



Assessing alternatives for new homes

Ed Green reports on the options for enabling current and future generations to build more, better homes in Wales



INTRODUCTION

There is a clear need for diverse, high quality housing that is not being met, and is not likely to be met through established methods. In Wales, we are building approximately half the new homes that are needed. Changing demographics mean that people need different forms of housing, in different locations.

Much of the housing that is currently being built may not serve us well in the future. Many new homes are inflexible, fail to meet current standards as a result of the 'performance gap', or generate secondary problems, such as increased dependence on cars.

The resulting *housing crisis* is well documented, as are the key underlying factors that limit the supply of new homes: scarcity of land allocated for housing, the elevated land costs that result, and the high cost of building new homes to current and emerging standards using established methods. In much of Wales, the efforts of a relatively small number of national housebuilders to build new homes are further hampered by depressed for-sale prices.

In comparison, relatively little is known about the range of alternative approaches to house-building that exist in the UK, some established and others that are emerging. Some of these approaches relate to construction techniques, others to delivery pathways. Each approach has particular benefits and limitations.

The **More | Better** report is the product of an evaluation of alternative approaches to housing delivery, conducted during 2016 and funded by Welsh Government's Homes and Places Division to inform decision-making by commissioners of housing in Wales. It provides 13 themed essays from expert contributors, coupled with 'best practice' case studies that analyse the

potential of alternative approaches to achieve higher standards.

The report concludes that there is *no single silver bullet* to 'solve' the housing crisis, but a combination of innovative delivery pathways and construction techniques could significantly increase our national capacity to build more homes, better.

CONTEXT: THE WELLBEING OF FUTURE GENERATIONS

There are clear and emerging drivers for change, including increasingly stringent limits to energy consumption and carbon production, and an increasing public aspiration for quality, in terms of place, design, workmanship, fuel efficiency, longevity and, crucially, affordability. These drivers should prompt a broader debate on the nature of new housing, including the process by which housing should be delivered, the standards it should be built to, and the ways in which performance, affordability and value should be measured.

The Well-being of Future Generations (Wales) Act 2016,

demands a focus upon long-term gains over short-term expedience. The seven well-being 'goals' enshrined in the Act can be translated into a set of aspirations for housing development in Wales, as shown in **Table 1**.

Most housing is built by a small number of nationally operating housebuilders using traditional construction techniques. In the following sections, one case study has been selected for each of the seven 'goals', to demonstrate the breadth of innovative alternative approaches already available to the Welsh construction industry.

ASSESSING ALTERNATIVES

Alternative approaches include *delivery pathways* (including commissioning and procurement, for example development partnership, community-led, self-build) and *construction techniques* (for example timber frame, offsite fabrication, volumetric construction). Each approach has different potential benefits and limitations in its application, giving rise to a range of factors to be considered

Table 1

A globally responsible Wales	Setting higher standards - reduced carbon footprints and energy-positive communities
A prosperous Wales	Developing an integrated all-Wales supply chain using local resources and a sustainable economy
A resilient Wales	Future proofing with long term flexibility, adaptability, ecological value and climate resilience
A healthier Wales	Reduced pressure on the health service through homes that promote physical and mental wellbeing
A more equal Wales	Eliminating household poverty by delivering affordable housing for all
A Wales of cohesive communities	Stronger neighbourhoods that support co-housing, self-build and cohesive communities
A Wales of thriving culture and language	Promoting diversity through Wales' unique cultural heritage, context and landscape

in the selection of a 'best fit' approach – see **Figure 1**.

Some of these benefits relate to project delivery (such as affordability, reduced site time, fewer defects). Others relate to the development 'in use' (reduced fuel bills, lower carbon footprint, energy generation). Some reduce specialist skills, increasing their applicability. Others lend themselves to densification of existing neighbourhoods.

Some alternative approaches support greater levels of flexibility and adaptability, while others can deliver higher quality, even zero-defect, building. Pop-up factories establish opportunities for local training, and promote the use of local materials and resources. Some approaches would put development directly into the hands of communities. However, unless these techniques are delivered at scale, their full benefit will not be realised (see **Figure 2** overleaf).

Alone, construction techniques cannot 'solve' the affordable housing crisis. However, combined with similar innovation in housing delivery, they could produce **more** housing that meets these goals, in terms of building sustainable communities and making better quality homes accessible to households that are currently excluded from them.

