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CITIZEN-LED RENOVATION

Country study UK

A PESTLE analysis on the environment for citizen-led renovation services in the UK

Author/contact: Sem Oxenaar (sem.oxenaar@rescoop.eu); Date: August 2021

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About this report

To support the development of sustainable building renovation activities by energy cooperatives and communities (citizen-led renovation) we have analysed three business models – operated by Carbon Coop (UK), Energy Communities Tipperary Cooperative (Ireland), and Klimaatpunt/Pajopower (Flanders) - for the delivery of such activities. To accompany the business model overviews we have analysed the context in which they operate using the PESTLE method looking at Political, Economic, Social, Technological, Environmental, and Legal factors relevant to citizen-led renovation in the respective countries. Additionally, the same analysis has been done for the Netherlands, and will be undertaken for the Basque country. This study on the United Kingdom (UK) has been the second in this set of five 'country analyses'. This study was prepared as part of the 'Citizen-led Renovation' project funded by the European Climate Foundation.

About citizen-led renovation

Citizen-led renovation is energy communities and/or cooperatives undertaking renovation activities for, and with, their members and local communities. This includes renovation, energy efficiency in buildings, and sustainable heating and cooling. Furthermore, these activities are often combined with installing renewable energy systems. Renovation activities range from performing energy audits and providing information to homeowners, all the way to guiding households through the entire renovation journey, which includes planning, financing, delivery of measures, and evaluation (a 'one-stop-shop' or 'integrated home renovation' service).[1]

Although the offered services differ from cooperative to cooperative most citizen-led renovation programs share a few common traits:

- Citizens are involved in the renovation process and governance of the initiative and/or project;
- As social enterprises without focus on profit cooperatives can act as a trusted partner providing independent advice and support;
- The development of local businesses and skills of people involved is supported by the program;
- Activities are adapted to local conditions and local networks and partnerships are created. Energy cooperatives and communities are rooted in their local communities and often act in partnership with local authorities, SME's, and other community groups and/or NGO's. Many follow a neighbourhood approach.

[1] For more information see: https://www.rescoop.eu/citizen-led-renovation

Summary:

There is a large potential for (residential) renovation services in the UK, including services run by energy cooperatives or communities (citizen-led renovation). The building stock is among the oldest and least efficient in Europe, with potentially up to 80% of the stock needing renovation by 2050. The national government has strong climate commitments, and estimates over 30 percent of GHG emissions reductions in the coming decade need to come from the building sector. Specifically for citizen-led renovation programs, or other non-profit one-stop shops, it is interesting that a majority of the dwellings are owner occupied, meaning they have both the incentive and decision making power to engage in renovations. Also, households seem to be interested in sustainable renovation, with over 40 percent of England's 24 million households indicating they were fairly or very interested in taking part in the governments grant scheme.

Several non-profit/charity groups, and commercial retrofit providers, are already active in the field of energy efficiency for the residential sector in the UK and schemes seem to be expanding/replicating (see the example of Carbon Coop). However, specifically for England, commitment from the government to renovation support is insufficient and lacks continuity, with five different schemes launched with a period of ten years. This has led to a lack of trust by the public, and boom and bust cycles among contractors leading to a loss of industry confidence. Several barriers and opportunities for the development of citizen-led renovation have been identified

Barriers:

- Lack of engagement with households and a lack of knowledge among households of the benefits and options for sustainable home renovation.
- A lack of trusted and skilled contractors. Partly because top down policy schemes have failed leading to a supply chain that could not sustain itself (especially the case in England)
- Funding environment: tight deadlines for applications, discontinuity, single measure orientation in the past.
- Supply chain issues: many large contractors appear to be not well suited for household size projects and favour profit over outcome orientation. Long subcontracting chains leading to bad customer service.
- Procurement at municipal level: restrictions on what local authorities can do and amount of influence they have to try new ways of working, e.g. including citizen-led initiatives.
- Concern among consumers about reliability (i.e. will the measures lead to the promised results), quality, and cost-savings when it comes to sustainable home renovation[2]. This is crucial because it is these social, and environmental, factors

[2] (Putnam, 2020)

that are increasingly relevant in why households choose to renovate their homes[3]. Trust and accountability are key in engaging households and stimulate demand, citizen and community led initiatives can offer this. The household knows who to get in touch with when an issue arises, and the contractors are local to their area. This unique selling point needs to be communicated more broadly.

