Energy justice in the home - a qualitative technology assessment of domestic low-carbon innovation within a social housing network

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Decarbonising domestic heating

- Heating accounts for about 37% of total UK carbon emissions when including industrial processes. The breakdown of UK carbon dioxide emissions from heating (CCC, 2021):

Space heating (including a relatively small amount of cooling) = 17%

Hot water = 4%

Cooking = 2%

Industrial processes = 14%.

- Of the 17% of carbon emissions from heating (and cooling) in buildings, about 13-14% can be attributed to domestic homes.

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Contemporary domestic decarbonisation challenges

- **(Following adapted from** Energy Catapult, 2022; CCC, 2020)
- **Net Zero targets** –Net Zero by 2050 plans - require offsets for certain energy-intensive sectors – meaning tougher targets for heating. Majority of buildings must be zero carbon.
- **Low starting point** – roughly 5% of homes have low-carbon heating. 24.5 million homes heated by natural gas.
- **Poor thermal efficiency –** 2/3 of UK building stock is draughty, damp or overheated, with poor thermal comfort.
- **Expensive changes -** all-electric or all-green hydrogen would cost roughly two to three times as much as natural gas (though this factor changes as gas prices rise)
- **Not all solutions are appropriate to all dwellings** – a bottom-up approach, place and building-based approach is preferable to a blanket top-down approach.
- **Incentives** – low public awareness of low-carbon heating technologies, incentives, costs, and little push households to switch.
- **Cost-of-living crisis –** big capital outlay for decarbonisation is not a priority under conditions of economic stress
- **Workforce and skills** - For every 100 qualified gas engineers in the UK there are fewer than 2 low-carbon heating engineers. 74% of heating professionals were not fully confident in selecting suitable low -arbon heating for clients.

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Image : https://constructingexcellence.org.uk/tophat-low-carbon-home/

Social housing in the UK

- Social housing sector provides 4.4 million homes across England (a net increase of around a 25,000 homes in the year 2021). The number of Affordable Rent and low-cost home ownership homes increased, while the number of social rent homes fell.
- General needs (social rent) homes make up 77% of all stock, with supported housing at 13% and low-cost home ownership at 7%.

Source: https://www.gov.uk/government/news/social-housing-sector-stock-and-rents-statistics-show-impact-of-pandemic

