

Living without the ladder: How adjustable housing could help us thrive in the 21st Century

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Abstract

Since 2008, the number of UK homes being bought and sold has fallen markedly. This liquidity problem forces aspiring homebuyers to make compromised choices and thereafter, makes it harder to trade-up. Meanwhile, housing in higher density areas is hard or impossible to adjust, such that more households will experience inappropriate housing for longer. In my research, I ask what is needed to give people real choice over time, so that more marginal homeowners - an important but overlooked group at the lower ends of the UK's dominant tenure group - can thrive after the property ladder. I show that more '*adjustable housing*' is not only about dwelling space, but needs to include other ways of owning, governing and sharing that make better use of the space and carbon bound up in our homes. This produces a more complete understanding of what is needed for people to live together, separately, in an environment that enables them to *continuously* adjust their housing to changes in career, family, education and care needs over our longer, healthier lifespans. These are examples of the episodic pathways that have come to characterise 21st Century living, as highlighted by recent shocks such as Covid-19 lockdowns and spikes in interest rates and energy prices.

In this paper I propose a framework for describing and implementing more '*adjustable housing*'. By this I mean housing systems that can be altered over a multi-stage life course with little or no physical change to the home, and which are viable to build in the UK context. My objective is to show how designers can work across fields to help people adjust to the sorts of episodic changes in housing needs that have come to characterise 21st Century living (Ong ViforJ *et al.*, 2021). More than this, I show how adjustable housing could help to unlock potentially huge energy savings, just by reducing under-occupancy in UK homes (Huebner and Shipworth, 2017). I focus on higher density areas, not only because they require housing models to deal with the proximity and pressures faced by dual career households (Costa and Kahn, 2000), but because this is where the greatest opportunities to save on carbon and material throughputs are to be found (Goldstein, Gounaridis and Newell, 2020). I also focus on private housing because the vast majority of UK homes are classed as being under-occupied, and most of these are owner occupied (Bruce, Bowers and Wilkins, 2023).

To explain these problems, I begin with an overview of the cultural, political and institutional situation in the UK, from an interdisciplinary perspective. Most notable amongst these is people's continued dependence on a frictionless 'property ladder' for making adjustments to meet changing housing needs. As an alternative, I set out my definition of adjustable housing, drawing on my earlier PhD findings. In my discussion, I sketch out the barriers to adjustable housing before outlining the new research that is needed to make this future possible. I conclude, heretically, by showing that to solve these complex and interdisciplinary problems, we need to abandon the idea that the property ladder is still functioning as a mechanism for allocating housing space, before looking again at three central pillars of sustainable housing design: loose-fit apartment layouts; user-led co-design; and, a 'fabric-first' approach to construction. This is not because these respective market, spatial, procurement and technical assumptions are wrong *per se*, but because they help to promote or justify the production of wasted housing space, especially when their implications are considered over the longer term.

Background and context

My position in the research is as a practising housing architect, looking outward at the fields of economics and real estate, with an industry perspective. As such, I am attempting to break from what is typically a monodisciplinary view of the UK housing crisis. Evidence from these three fields reveals a central but widely overlooked problem that particularly concerns more marginal homebuyers. This is a group of recent or aspiring homeowners that exist at the fringes of the housing market and at the boundaries between private rental and owner occupation. Their lack of effective demand in the UK property market makes them more likely to trim their housing aspirations - and therefore, their level of longer term satisfaction - until they can afford to buy a home (Meen, 2013, p. 637, 2018, pp. 21–25; Arundel and Doling, 2017, p. 650; Köppe, 2017, p. 178; Crawford and McKee, 2018, p. 194). The problem of choice and long term satisfaction is not helped by housing targets which prioritise ‘unit’ numbers and can justify smaller dwellings (White *et al.*, 2020, p. 89).