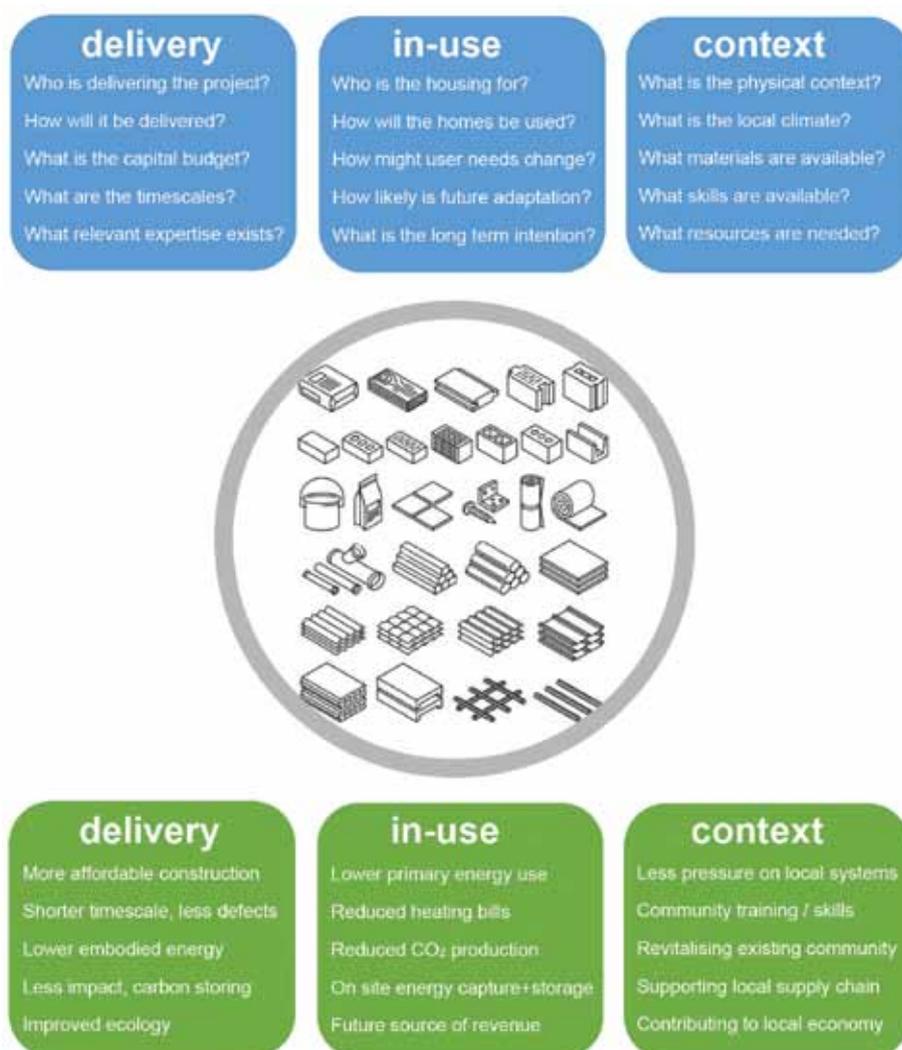
THEMES AND CASE STUDIES

01 Low carbon, energy positive

The work of the Zero Carbon Hub (now the Building Hub) identified a clear pathway towards making zero carbon achievable by the industry at large, at a grassroots level. This work included recognition of the severity of the performance gap, between designed and delivered projects, and recommended that future performance standards for zero carbon homes should be linked to 'as-built' performance to achieve the '2020 Ambition': 'That at least 90 per cent of all new homes meet or perform better than the designed energy/ carbon performance...'

SOLCER house is one of three case studies included in the report that

Figure 1: Key considerations and benefits affecting choice of approach



The prototype SOLCER dwelling, Wales' first 'energy positive' affordable house, was completed in 2015. www.lcbe.uk