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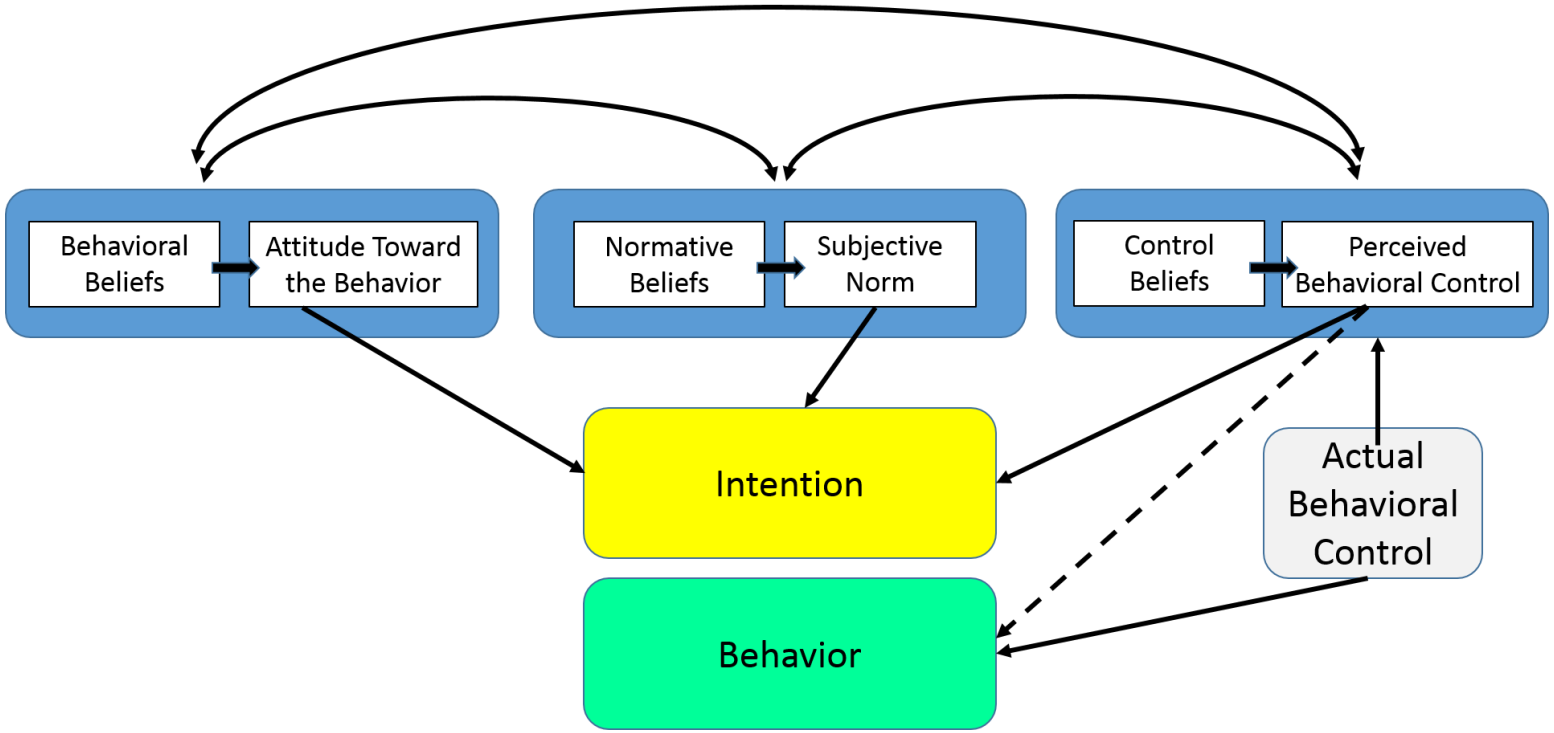
Decarbonising social housing

- Policy guidance on social housing responsibility for net zero is currently unclear in many areas, and there is a need for a more defined pathway to decarbonisation for the social housing sector (Rainsford, 2021).
- Social housing providers will play a major role in decarbonising the UK's housing stock, particularly in areas such as the Tees Valley, where there is an abundance of older, energy inefficient housing.
- Just transition to cleaner heating requires the right support, as capital outlay for decarbonisation may result in higher energy prices for residents, opportunity cost for other areas of building maintenance or infrastructure.
- Thirteen Group manage over 35,000 homes, with more than 72,000 customers across the Tees Valley and other areas of the Northeast and Yorkshire (Thirteen, 2022).
- 3-phase approach to decarbonisation of housing stock – involving primarily solar panels, air source heat pumps and battery energy storage systems.

thirteen

Managing and building homes

Rainsford 2021 available at https://livrepository.liverpool.ac.uk/3148007/1/PB_2_06.pdf



Project design

- Participatory technology assessment – bottom up engagement with social housing residents
- Theory of Planned Behaviour as an indicative theory framework – thematic analysis of qualitative data
  - identify knowledge, skills, attitudes, drivers and barriers towards technology for low carbon transition within the home
- Resident interviews (n=20+), video presentation of LC home
- Comparative survey (Tees Valley/National) – pending

Results

Structure of themes

CONTROL BELIEFS (BARRIERS & MOTIVATORS)	BEHAVIOURAL BELIEFS (ADVANTAGES & DISADVANTAGES)	NORMATIVE BELIEFS (IMPORTANT REFERENTS)	OTHER THEMES (BEYOND TPB)

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Control beliefs (barriers and motivators)