Opportunities:

- With a relatively old and carbon intensive housing stock there is ample potential for renovation.
- There appear to be no clear opportunities coming from national government support measures in England with the cancellation of grant support for renovations and no specific support available for energy communities. Likely there will be some support available at municipal level.
- For Scotland, Wales, and Northern-Ireland there is grant funding available for households providing a potential opportunity for citizen-led renovation services

1. Background: building stock, renovation potential, & community energy

Background: building stock characteristics and renovation potential

The United Kingdom (UK) has 29 million homes, with plans for up to 1.5 new homes by 2022[4]. In 2018 60.8% of the population lived in semi-detached houses (highest share in Europe), around 24% in detached houses, and only 14% in apartments (flats). Around 63% of the dwellings in the UK are owner occupied, around 20% is privately rented, 10% is rented from (non-profit) social housing providers, and 7% is rented from public authorities (2018 data)[5]. In 2017 30% of the residential building stock stemmed from before 1945, 20% between 1945 – 1969, around 20% between 1970-2000, and almost 30% after 2000[6]. Around 50% of the homes have an Energy Performance Certificate (EPC) rating of D, and over 20% is even rated E or worse. Also, 80% of UK existing housing stock, so potentially

[3] (Brown, 2018)
[4] (Committee on Climate Change, 2019)
[5] (Office for National Statistics, 2021a)
[6] (European Commission, n.d.)

around 23 million homes, will still be in use in 2050[7], yet the UK housing stock is among the oldest and least energy efficient in Europe[8].

Energy use for heating and warm water from homes currently amounts to around 25% of UK energy use and 15% of greenhouse gas (GHG) emissions[9]. With average residential energy use amounting to 173kWh per m2, which is slightly above the EU average and the trend has been strongly declining since 2000[10]. In 2018 on average 63% of residential energy use was for heating, 17% for hot water, 13% for appliances, and 3% for both cooking and lighting.

To reach the governments climate goals all homes need to be 'low-carbon' by 2050 and fall by at least 24% in 2030 (from 1990) yet currently less than 2% of buildings is heated using low-carbon sources and emissions from homes are currently rising by about 1 percent a year[11]. Currently most buildings (around 24 million) use natural gas for heating and will need to shift towards sustainable sources and systems[12]. Also, around 1.7 million homes are not connected to the gas grid and use oil (1.5 million homes) and liquefied petroleum gas (200.000 homes)[13]. There is thus a very large potential for sustainable home renovations in the UK, with the government indicating that residential buildings have the highest potential for emission reductions in the UK economy between now and 2032 (amounting to 32% of the total). And one study estimates that current energy use in UK households can be reduced by 25% in 2035 using cost-effective energy savings measures. With falling technology costs in the future and taking into account the added benefits of energy savings to, for example, health and comfort, the electricity grid, and the wider economy this could rise to 50% reduction[14].

Energy savings, and thus sustainable renovation, are a big part of this[15]. At the same time 4.7 million homes (in 2016) failed to reach the required health and quality standards and 2.5 million households in energy poverty (11%) in England, while in Scotland 24%, in Wales 23%, and in Northern-Ireland 21.5% of households are classified as being in energy poverty. At the same time poor housing aggravates existing health conditions of inhabitants, leading to between 1.4 and 2 billion pounds a year in healthcare costs[16].

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[7] (Dowson et al., 2012)
[8] (Nicol et al., n.d.)
[9] (Committee on Climate Change, 2019)
[10] (European Commission, n.d.)
[11] (Committee on Climate Change, 2019)
[12] (Lingard, 2020)
[13] (House of Commons Environmental Audit Committee, 2021)
[14] (Rosenow et al., 2018)
[15] (Rosenow et al., 2018)
[16] (Committee on Climate Change, 2019)

Sustainable renovation is crucial in helping remedy both energy poverty and health related issues.