My research, however, does not critique these spatial outcomes on the grounds of space standards or with cries of “rabbit hutches” or “postage stamps”, as many commentators have done. Rather, I am concerned for the *consequences* that flow from such compromised choices. These occur once the needs of such marginal homebuyers begin to change, as they are prone to do in our “age of uncertainty” (Sardar, 2010; Bauman, 2013). Taking an interdisciplinary perspective, the literature shows that a combination of tenure, taxes, planning, construction, density, affordability, and changes in lending practice, conspire to prevent these groups from adjusting their homes, either by moving house or by making building alterations (Nationwide, 07/2019; Till and Schneider, 2005, p. 288; Pinder, Iii and Saker, 2013, p. 457; Hudson and Green, 2017; Lloyds Bank, 2017; Femenias and Geromel, 2020, p. 482; Preece *et al.*, 2020, 2021, pp. 2 & 100–101).

Scale helps to explain why this problem of housing adjustability has so far been considered from too narrow and monodisciplinary a perspective. To illustrate this point, take architectural research, where architects have tended to consider adjustability (or flexibility) only at the *micro*-scale of the private dwelling (Schneider and Till, 2007; e.g.

Saarimaa and Pelsmakers, 2020). This means that architects will tend to overlook the value of circulation and shared spaces as having social value beyond “defensible space” (Newman, 1973; Coleman *et al.*, 1985; Lees and Warwick, 2022). Meanwhile, research by economists has tended to limit consideration for adjustability to the *macro*-scale of the housing market, within which people are expected to adjust their housing by making house moves whenever their needs change (Cheshire, 2018, p. R14; Cheshire, Hilber and Koster, 2018, p. 128). Lastly, the real estate view is that adjustability can be achieved through alternative tenure models, such as shared ownership, or by means of shared living arrangements (e.g. cohousing). These products continue to be valorised despite the failure of either to gain meaningful traction amongst UK consumers (Jarvis *et al.*, 2016, p. 6; Cromarty, 2020, pp. 3 & 25–31; Whitehead and Williams, 2020, pp. 112–127; UK Cohousing Network, 2021).

Instead, in this research, I identify the intermediate or *meso*-scale of a multi-dwelling development or small estate, as containing features which could help people to *continuously* adjust their consumption of housing services, without having to move house or make physical alterations. Housing services means the complete package of benefits that can be derived from a home, in this case, the equity, private space and shared amenities that I show can flex to support changing needs over time. This meso-scale is also the scale at which social value is derived from semi-private infrastructure (shared gardens and walkways, for example). In contrast, housing research has tended to look at the *neighbourhood* scale, within which social value is usually associated with *public* infrastructure, such as streets and parks (e.g. Serin *et al.*, 2018; Carmona *et al.*, 2020).

I have undertaken the research from a practitioner’s perspective but using a capabilities approach. The capabilities approach - as distinct from more familiar but abstract price-based measures - is a way of evaluating success in terms of the freedoms and opportunities that are created for people to be and do all that they have reason to value (Nussbaum, 2003, pp. 41–42; Sen, 2010, p. 233; Robeyns, 2019, p. 252). Such capabilities-led thinking has only recently been applied to housing research and, to date, has been limited to theoretical work (e.g. Clapham and Foye, 2019, pp. 16–25; Foye, 2020, pp. 9–10;

Kimhur, 2020, pp. 271–272). As such, my research represents a tentative attempt to apply a capabilities approach to the post-occupancy evaluation of housing.

My terms of reference are limited to private sale housing, whether this is owner occupied or ultimately sublet by private owners. This is not only because of the prevalence of under-occupation amongst owner occupiers (Bruce, Bowers and Wilkins, 2023), but is so that my research might have more political impact by addressing the needs of a financially exposed but politically ‘valuable’ segment of the housing market, that exists on the fringes of the owner occupied sector (Meen and Whitehead, 2020b, pp. 211–212 & 239). I have therefore excluded consideration for social housing, institutional buy-to-let and housing on publicly-owned land. Instead, my intention is to rehabilitate the idea that multi-dwelling *housing* could be seen as a ‘normal’ - and even desirable - way of extending the range of the owner occupied housing market in the UK. This is on the basis that homeownership remains the UK’s dominant tenure (English Housing Survey, 2021, p. 6) but now needs to be reframed to make mid-density typologies (Scruton *et al.*, 2020, pp. 99–101) and more collective living into a positive lifestyle choice, as could help the transition to a *post-growth* economy (Jackson, 2009, p. 196).