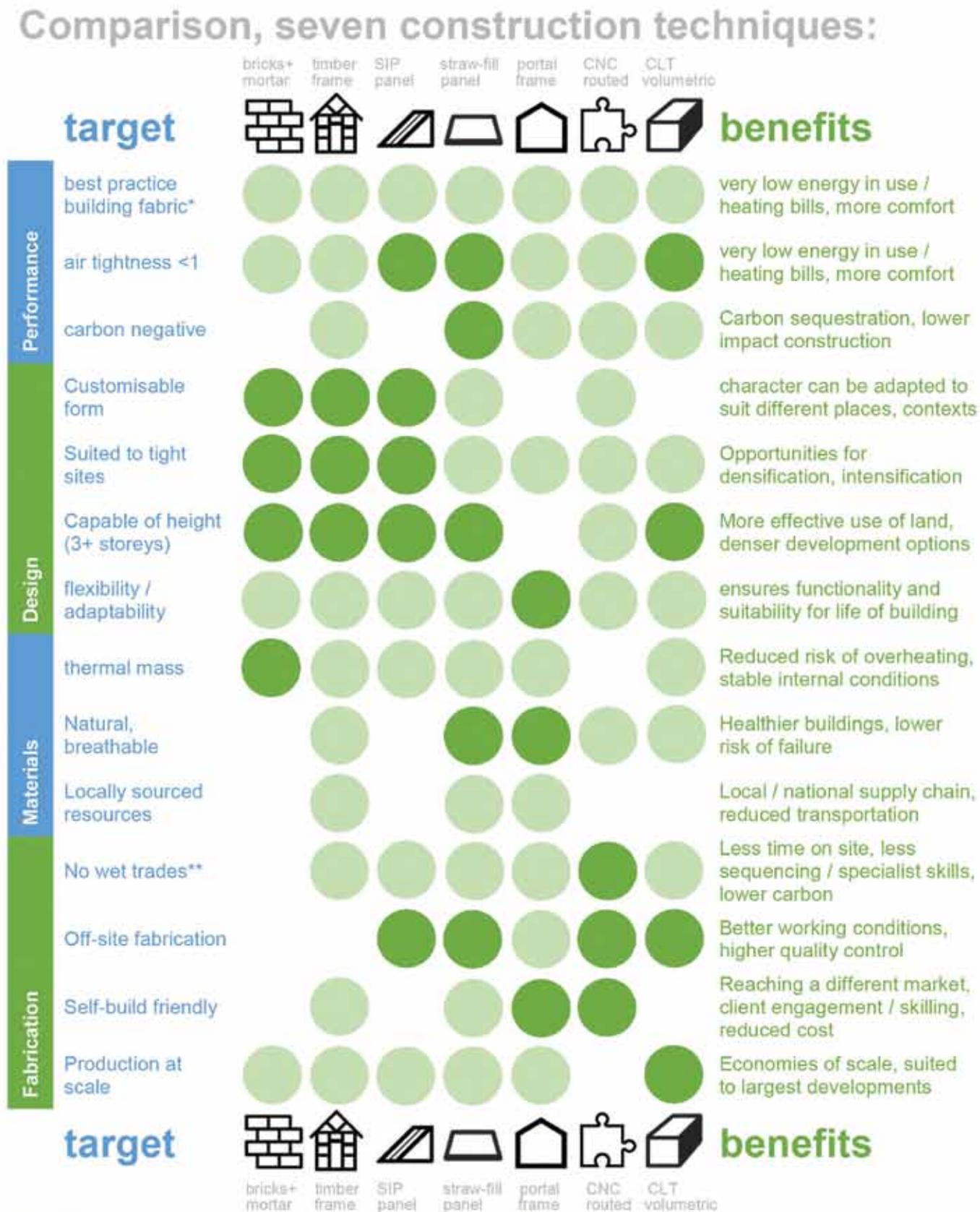
be properly integrated, in terms of design, construction and operational / maintenance programmes.

02 An all-Wales supply chain

Most alternative techniques use less cement than 'bricks and mortar'. Many are timber-based, a sustainable resource existing widely in Wales that 'locks' carbon into buildings, improving carbon footprints, and providing opportunities for local resource use and economic benefit. Gary Newman of Woodknowledge Wales makes the case for more widespread use of timber in Welsh construction. While timber is a resource that we possess in

generate significant income through renewables. In the right context, renewables provide a means by which housing delivery can be reconsidered as an income stream, offsetting rentals to deliver more affordable housing in economically challenging locations, even in relatively isolated communities. However, in order to be successful, energy generation must

Figure 2: the range of potential benefits associated with different construction techniques



* facility to achieve thermal performance equivalent to Passivhaus standard

** excluding foundations



Potential benefit



Delivered benefit



Principal elevation of the Ty Unnos house. The system transforms low-value local materials into a high-value engineered product. www.tyunnos.co.uk

Affordable homes based on the Ty Solar design by Western Solar Ltd, designed and manufactured in Pembrokeshire. www.tysolar.co.uk

abundance, more than 85 per cent of the timber used in Wales is currently imported. Greater consideration of embodied carbon would inevitably force more widespread timber use in construction.

