre (EP/S029575/1); Kaylen Camacho McCluskey—Research England Policy Support Fund; Kate Simpson, Centre for Sustainable Construction and Retrofit: Strategic Investment Fund, NTU; Faye Wade—UKRI Energy Demand Research Centre (EP/Y010078/1)

References

Bieler, A., Joosse, A., Bano, N., & Jacob, J. (2019). *Final report on OCWI's shared apprenticeship model*. Ontario Centre for Workforce Innovation.

Brocklehurst, F., Morgan, E., Greer, K., Wade, J., & Killip, G. (2022). Domestic retrofit supply chain initiatives and business innovations: An international review. *Buildings & Cities, 2*(1), 533–549.

BPIE. (2024). *Renocally: Empowering municipal renovation action plans and use of technical assistance*. BPIE. https://www.bpie.eu/renocally/

Cauvain, J., Karvonen, A., & Petrova, S. (2018). Market-based low-carbon retrofit in social housing: Insights from Greater Manchester. *Journal of Urban Affairs, 40*(7), 937–951.

CEDEFOP. (2023). *Construction workers: Skills opportunities and challenges (2023 Update)*. CEDEFOP. https://tinyurl.com/3s3hjd3n

CIOB. (2022). *UK crying out for female tradespeople says research by the Chartered Institute of Building*. CIOB. https://www.ciob.org/news/uk-crying-out-for-female-tradespeople-says-research-by-the-chartered-institute-of-building

CITB. (2024). *Equality, diversity and inclusion*. CIOB.

Clarke, L., Michielsens E., Snijders, S., & Wall, C. (2015) *No more softly, softly: Review of women in the construction workforce*. University of Westminster. https://core.ac.uk/download/pdf/161107132.pdf

Clarke, L., Michielsens, E. & Snijders, S. (2017) Misplaced gender diversity policies and practices in the British construction industry: Developing an inclusive and transforming strategy. In F. Emuze & J. Smallwood (Eds.), *Valuing people in construction*. Routledge.

Clarke, L., Sahin-Dikmen, M., & Winch, C. (2020). Transforming vocational education and training for nearly zero-energy building. *Buildings and Cities, 1*(1), 650–661.

Clegg, S., Loosemore, M., Walker, D., van Marrewijk, A., & Sankaran, S. (2023). Construction cultures: Sources, signs, and solutions of toxicity. In S. Addyman, & H. Smyth (Eds.) *Construction project organising* (pp. 3–17). Wiley-Blackwell.

Commission and Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, , 2023 European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. (2023). *Transition pathway for construction*. Publications Office of the European Union.

CORDIS. (2023). Leveraging new skills for the building sector to deliver on the European Green Deal. In *CORDIS Results Pack on construction skills: A thematic collection of innovative EU-funded research results* (2nd ed.). European Commission.

Crespo Sánchez E., López Plazas F., Onecha Pérez B., & Marmolejo-Duarte C. (2023). Towards intergenerational transfer to raise awareness about the benefits and co-benefits of energy retrofits in residential buildings. *Buildings, 13*(9), 2213.

European Construction Sector Observatory. (2020). *Improving the human capital basis—Analytical report*. https://ec.europa.eu/docsroom/documents/41261

European Commission. (2020). *A renovation wave for Europe—Greening our buildings, creating jobs, improving lives*. COM(2020) 662 final. European Commission.

European Commission. (2021). *Questions and answers on the revision of the energy performance of buildings directive, European Commission, 15 December 2021*. European Commission. https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_6686

European Commission. (2023). *Businesses in the construction of buildings sector*. European Commission. https://ec.europa.eu/eurostat/statistics-explained/index.php?oldid=305530#Size_class_analysis

EEA. (2023). *Greenhouse gas emissions from energy use in buildings in Europe*. European Environment Agency (EEA). https://www.eea.europa.eu/en/analysis/indicators/greenhouse-gas-emissions-from-energy?activeAccordion=ecdb3bcf-bbe9-4978-b5cf-0b136399d9f8

European Union. (2023). *Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending regulation (EU) 2023/955 (recast)*. Official Journal of the European Union.

European Union. (2024). *Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings (recast)*. Official Journal of the European Union.

Galvin, R., & Sunikka-Blank, M. (2014). The UK homeowner-retrofitter as an innovator in a socio-technical system. *Energy Policy, 74*, 665–662.

Geonardo. (2024). *European skills registry*. https://skillsregistry.eu/

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

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

Macrorie, R., Arbabi, H., Camacho McCluskey, K., Eadson, W., Hannah, R., Simpson, K., & Wade, K. (2024). Workshop materials: Output summary notes; participant expertise register. *Zenodo*. https://doi.org/10.5281/zenodo.11202215

Marmolejo-Duarte, C., Arenas, R., Berrio, S., Spairani, Y., Lamas, C. (2022). One-stop-shops as a model to manage housing energy retrofit. A General Approach to Europe and Spain. in: *PLEA 2022: Will Cities Survive? The future of sustainable buildings and urbanism in the age of emergency*, 2, 979–984.

Oktave. (2024). *L'accompagnement Oktave dans la rénovation énergétique*. https://www.oktave.fr/accompagnement-renovation-energetique/

Renovate Europe & E3G. (2022). *Briefing: Speeding up the delivery for renovation—Investing in skills*. Renovate Europe.

Regnier, C., Mathew, P., Robinson, A., Shackleford, J., & Jiron, A. (2023). *System retrofits in efficiency programs: Track record and outlook*. Lawrence Berkeley National Laboratory.

Stroud, D., Antonazzo, L., & Weinel, M. (2024). "Green skills" and the emergent property of "greening." *Policy Studies*, 1–20. https://doi.org/10.1080/01442872.2024.2332441.

Topriska, E., Kolokotroni, M., Melandri, D., McGuiness, S., Ceclan, A., Christoforidis, G.C., Fazio, V., Hadjipanayi, M., Hendrick, P., Kacarska, M., & Peñalvo López, E. (2018). The social, educational, and market scenario for nZEB in Europe. *Buildings*, *8*(4), 51.

Wade, F., Shipworth, M., & Hitchings, R. (2016). Influencing the central heating technologies installed in homes: The role of social capital in supply chain networks. *Energy Policy, 95*, 52–60.

Wade, F., Webb, J., & Creamer, E. (2022). Local government capacities to support net zero: Developing comprehensive heat and energy efficiency strategies in Scotland. *Energy Research & Social Science, 89*, 102544.