Such reframing is needed to overcome the continued stigmatisation of more collective or multi-dwelling forms of housing amongst UK homebuyers. This has been a growing cultural perception since the 1980s, over which time social housing has come to be widely seen as a disempowering or even residualised solution to affordability problems, rather than a potential lifestyle preference (Tunstall, 2020, 2021). Meanwhile, collective settings such as cohousing are seen as an idealistic, elitist and reactionary response to narrowly defined, political or communitarian interests that many find off putting (Delgado, 2012, p. 441; Sargisson, 2012, p. 51; Chiodelli, 2015, p. 2577). Yet, between these extremes, my research finds an acceptance of - and even a desire for - more ordinary, affordable ways of living together separately. Thus, in many ways, my research concerns the changing nature of housing aspirations (Crawford and McKee, 2018; Preece *et al.*, 2020), by going beyond the numbers game of simply increasing the *supply* of new homes.

How we got here

Constructive solutions to these problems cannot start from a position of blame or radical change. This is because all participants are behaving rationally, given the incentives placed in front of them. Their incentives flow from cross-party support for both the premise of a homeownership democracy (Jackson, 2012), and from the overly simplistic view the only solution to an apparent shortage of homes is to increase supply (Meen and Whitehead, 2020b, pp. 39–40 & 117). Such messaging has literally paved the way for a carbon intensive drive to ‘oil’ the lower ends of the housing market with new homes. The result has been a wave of often smaller or inflexible apartments, made so because the design brief is first and foremost to maximise ‘unit’ numbers, rather than bed spaces or long term value (Park, 2017).

It is true that a compact apartment can represent a first step onto the ‘property ladder’, but the data suggest that simply building more of the same will do little to solve the UK’s underlying housing problems. For example, the 2021 census shows there is no shortage of housing space, because 69% of homes are under-occupied (Bruce, Bowers and Wilkins, 2023). Nor is housing unaffordable in aggregate, because if it was, prices would fall (Meen, 2018). Furthermore, the target to expand the existing housing stock by <1% each year will not lower house prices (Gallent, Durrant and Stirling, 2018), and if it did, any government would soon find itself in opposition. So how did we get here?

Firstly, there is a political danger in letting prices fall. This can be explained by the fact that 65% of voters already own their home (English Housing Survey, 2021, pp. 6–8) and therefore their needs will ultimately take priority over those who do not. This realpolitik means that well known drivers of the UK’s affordability problems are out of policymakers’ reach. The known drivers of house prices are property taxes, household incomes, borrowing constraints and interest rates, but these are mostly left unchanged because to do otherwise could make existing homeowners feel poorer, either directly or indirectly, by risking macroeconomic consequences (Meen and Whitehead, 2020b, pp. 39–40 & 117). For this reason, UK governments tend to turn instead to demand-side incentives, often using public money to boost the buying power of people at the lower ends of the market.

Such incentives include Help to Buy, mortgage guarantees, tax breaks, shared ownership and other financial products that do not address the systemic problems but are nevertheless seen to be helping people in need (Whitehead and Williams, 2020).

A second explanation for how we got here is that policies of today are limited by recent history - or 'path dependency' - even when the context changes (Meen and Whitehead, 2020a, p. 239). For example, at today's higher property values, stamp duty land tax (a tax on transactions) has effectively become a fine for moving house, whilst inheritance tax rewards those who do not. The effect of these once relatively benign and equitable taxes, is to restrict the supply of second hand homes for sale, with inevitable consequences for affordability as well as productivity (Hilber and Lyytikäinen, 2017).