The Ty Unnos system was developed in Wales, to transform low grade, low cost Welsh timber into higher value construction products. Short term, approaches such as Ty Unnos build capacity in timber-rich parts of Wales for local supply to feed local construction. Longer term, an all-Wales supply chain would keep much of the capital expenditure associated with new housing within Wales, reduce transportation costs, reinvest capital in Welsh industries, and develop expertise and products for export outside of Wales.

03 Flexibility and resilience

In 2008, English Partnerships re-introduced space standards 10 per cent more generous than Parker Morris. Lifetime Homes and the London Housing Design Guide have followed these new minimum standards, to allow for accessibility, flexibility and adaptability.

However, such standards inevitably add cost, and preclude a less prescriptive approach that might lead to a broader range of housing 'options'. Recent high-profile international projects have explored the role that starter homes and micro homes might

play in the delivery of affordable social housing. Foremost among these is the work of Aravenna's practice Elemental.

With increasing awareness of climate change impacts, building in climate resilience has increasingly become a priority. The key focus of resilience is a reduction in the vulnerability of users and communities to the environmental consequences of climate change.

Pentre Solar was commissioned in 2017. The six-home zero energy hamlet in Pembrokeshire is the first fully solar village in Wales. See the article by Glen Peters on p29 for more details.

04 Healthier homes

As a sector we fail to fully appreciate the impact and cost of poor housing on health services. The built environment remains woefully wasteful and far from 'sustainable'. We no longer have the luxury of being less bad, but must become more good, and 'restorative' in our approach to wellbeing, performance, and environmental impact.

As Martin Brown describes, to comply with the Living Building Challenge, the world's most rigorous building certification scheme, a project must be healthy and energy positive whilst being carbon negative. This is a fundamental shift away from buildings as resource consumers towards buildings as resource conservers and producers. While standards such as

the Living Building Challenge remain aspirational in Wales and current 'capital cost' thinking presents a barrier to its implementation, the future and wider financial, health, environmental and ecological benefits are only just beginning to be understood.

The LILAC (Low Impact Living Affordable Community) co-housing project was intentionally formed, planned and managed by the residents who share activities like cooking, childcare and gardening. Completed in 2013, it was designed by White Design and constructed from ModCell, one of the first products to make large-scale, carbon-negative building a commercial reality. The robust, low skill build system facilitates involvement of local people, local skills and local materials.

05 Affordable housing for all

According to BCIS data, the cost of new housing in the UK is among the most expensive in Europe, at around £1050/m². Changes to Building Regulations have improved performance, but added to cost.

In the past, historical social/affordable housing pilot projects attempting to attain higher standards of energy efficiency (for example Code for Sustainable Homes level 5/6) have often done so by adding 'bolt-ons' to traditional approaches rather than considering alternatives holistically. For lower income communities in Wales, the prospect of purchasing new housing



The completed LILAC project, made from straw-based panels assembled at a flying factory nearby, with rainwater harvesting and SUDs at its heart. www.lilac.coop



A proposed street view of Willowbrook, one of 12 phase 1 sites delivering tenure-blind, high quality, energy-efficient homes in areas of need. www.cardiff.gov.uk/ENG/resident/Housing/Housing-Partnership-Programme/Pages/default.aspx

outright at elevated costs is unrealistic. Alternative approaches are needed, that deliver 'better' affordable housing without untenable cost increases.

Capital costs for case studies are in the range £500/m² to £1500/m². At the lowest end, capital costs do not deliver 'finished' buildings, only shells. Self-build construction dominates the lower cost case studies due to savings on labour (25-45 per cent of total cost), but is limited in its applicability. Other approaches propose to deliver better value homes in terms of energy conservation and reduced heating bills, without considerably increasing capital costs.

It is important to distinguish between cost and value. Alternative approaches can deliver better value than traditional approaches, through wider benefits such as reduced pressure on local systems (including environmental systems and healthcare), skills provision, increased local employment, and benefits to the local economy.