Background: community energy

In 2019 the community energy sector in the UK included over 300 organisations owned and controlled by and/or created for communities. They engaged over 90.000 households supported by 263 full time staff. The total community owned renewable energy generation capacity amounted to 265MW. In the past years the biggest challenge for community energy in the UK has been the closure of the feed-in-tariff (FiT) which made many existing business models unviable. Between 2016 (when FiT rates were lowered) and 2018 this has already led to a strong decline (80%) of new energy communities, investment value, and generation capacity[17]. In general the situation in the UK for community energy does not seem to be very positive at the moment. At the same time energy communities and cooperatives in the UK seem to be frontrunners in the field of sustainable home renovation. For example, Carbon Coop in Manchester has been retrofitting homes for over 10 years and has developed an integrated approach (People Powered Retrofit) and is currently working with other groups and charities to replicate the model. Cooperatives and communities focussing on energy efficiency, sustainable heating, and retrofit are growing in other parts of the UK as well. For example BHESCo in Brighton/Hove, Futureproof in Bristol, and Retrofitworks in London.

2. Political

Factors: government priorities and policy to promote sustainable renovation; policies to boost citizen participation, energy communities, and cooperatives; existence of funding tools and grants.

Government priorities and policy to promote sustainable renovation

The Committee on Climate Change – an independent public advisory body on climate change- concluded in 2019 that UK national government policy is not effective in supporting building renovation, improving energy efficiency, and reducing emissions from buildings[18]. In their report on the future of housing they called on the government to take action on building renovation and treat it as a 'national infrastructure priority'. Asking for: strengthened support policies for homeowners/tenants on both energy efficiency and health and comfortable indoor environments; the development of a

[17] (Robinson & Stephen, 2020)
[18] (Committee on Climate Change, 2019)

strategy to decarbonise heating; improve general awareness around climate change related risks for buildings; the development of a strategy to improve existing green infrastructure.

The UK national government has not been very consistent in their policy on sustainable renovation of homes (retrofit). For example, the CLR-initiative interviewed indicated that due to frequent changes, discontinuation, and bad execution of retrofit support schemes in the past many contractors have gone bankrupt. The current Greenhomes Grant scheme (see table on support measures) which was launched as a main measure in helping reduce GHG emissions and tackle energy poverty in England seems to be heading in the same direction, with its budget drastically cut and operational problems due to complex processes and delayed payment of the grants[19]. Yet, a recent polling done on behalf of the UK government showed that there is ample demand for the scheme, with 4.5 million out of 24 million households in England indicating that they would be very interested in taking part, with an even larger share 'fairly interested'. With, initially, 600.000 vouchers available this means there was eight times as much interest as there was availability. Moreover, most interest was coming from areas with the poorest energy efficiency in homes. This indicates that with stable and well executed support measures could have a large effect on building renovation rates in England[20]

One study mentioned that UK retrofit policy is driven for a large part by the 'fuel poverty' agenda. With around 11% of households in England and 23% of households in Wales in fuel poverty, meaning they spend more than 10% of their income on fuel or have above average fuel costs leading them to fall below the poverty line (residual income). With the main causes in the UK being general bad energy efficiency in homes, poor heating systems and insulation, low incomes, and high energy prices. Retrofit of buildings, sustainable renovation improving the energy efficiency, is can then be a good way to remedy this. While two thirds of UK households in energy poverty own their home, they do not have the up-front capital to invest in renovation Despite the UK governments commitment to eradicate fuel poverty there is currently no effective policy in place[21]. Moreover, since the introduction of the UK governments Fuel Poverty Strategy the amount of households in fuel poverty has increased by between 60.000 to 2.4 million[22]. The main instrument currently being used is the Energy Company Obligation (ECO) requiring larger energy suppliers to install energy efficiency measures in homes (similar to ECO schemes in other countries). The ECO scheme targets 'easy' measures such as loft and cavity wall insulation. However, a recent study on the UK's energy efficiency policy found that most easy to treat homes have now been treated, with only more

[19] (Ross et al., 2021)
[20] (Ralston, 2020)
[21] (Putnam, 2020)
[22] (House of Commons Environmental Audit Committee, 2021)

difficult and expensive ones remaining. As a result the rate of installation of measures has slowed[23].