A third explanation is that new housebuilding activity has the support of vested interests, making it harder for alternative narratives and solutions to cut through. From policymakers and lenders to architects and housebuilders, the inclination to design, build, create jobs, sell debt, grow the economy and boost tax revenue, is so strong that it trumps even widely held environmental goals. This is analogous to the continued VAT exemption on new building activity, which penalises retrofit and its significantly lower material and energy throughputs (Menteth, 2019).

Together, these three realities - politics, history and vested interest - show why the sorts of radical or utopian reforms that idealists have tended towards, are unlikely to fundamentally improve the housing problems facing marginal buyers. Instead, in my work, I accept a more realistic world view in which future policy will continue to be shaped by the past; where homeownership remains both culturally 'normal' and politically existential; but where a new approach to dense, profitable, multi-dwelling housing will remain central to any realistic solution to the UK's 'housing crisis'.

Lessons from the literature

To explain why we need to move the housing question out of the 20th Century mindset, I find it helpful to unweave the stories that we, in industry, tell ourselves to justify the status quo. One such myth is that buyers - freely transacting consumers - have the power to shape what gets built. Another is that people can make frictionless moves up and down the 'property ladder' whenever their needs change. A third is that people can easily extend their home. A fourth is that communities can and should set the design rules. A fifth, is that smaller homes can also be communities. A sixth is that low energy housing can have a minimal or zero carbon footprint.

In reality, however, a close reading of the literature from multiple fields - mainly housing economics, political science and real estate - explains why each of these stories belongs in the 20th Century. The volume housebuilder product - supposedly shaped by a well-functioning housing market - is barely affected by changing housing aspirations. This is because the more marginal homebuyers that such homes are intended for are design takers, rather than design shapers (Crawford and McKee, 2018, p. 193). In other words, housebuilders are free to 'do housing to people' because their customer base lacks the effective demand (or buying power) they need to influence what gets built. Such buyers - having taken what they are given - will also struggle to subsequently move house, because of a combination of taxes, prices, borrowing constraints, lack of choice and later entry to homeownership, as evidenced by the collapse in mortgaged house move transactions since 2008 (Hudson and Green, 2017; Lloyds Bank, 2017; Ong Vitorj *et al.*, 2021). Meanwhile, home extensions and alterations are hard or impossible to make - especially in higher density areas - because of a combination of tenure, typology, planning and construction (Schneider and Till, 2007; Femenias and Geromel, 2020; Pelsmakers, Poutanen and Saarimaa, 2020).

Research methods

To understand which characteristics do or could improve adjustability - and how these could be made more attractive for UK developers - I have undertaken post-occupancy evaluations (POE) of two, multi-dwelling housing models (Graham, 2023). This was to ensure a grounding in real life case studies as opposed to the more abstract basis of earlier, capabilities-led housing research. The POE method for each model comprised two distinct parts: (1) a round of resident surveys and (2) a series of interviews with both residents and multiple other key stakeholders. In this way, I generated mostly qualitative but also, to a lesser degree, quantitative data: qualitative in terms of the descriptions of processes and housing outcomes that emerged; and, quantitative in terms of the cost of certain development risks, or of the numbers of residents who actually participated in the co-design process. The participant stakeholders included residents, designers, developers, enablers, planners and sales agents. I used an inductive, grounded process - leading to thematic analysis of the data - to provide a new insight into the systemic barriers that make the housebuilding industry so unresponsive to changes in consumer aspirations.

I selected the case study development models because they each contain characteristics that the literature shows could support some degree of adjustability, either during the design process or once in use. These common characteristics included: multiple dwellings in a single estate or building; shared spaces; enlarged circulation; a scale that supports informal self-governance by users; management structures that reward participation; and, evidence of some intention to expand people's freedoms. This *intention* can be seen in my chosen schemes' because of their attempts to satisfy social, spatial or financial demands that are not normally available on the mainstream housing market (e.g. more choice, more control or a lower cost of entry).