Pro-environmental values	*Occupancy and building type*	*Cost horizons*	*Retrofitting versus new build*	Disruption	Fabric first
• *"Well, it'll benefit climate change. You know, because I'm not burning fossil fuels." [P2]*	• *I don't know how it would work with the set up in my ground floor flat" [P8]*	• *So, not discounting things like climate change and things like that, from an economic point of view, and being a lease owner, it's not a financially viable project for me." [P2]* • *"So there's the basic cost list and that it would cost less definitely" [P6]* • *Would cost you £10,000 to buy it, you save £50,000 in a lifetime, that's worth it." [P14]*	• *"I can't help thinking that as a retrofit to this property it wouldn't work without other things being done. [P1]* • *"Maybe upgrading the properties and as they're doing that, installing it." [P12]*	• *"[M]y main concern is the upheaval" [P3]*	• *"There would have to be a lot of insulation to the home before the low carbon side of it would work" [P1]*

Behavioural beliefs (advantages/disadvantages)

Running costs (13)	*Pro-environmental values*	Pro-solar	Thermal comfort	Technology scepticism	Domestic space mangement	Maintenance and repair
• *"Well it's going to be cheaper fuel, that's a big factors isn't it""* • *"My concerns are cost "*	• *"I think I can help me to warm more ecological and reduce my carbon emission and all that."*	• *"the easy one would be solar panels, because it's a long building and its an East West building, and we've got ample room on the roof for solar panels" [P5]*	• *Advantages: "Well, they'd be warmer. They'd just run constantly. Don't have to mess about with the thermostat or anything like that. They'd be set with the weather." [P12]* • *Disadvantages: "I just don't want to have my bedroom heated or anything. Can it be switched off from there?" [P9]*	• "I suppose the problem would be with any batteries wouldn't it, cause all the all the rest is nice and sufficient." [P11]	• *"you'd lose a bit of wall space, perhaps with the size of the radiators, but I would say none [disadvantages] that you couldn't overcome very readily." [P1]*	• "So when it comes to maintenance of systems like this it might be might be a bit long and costly but that's it really." [P4]

Normative Beliefs (Important Referents)

Who would approve of/live in a low-carbon home	Who would disapprove of/not live in a low-carbon home
• "People who can afford it" • "Younger People" • "People on low income" • "Environmentally Conscious" • "Big Families" • "Those who see other people with it" • "Councils, Social Housing Provider and the Government"	• "No-one would disapprove" • "Older People"

Contextual themes

Normalisation of pro-environmental attitudes	**Information environment**	**Income inequalities**	**Current rise in energy prices**
• "[there] is going to be something wrong with you if you think green and having sustainable energy is a bad idea in any way whatsoever"[P4]	• *"I think there would be really interested, it would be positive impact on them and possibly they didn't know anything about it, because I didn't know anything about it until I went to group Thirteen's open day. These retrofits, I've never heard of it before, so yeah, I think that would be a positive note" [P3]*	• "Others do not have the same luxury "The only negative feeling is that I've I wish everybody else was having this system so they wouldn't have to, you know, families with kids, wouldn't have to worry about their cost of keeping themselves warm when it comes to winter." [P4]	• "We run entirely on electric, so we're all feeling the pinch, but even more so if you're just running on electric for your heating" [P3]

Initial conclusions

- Dominant discourse of low carbon has normalised pro-environmental value expressions – these now shape core control and behavioural beliefs.
- Current context matters – cost of living crisis and the uncertainty surrounding capital outlay and long-term benefits colour all responses.
- Support for a *fabric first* strategy (insulation-then-infrastructure)
- Pro/anti retrofit support influenced by:
  - Multi-occupancy households
  - Family size
  - Age of occupants (younger more supportive?)
  - Temperature variations within the dwelling and capacity to meet complex thermal comfort needs
  - Knowledge of systems, learning approach and ongoing support to occupants in managing new technology
  - Space availability for tech
  - Scale and length of disruption
- Retrofit strategy should involve engagement on these factors to achieve broad resident support.

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Any questions?

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