Although lacking on specific support policy for building renovation the UK does have a strong framework for climate change in place, with the climate change act setting out binding targets. And the government recognizes it cannot reach its objectives on climate without major renovation of the UK housing stock. The 2008 UK Climate Change Act sets a long-term emission reduction target of 80% by 2050 (compared to 1990 levels). To meet this target the government has set carbon budgets limited the amount of GHG to be emitted in the UK in every five year period. In the 2017 Clean Growth Strategy the government describes its approach to meeting the carbon budgets between 2023 and 2032[24].

Specifically for the building and construction sector the UK government has also set targets on reduced carbon emissions through the 'Clean Growth Buildings Mission' and a 'Construction Sector Deal'[25]. But these targets are mainly aimed at new buildings instead of the existing stock[26].

Policies to boost citizen participation, energy communities, and cooperatives

One expert indicated that there is currently no policy coming from the national government to support citizen participation on energy/renovation topics and energy communities/cooperatives.

Government policy and support measures (grants, funding, instruments, tax incentives, etc.)

Most funding tools and grants identified are not being given out at the national level but are available in either England, Scotland, Northern-Ireland, and/or Wales. The table below provides an overview.

[23] (House of Commons Environmental Audit Committee, 2021)
[24] (Rosenow et al., 2018)
[25] (Currie and Brown, 2019)
[26] (*The Grand Challenge Missions*, n.d.)

Policy and support measures for sustainable renovation, energy efficiency, and renewable energy		
Name:	*Government level:*	*Description:*
Green Homes Grant Voucher Scheme	England	Initially put in place for the period 2020/2021 with a 2 billion pound budget of which up to 1.5 billion for households. However, for 2020 and 2021 around 73 million pound in grants has been given, and the budget for 2022 has been lowered to 320 million pound. Homeowners and landlords can receive vouchers worth up to 5000 pound and low income households with up to 10.000 pounds for accredited retrofits. Up to 2/3 of total retrofit costs are reimbursed.
Green Homes Grant skills training competition	England	Started in 2020 as part of the Green Homes Grant Voucher Schemer. Gives a total of 7 million grant funding to suppliers to deliver accredited training to installers of low-carbon systems. Courses can be on any of the technologies part of the Green Homes Grant scheme, certification for the installer, or to become a certified 'retrofit coordinator' or 'assessor'
Lower income green homes upgrades	England	500 million pound will be available for 'green home upgrades' targeted at helping lower income households reducing greenhouse gas emissions and energy bills. The funding will be delivered through local authorities (Local Authority Delivery scheme) and the Local Energy Hubs[27]
Home Upgrade Grants	England	The Home Upgrade Grants will target deep renovation measures for low income households living in very energy inefficient homes. Initial funding is 150 million pound[28].
Green Home Finance Innovation Fund	England	A 5 million pound fund to develop finance products to incentivise energy retrofits, including green mortgages. Started in 2019 and running for 18 months[29].
The Social Housing Decarbonisation Fund	Unclear	Fund to help retrofit social housing at a large scale. As of yet 50 million pound has been made available for demonstration projects[30]
Rural Community Energy Fund	England	A fund that supports communities in rural areas in England to set up renewable energy projects in their area. In a first stage communities can get up to 40.000 pounds for a feasibility study on installing renewable energy systems, and in a 2nd stage they can get up to 100.000 pound for the development and planning of feasible projects. The program is executed through the 'local energy hubs' (see actor table).

[27] (House of Commons Environmental Audit Committee, 2021, p. 28)
[28] (House of Commons Environmental Audit Committee, 2021, p. 20)
[29] (House of Commons Environmental Audit Committee, 2021)
[30] (House of Commons Environmental Audit Committee, 2021, p. 30)