The first case study was a cohousing scheme and the second, a micro-apartment model. Cohousing has been defined as "intentional communities, created and run by their residents [in which] each household has a self-contained, private home as well as a shared community space" (UK Cohousing Network, 2021). Micro-housing is less clearly

defined, but appears in both architectural press and government policy in the context of homes that challenge space standards at the lower end of the scale, where a 1-bed 1-person apartment can be as small as 37m² ('Micro-homes: Part of the solution or part of the problem', 2015; Department for Levelling Up, Housing and Communities, 2017, p. 89). Examples of both models can be found in higher value parts of London and the south east of the UK. Both case study models were delivered after the 2008 Global Financial Crisis and in places where affordability has been more constrained than elsewhere in the UK (Savills, 2021, p. 4). The selected models have some characteristics in common, namely their social aspirations and shared amenities, albeit that these are more explicit and extensive in the cohousing model. As such, the cohousing scheme was the primary focus of my fieldwork, however, the micro-housing developments offered enough similarities as to provide a useful comparison.

Findings

Analysis of my fieldwork enabled me to unpick three more of the stories we tell ourselves to justify the status quo, on top of those discussed earlier through the literature review. The first - using survey and interview data from the two case study models - is that when potential residents are allowed to decide what gets built, this 'insider' group can in fact exclude 'outsiders', whilst adding excess development risks and therefore costs for the developer (Graham, 2023, pp. 328-9). Insiders will do this despite their good intentions, because their membership will be self-selected according to their available time and money. They will therefore project their more narrow needs and preferences onto outsiders who could not participate, who join later, or who buy into the scheme in the future, as second hand homebuyers.

The insiders' design choices can directly exclude people who do not fit with their consensus view of an ideal neighbour, be this demographic or political. Insiders' choices can also indirectly exclude people whose needs are simply absent or unrepresented during the co-design process. Furthermore, a supply-demand mismatch - for example, too many bigger homes and excessive shared amenities will price out more price-

sensitive buyers, thereby exposing the developer to the risks and costs of a longer sales period and added marketing costs. Unforeseen costs can include unplanned expenditure on landscaping or a higher specification of internal fit-out.

As well as adding to the development costs, the insider consensus can add longer-term running and maintenance costs which may exclude yet more buyers on affordability grounds. These are consequences of community- or user-led design, but are compounded by the fixity of the architecture. A fixed architecture will prevent a developer or the occupiers from adjusting the scheme to meet changing market, sales or demographic conditions, whether at the point of sale or during occupation.

My second finding - from the same survey and interview data - is that small or micro-homes cannot provide the sorts of community living that they are often marketed as - at least, not over the longer term. This is because the sorts of social cohesion that can be assembled by a sales team on day one - often a function of buyers' similar education, age, financial means or housing pathways - will soon disintegrate as a consequence of even minor changes in people's housing needs. Examples of change included situations so modest as the original, single buyer forming of a couple, or their increasing need to work from home. In smaller, inflexible housing, these modest and relatively predictable changes lead to more frequent house moves and therefore an increase in churn, transience and loss of decision-making relationships, as experienced by the shrinking community left behind.

My third finding is that there is an environmental benefit that could come from making more effective use of new housing space over time. This is because spatial efficiency matters at least as much as building performance when it comes to reducing the whole life carbon footprint of a home. Although more detailed modelling is now needed, it is self-evident that homes which are periodically under-occupied will unnecessarily waste some of the 'embodied carbon' that is bound up in their building fabric. The proportion of waste depends on assumptions about the extent of under occupation that occurs over time, as well as about the embodied and operational carbon that flows from the construction and building performance. We know, however, that embodied carbon can

represent up to 70% of the whole life carbon footprint of a new home (Mitchell, 2022, p. 2) and that therefore there are potentially huge energy savings to be achieved, simply by encouraging or enabling people to make better use of their housing space over time (Huebner and Shipworth, 2017).

My conclusions from these findings are somewhat heretical, insofar as I argue that neither user-led design nor loose-fit layouts are viable solutions to the 'housing crisis'. This is because these central pillars of sustainable housing practice are precluded by affordability and liquidity problems in the housing market that are likely to persist, now that the property ladder no longer functions as it did. This will continue to be to the detriment of marginal homebuyers who will have more to gain from a bigger, baggier dwelling or the chance to inform the design, yet cannot afford such luxuries. Just as heretically, I argue that better building performance and more sustainable materials - though vitally important - are insufficient on their own if the designer has not also considered ways of allowing more optimal use of the available space over time. In short, for UK homeowners to thrive after the housing ladder, we need a whole system approach to minimising wasted space, development risk and community churn over the longer term, especially in higher value, higher density areas.

What is adjustable housing?

Using insights gathered from interviews during my fieldwork, there emerged some ways through which new housing might become less wasteful of space and carbon, and generate fewer house moves. These are examples of economic, environmental and social value, as make up design value - an evaluative term that is still being defined (White *et al.*, 2020). Using the concept of 'adjustable housing', I describe how it could be possible to enhance design value by giving people real choice over time. To explain this, I break down the concept into three dimensions, where each works within - rather than against - our established housing systems, culture and institutions. This is important because popular solutions that imagine away the political and social centrality of individual

homeownership to UK culture - or indeed, call for radical changes to the tax system - are unlikely to gain traction.

The first dimension of adjustable housing is what I call *adjustable dwellings*. This is where small apartments can be joined vertically or horizontally, then divided again when the extra space is no longer needed. The second is *adjustable equity*, which describes the security and resilience that comes from owning one of these small apartments, whilst renting any units they join to. The third dimension is *adjustable infrastructure*, into which private apartments may spillover (think play, plants, bikes or outdoor dining) and where neighbours can build the sorts of durable relationships that I find are necessary for the equitable co-management of a shared housing environment (Graham, 2023, pp. 328–9). Such infrastructure might include shared amenities, gardens, growing space, walkways, incidental sitting spaces in the building circulation and even a guest room or storage spaces - in other words, shared spaces which people can variously meet in or meet about.



Above: adjustable housing as a three-dimensional concept for living together separately, that is more than spatial.

To characterise this concept, take a household who needs a 2-3-bed apartment for their growing family. Like many at their lifestage, they can afford the monthly mortgage repayments but could not have raised the deposit needed to purchase so much living space (Hilber and Vermeulen, 2016, p. 390; Meen and Whitehead, 2020b, pp. 230–232). Instead, the adjustable housing model would enable them to buy their own 1-bed apartment in the first instance and thereafter, connect to and rent an identical flat next door. This way they avoid what economists call the problem of ‘purchase affordability’, whilst retaining the option to expand their home in response to the birth of a child, say, or to some other care need.

The capacity to find and agree to such an arrangement, however, must be arranged consensually between other neighbours. This is needed because privately-owned, resident-led developments normally lack the top-down management that administers changes and rules in housing owned by a local authority or housing association. My research shows that the need to co-manage is a sought after characteristic amongst certain groups. However, co-management also makes households more reliant on informal shared spaces, not just for play, seating or growing, but as an arena in which to learn of others' changing needs - for example, an older neighbours' interest in downsizing by releasing a portion of their dividable apartment. The option to split two apartments so that one half can be taken from one apartment and joined to another, means that the available housing space (and its associated carbon) can be more efficiently allocated over the longer term. It also ensures that neither party is forced to move away from their local networks, just because their housing needs have changed.