Renewable Heat Incentive	UK national	Launched in 2014 and open till 2022, aimed at encouraging uptake of renewable heating systems among households, communities, and businesses. Provides 7 years of support. Technologies included (i.a.) are biomass boilers/stoves, ground to water and air to water heat pumps, solar thermal.
Private Rented Sector Landlord Loan	Scotland	3.5% interest loan of up to 17.500 pounds for landlords. A variety of energy efficiency improvements and renewable systems are eligible.
Home Energy Scotland Lone	Scotland	Interest free loan up to 17,500 pound coupled to up to 40% subsidy for some energy efficiency measures, and 75% for certain renewable systems. Energy efficiency measures include wall, window, door, and roof insulation (different types), heat pumps and electric boilers, but also for improvements on gas, LPG, and oil boilers. Renewable systems also include electricity or heating storage and connection to district heating.
Energy Company Obligation /Affordable Warmth Obligation	England	Scheme supporting energy efficiency improvements (including insulation/heating) in low income and vulnerable households. Mainly supports loft and cavity wall insulation, or upgrading old boilers. The scheme is funded by large energy suppliers. Seen as the 'main'
Feed in Tarif	UK national	New feed in tariff applications were stopped in 2019
Warm Homes Nest Scheme	Wales	Offers free advice and funds energy efficiency improvements to households living on government benefits or with specific health issues. Measures include new boilers/central heating, and insulation.
UK pensioners scheme	UK national	People born before 1953 on a state pension/benefit can receive 'winter fuel payment', 'warm home discount', or 'cold weather payment'.
Northern Ireland Sustainable Energy Programme	Northern Ireland	Grants to implement energy saving measures. Around 8 million pound per year. Offers several schemes. 'Affordable warmth' funds energy efficiency measures for households with an income lower than 20.000 pound per year. 'Boiler replacement scheme' funds up to 1000 pound for boiler replacement or switching from oil to gas or wood for households with systems older than 15 year and under 40.000 pound per year income.
Local Energy Programme – BEIS	England	The UK government department on Business, Energy, and Industrial Strategy (BEIS) supports local authorities and other local organisations through its 'local energy programme'. It finances the 'local energy hubs' (see actor table), and its team is the main contact point and support provider for local authorities on energy related issues.
Re:fit programme	England and Wales	An energy performance contracting scheme run by the government for local authorities and public buildings (schools, hospitals, universities, etc.). Focussed on energy efficiency measures including building renovation and local energy generation.
Public Sector Decarbonisation Scheme	England, Wales, Scotland	Government funding program for energy efficiency improvements/decarbonisation for heating in public sector buildings.

3. Economic

Factors: spending in the renovation sector; energy prices for households; renovation cost for homeowners and developers., cost of housing for homeowners/tenants.

Spending in the renovation sector

There seems to be limited data available on renovation sector spending. One very small study by a commercial provider was identified, it found that during the 2020 lockdown period households spend 55 billion pound on renovation (4000 per household). Likely, most of this was spend on regular, and not energetic, renovation[31].

Energy prices for households

Total household expenditure follows a fluctuating but long term downward trend, from 30.000 million pound in 1999 to around 25.500 million pound in 2019 (in 2010 prices). However in the past five years (2014-2019) spending has not changed much, with 51% going to electricity, 44% to gas, 4% to liquid fuels, and 1% to solid fuels[32]. Average annual gas bills for households have (in real terms) declined over the past years from 516 pounds per year in 2017 to 488 pounds per year in 2020. On the other hand, average annual electricity bills for households have (in real terms) increased from 517 pounds per year in 2017 to 553 pounds per year in 2020 (temperature adjusted)[33].

Renovation cost for homeowners and developers

Renovation costs are clearly very dependent on building type and type of measures taken. But average amounts can be found. With one study quoting the following averages: solid wall insulation around 8500 pounds installed costs, cavity wall between 500-1300 pounds, glazing improvements around 5000 pounds on average per property, floor insulation between 2000-3000 pounds, and loft insulation around 400 pound, and heat pump costs lie between 7000 and 16.000 pound for installation in existing buildings depending on type[34]. Carbon Coop, a cooperative provider of renovation services, indicates that their average (deep) home renovation including a sustainable heating system such as a heat pump costs the homeowner around 50.000 pounds. A study done as part of the 'Zero Energy Buildings Catalyst' estimated the cost of a 'conventional' whole house retrofit (achieving around 70

[31] (Money.co.uk, n.d.)
[32] (UK Government, n.d.)
[33] (UK Government, n.d.)
[34] (Rosenow et al., 2018)

percent GHG reduction) at 47 thousand pound in 2018, and the costs of a retrofit to net-zero levels (over 90 percent GHG reduction) at 75 thousand pounds[35].