Discussion: Delivering adjustable housing

Theory is one thing, but in its current state, my tentative - perhaps idealistic - model for adjustable housing is not yet defined enough to be taken to market. This is because it still needs expert validation, and because it challenges some existing systems and institutions that currently make it hard to deliver. Such obstacles need to be researched in turn, specifically with regards to problems of investment, lending, briefing, planning, design and construction. The proposition therefore needs to be tested through new research, industry collaborations, expert validation and if possible, a pilot project.

The first - and perhaps greatest - of these research opportunities lies in developing a market for adjustable housing. For this, in my further research, I aim to design the parameters of an impact investment fund and a green mortgage product, to show how adjustable housing developments could attract lower cost finance. My research will identify ways of measuring the design value of adjustability, as aggregated over a lifecycle. This will reflect: (1) individual benefits accruing to the separate households, because fewer house moves mean cost savings that could make such borrowers more

attractive to lenders; (2) collective benefits accruing to the resident community, because better upkeep or lower management costs could again be reassuring to lenders; and, (3) societal benefits accruing to society as a whole, because aggregated savings in embodied and operational carbon, for example, could be attractive to ESG investors.

By developing these metrics, I expect to challenge industry norms like the green mortgage industry's reliance on energy performance certificates (EPCs). This is because EPCs are measured in kWh/m²/year and therefore reward people who buy homes with lower energy bills per square metre, rather than homes that use less space and therefore less carbon over the longer term. For illustration, a household that under-occupies a big but well-performing home could access a discounted green mortgage because they use less energy per square metre. In contrast, the same household in a smaller home of standard performance might use less energy *per person* (and therefore less embodied and operational carbon overall), yet will have to pay a standard, higher mortgage rate. In a market where lending determines house prices and therefore developer choices, it is clear that environmental goals can only be properly addressed when the incentives encourage better use of space over time.

A second opportunity lies in researching the amendments to planning legislation that adjustable housing requires. For this, I am developing ways that the approvals process could become more scenario-based. This would help local authorities to permit schemes where the number of dwellings can vary within certain bounds, when some apartments are divided or joined over time. However, the best way of testing the findings from this piece of the research will be through a live pilot project. This is so that the necessary planning dialogue with a local authority can be used to explore the potential for exceptions or other legislative opportunities.

A third stand-out research opportunity is to design some of the physical and spatial arrangements that are needed in an adjustable housing scheme. My aim here is to produce a pattern book of flat plans and building components. This will illustrate some flexible arrangements for party walls, services and layouts, designed to minimise upheaval, optimise floor area and retain fire, acoustic, security and structural integrity

when flats are divided. Again, a pilot project would provide real world constraints on site and briefing, so that this research by design is also grounded in reality.

Conclusions and collaborations

In conclusion, there is an opportunity to shift from sustainable housing design - doing less harm - to more regenerative, adjustable housing design, which aims to do more good over a longer period, with corresponding reductions in energy and material throughputs. At a conceptual level, adjustable housing also presents a new way of framing and explaining the many ways that housing systems and housing policies are intertwined into ordinary lives. This requires practitioners and researchers to give closer scrutiny to the idea that user-led design, loose-fit layouts, low-energy materials and continued reliance on the UK's housing ladder are still suitable ways of delivering housing to support 21st Century lives and crises.

The new research that I have laid out will add to this small but urgent area of knowledge by reaching across fields and through collaborations between industry and academia. For the financial and mortgage market element, I am now seeking lenders or investors whose valuations include consideration for energy use and social value. For the planning element, I will interview experts in academia as well as senior planning officers. For the spatial and technical design I am in touch with architects and manufacturers with experience in housing layouts, specification manufacture. More than these, however, I need a pilot project to serve as a vehicle to test and discuss the many possibilities of adjustable housing - financial, legislative and technical. This will come from an innovative developer or investor seeking first mover advantage at a time when longer, more episodic lives demand housing that can support constantly changing needs, without costing the earth.

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