Cost of housing for homeowners/tenants

In the UK 15.1% of the total population lives in a household that spends more than 40% of their income on housing, after Greece (39,5%) and Bulgaria (17.9%) this is the highest percentage in Europe[36]. The average house price in the UK in 2020 amounted to around 250.000 pound. In 2019 housing affordability improved slightly in England with people with a full time job typically (median) spending around 7.8 times (down from 8) their work based income on buying a house, in Wales this was 5.8. There are however very large differences between the north and south of England, with ratios of 10-15 not uncommon for the southern areas[37]. Moreover, the affordability gap between low and high income households has continued to grow. For rental properties, renters with a median income paid around 30% of their income in rent, and rent being unaffordable (>30% of income) for renters with lower than average income[38]

Private sector financing methods

In 2019 the UK government announced a 5 million pound fund to develop finance products to incentivise energy retrofits, including green mortgages. Green mortgages provide better terms mortgage terms such as lower interest or extra borrowing capacity for those buying a more energy efficient home or committed to improving the energy performance. Currently at least several banks are offering a Green Mortgage in the UK. With one providing a discounted interest rate to those buying a property with an EPC of A or B, and another offering an additional loan of between 5000 – 25.000 pounds with a lower interest rate given that at least 50% of the loan is used to improve the energy performance of the home[39].

[35] (Green Alliance, n.d.)
[36] (Eurostat, 2020)
[37] (Office for National Statistics, 2020a)
[38] (Office for National Statistics, 2020b)
[39] (House of Commons Environmental Audit Committee, 2021)

4. Social

Factors: culture (in favour or not) of sustainable renovation and energy efficiency

Culture (in favour or not) of sustainable renovation and energy efficiency

Existing studies identified several barriers to sustainable renovation that indicate that there is generally not a strong culture in favour of sustainable home renovation. There was found to be a lack of awareness among households and knowledge about what the benefits and options of retrofit are. Moreover there is also a trust issue with concern among households about reliability (i.e. will the measures lead to the promised results), quality, and cost-savings when it comes to sustainable home renovation[40]. One study found that the lack of trust might not be unwarranted with many insulation measures being wrongly executed in practice. These are crucial issues because it are social, next to environmental, factors that are increasingly relevant in why households choose to renovate their homes in the UK[41].

5. Technological

Factors: access to existing technological solutions; renovation skills and availability of professionals in the construction sector; Research and development in the renovation sector

Access to existing technological solutions (supply chain development)

To help reach the UK's ambitious climate goals the government has set a target of 600.000 heat pump installations per year by 2028 in new and existing homes. Although, as one study mentions, this is an ambitious target it falls short of what should be done (900.000 installations per year). Even for the lower target a significant 'scale-up' of the market for heat pumps will be needed requiring new support measures. For example, the existing support measure (Renewable Heat Incentive, see **Error! Reference source not found.**) has led to only around 60.000 of the planned 491.000 heat pumps installed. In 2019 only 14.000 heat pumps were installed in existing homes, and 10.000 in newly build homes[42].

Another area in which supply chains appear to be underdeveloped in the UK is that of natural/biobased fibre insulation. With both access to and use of such materials in the UK was found to be low with most materials needing to be imported[43].

[40] (Putnam, 2020)
[41] (Brown, 2018)
[42] (Lowes et al., 2021)
[43] (House of Commons Environmental Audit Committee, 2021)

Renovation skills and availability of professionals in the construction sector

Like many countries the UK faces a 'skills gap' when it comes to renovating homes. This is partially due to the frequently changing policy framework for building and renovation leading to uncertainty and a lack of focus on developing the needed skills[44]. Moreover, as an expert interviewed indicated, the inconsistency of policy support has led to boom and bust cycles in the construction industry, with skills being lost as companies go bankrupt or let personnel go. This statement seems to be confirmed by the UK construction statistics, indicating that in 2019 out of all sectors the construction sector had most bankruptcies[45]. This process has also led to a general shortage of contractors for renovation work. Similarly one study also found one of the reasons for a low uptake of heat pumps due to difficulty with finding trusted and skilled installers (in addition to low awareness, financing constraints, concerns around disruption in the house)[46].

In addition to inconsistent policy the focus by the UK government on supporting individual renovation measures instead of more comprehensive whole-house approaches has also been detrimental to the development of a functioning supply chain for residential retrofits further hindering the availability of enough contractors with the right skills for renovation[47]. To help overcome this the UK government has set up a competition on training connected to the Green Homes Grant scheme (see **Error! Reference source not found.**) and a 'Green jobs taskforce' to support reaching 2 million jobs for a decarbonised economy, including home renovation[48].

Research and development in the renovation sector

R&D on sustainable home renovation in the UK is well established, with several initiatives underway focusing on different aspects of home renovation (upscaling/industrialization, finance (see 'private sector financing methods'), market development, etc.). For example around larger scale whole-house retrofit such as 'Energiesprong' a method first developed in the Netherlands providing a standardized and industrialized solution by using e.g. premade façade and roof parts that can be installed quickly on site[49]. The method is currently being adapted for the UK involving a variety of partners, including the UK government through its innovation support organization (Innovate UK)[50].

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[44] (Committee on Climate Change, 2019)
[45] (Office for National Statistics, 2021b)
[46] (Committee on Climate Change, 2019)
[47] (Brown, 2018)
[48] (House of Commons Environmental Audit Committee, 2021)
[49] (TransitionZero, n.d.)
[50] (BowTie Construction, 2021; Energie Sprong UK, n.d.)

One notable demonstration scheme funded by the UK government is focused on projects aimed at developing local supply chains for energy efficiency measures. It has provided 4.7 million pound to in total 6 organizations to work on this, including a citizen-led renovation group, and REScoop.eu member Carbon Coop. The initiatives focus especially on the supply side of renovation (supply chain integration and project coordination) making it easier for households to do sustainable home renovation[51].

6. Legal

Factors: e.g. building regulation, standards, and certification for sustainable building renovation; building energy performance certificates; other legal factors

Building regulation, standards, and certification for sustainable building renovation

There are different building regulation frameworks in the UK for England, Wales, Scotland, and Northern Ireland[52]. But for the whole UK the energy performance of residential buildings is measured using the 'Standard Assessment Procedure' in energy use per unit floor area, a fuel-cost based energy efficiency rating (SAP rating), and CO2 emissions (Environmental Impact Rating)[53]

However, the Committee on Climate Change has concluded that the standards for new buildings are too low, too complex, and that there is poor compliance both due to indifference and confusion about roles and responsibilities. They find that action is needed to close the gap in performance between design and actual performance of new and renovated houses[54].

In the UK specific standards and certification applies to 'retrofit'. The standard 'PAS 2035' gives specifications for the 'energy retrofit' of buildings, a guide of best practices for domestic retrofit, supports a retrofit quality mark (Each Home Counts / Trustmark Government endorsed quality scheme). It was developed to help reach the EU's Near Zero Energy Buildings objective through supporting 'whole-building' / 'deep' retrofits of domestic buildings. The PAS2035 sets requirements for the assessment of buildings, identification and evaluation of energy efficiency measures, their design and specification, and the monitoring and evaluation of renovation projects. Moreover it provides specific calcifications that the roles of retrofit advisor, assessor, coordinator, designer, installer, and

[51] (UK national government, 2020)
[52] (Committee on Climate Change, 2019)
[53] (Brown, 2018)
[54] (Committee on Climate Change, 2019)

evaluator require. Standardizing how these functions are fulfilled and provide a standard of quality. Contractors that want to make use of, for example, the Green Home Grant Scheme need to be certified according to the above standards and registered with TrustMark[55].

Other relevant standards include the National Occupational Standards for performance of professionals in the building sector, the PAS 2030:2019 or 2017 on energy efficiency measures, and the Microgeneration Certification Scheme (MCS) for (among others) renewable energy systems. A full overview of applicable standards on construction and renovation activities is available from the British Standards Institution[56].

Building Energy Performance Certificates

The UK government has the (non-binding) ambition to have as many home as possible with an EPC rating of C by 2035. As mentioned above the energy performance of buildings is calculated using the method described by the Standard Assessment Procedure. In 2018 the average SAP rating for homes in England was 63 on a scale of 1 (highly inefficient) to 100 (highly efficient). One study indicates that EPC's are increasingly being used for renovations, but that they are not designed for this purpose and might be inadequate. Some of their critique includes the EPC being based on calculations instead of on-site measurements, cost of fuel being a big factor in the EPC (which is not necessarily representative of efficiency), the benefits of heat pumps and decarbonisation in general not being reflected, and older houses being rated worse than they should be. Building renovation passports have been mentioned as a possible follow up to EPC's[57].

Private rental properties must also comply with Minimum Energy Efficiency Standards meaning that from 2020 onwards properties with an energy performance certificate (EPC) lower than E can no longer be let (unless a specific exemption applies). The government is currently looking into raising the minimum to an EPC rating of C[58].

7. Environmental

Relevant factors such as awareness on energy efficiency were discussed under social factors.

[55] (House of Commons Environmental Audit Committee, 2021)
[56] (The British Standards Institution, 2019)
[57] (House of Commons Environmental Audit Committee, 2021)
[58] (House of Commons Environmental Audit Committee, 2021)

8. Existing schemes and relevant actors in the (citizen-led) renovation sector

Existing schemes and relevant actors in the (citizen-led) renovation sector (non-exhaustive)	
Name	*Description:*
Warmer Sussex/ Retrofit Works	Cooperative retrofit program in the area of Sussex. Partnership between local authorities and local cooperatives[59].
Carbon Co-op / People Powered Retrofit	Cooperative retrofit program (REScoop.eu member), see busines model overview document.
Low Carbon Hub / Oxfordshire Retrofitworks	Aimed at increasing demand for retrofits through local community groups engaging with households. Will be using the 'retrofitworks' cooperative model also being developed for the Sussex area[60].
Parity Projects / Retrofit Together	A collective purchase scheme for retrofits in London[61].
BRE / Homeworks	Designing an app to help contractors refer clients to contractors with the right skills to do energy efficiency measures. Done in partnership with the Trustmark organisation and private companies[62].
Centre for Sustainable Energy / Futureproof	Non-profit in the West of England running a program in partnership with local authorities to target 'early adopters' of retrofit. Aimed at single measures, not necessarily whole house retrofit[63].
Low Carbon Homes	Regional network
Home Energy Scotland	Network of local energy advice centres in Scotland providing information on, and access to, renovation support schemes for households.
Energy Savings Trust	Non-profit promoting energy efficiency and renewable energy working with households, government, and businesses. Run a network of local energy advice centres.
Community Energy England	Umbrella organisation for energy communities in England

[59] (UK national government, 2020)
[60] (UK national government, 2020)
[61] (UK national government, 2020)
[62] (UK national government, 2020)
[63] (UK national government, 2020)

Community Energy Wales	Umbrella organisation for energy communities in Wales
National Energy Foundation	A charity focussed on improving energy efficiency in buildings
Sustainable Energy Academy / Superhomes network	A network of homeowners that have renovated their house to achieve 60% emissions reductions. They organise open days so people can visit and experience what an energy efficient home can look like.
TSO/DSO's	Northern Powergrid, Electricity Northwest, SP Energy Networks
Ofgem	UK national regulator for gas and electricity markets
UK national government – Department for Busines, Energy, and Industrial Strategy (BEIS)	Department responsible for (i.a.) energy
Regional Energy Hubs	Support programs for local authorities on local energy strategies and projects in England. There are 5 'hubs' in total. Funded by BEIS as part of the 'clean growth' strategy, related to the 'local energy program' (see table with policy measures)).
Communities for Renewables	"helps communities set up local energy enterprises and supports them to develop, finance, and manage their own renewable energy generation". They are an 'asset locked community interest company' which means that surplus profit is reinvested in supporting new community energy initiatives.
Regen	Non-profit energy expertise centre
Association for Public Service Excellence – Energy team (APSE Energy)	Non-profit association of municipal governments in the UK. 60 of their members are involved in the 'Local Authority Energy Collaboration'
Simple Energy Advice	Advisory website developed by the UK government on energy efficiency in homes. E.g. on available grants (national/regional/local), simple savings measures, available technologies for energy efficiency, search for installers of systems.
UK green buildings council	Non-profit network representing over 500 members from the building sector. Together with EIT Climate-KIC run the 'Accelerator Cities' project to help local authorities with sustainable home renovation
Coalition for the Energy Efficiency of Buildings (CEEB)	Set up by the Green Finance Institute the coalition combines actors from across different sectors to develop the market for residential retrofit finance.

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