The innovation around Cardiff Council's Housing Partnership Programme, delivering 1,500 homes in conjunction with private developer Wates Living, lies in the use of a development partnership, and ensuring an equitable mix of housing types and tenures. While this approach may not be viable across Wales as a whole, in areas that include developable higher-

value land, it ensures that less desirable sites are developed hand in hand with, and to the same standard as, market-friendly sites.

06 Cohesive communities

The private sector, public/private partnerships, custom build, co-operative housing and self-build all have a part to play in the delivery of affordable housing. Approaches that encourage households or communities to build their own homes result in new homes being delivered in addition to homes delivered through conventional routes, not in place of them, and could make a meaningful contribution to housing supply.

Community-centred initiatives are already happening in Wales, supported by organisations such as the Wales Co-operative Centre. The report identified that land should be made available for the delivery of social/affordable housing projects, and that locally administered registers could assess appetite for self-build and community projects, and connect people that have a better chance of success working together. Local authorities could facilitate projects by providing serviced plots with 'principles of development' in place. Available, affordable land removes the two biggest barriers to self-build.

DDM (distributed digital

manufacturing) has been used in the fabrication of the first occupied WikiHouse in the UK last year. The structural chassis of the house in Warwickshire was fabricated from plywood sheets using a CNC router (a computer controlled routing machine), and was assembled on site in just two weeks by untrained volunteers, virtually eliminating labour costs.

KIN architect's Alex Whitcroft also talks about the benefits of open protocols across the whole supply chain, the importance of working collaboratively, and of sharing knowledge in order to continue learning and developing ideas. Looking forwards, case study projects should be monitored during construction and post occupation, using an open, inter-disciplinary protocol for data collection, reporting and dissemination. Affordability and the wider value of each construction technique should be a focus of such monitoring.

07 The Welsh context

In the final section, Niall Maxwell of Rural Office for Architecture discusses the unique Welsh context. For a small nation the historic architectural language of Wales is diverse - from Victorian coastal gentrification to the impact of heavy industry, but with the majority being the vernacular of rural hinterland. He goes on to discuss how settlements

06



07



The first completed WikiHouse home in the UK was cut from 512 sheets of plywood by a small workshop. It was erected in a little over a week and took another week to enclose. www.wikihouse.cc

The Barnhaus system draws from agricultural construction for inspiration. Simplicity of form and detailing are central themes of the design. www.pentan.co.uk/project/barnhaus/

have grown over time to serve the demands of a changing population, but not always supported by commercial activity, which impacts on the character and distinctiveness of regions across Wales. Wales must find an identity of its own, if it is to develop successfully and sustainably in the future.

The Barnhaus approach was predicated on the basis that contemporary house-building practice produces homes that are too small, inflexible, lacking in character, energy-hungry and, above all, unaffordable. It uses agricultural construction techniques, which are naturally more suited to rural or landscape locations. The approach uses materials widely available in a rural context, and is intended to be robust, low skill and self-build friendly...

CONCLUSION: INITIATING A STEP CHANGE

When the new Welsh Housing Standard emerges, it must promote quality, diversity, sustainability, shared learning and equality. It should be capable of adapting to emerging best practice, and demand excellence in the built environment, to ensure that Wales has a clear pathway to decarbonisation, and a means of developing sustainably for the future.

To facilitate a step change in the quality and quantity of housing, Welsh Government should:

- Task a working group with understanding housing in the context of the WFGW Act
- Map existing and emerging housing standards against existing performance standards
- Liaise internationally with innovative policy makers, commissioners and practitioners
- Establish an open-access forum for anyone interested in building homes
- Map housing need, supply and opportunities in a transparent, joined-up way
- Nurture industry in Wales with potential to contribute to a Wales-based supply chain
- Explore the intensification of existing low density communities in viable locations.

Wales should lead the way by placing affordable housing and affordable warmth at the centre of national policy, with homes and places that meet our needs, now and in the future. We must stop thinking purely in terms of capital costs. Construction that drains resources should be replaced with buildings that generate resources – that are energy positive and carbon negative. This fundamental perspective shift is in line with the WFGA (Wales) 2015.

By employing alternative approaches, we could be constructing new homes and neighbourhoods in a more contextually appropriate way, with greater long-term value. Alternative

approaches have the potential to deliver affordable homes in parallel with more established methods, so long as knowledge is shared with commissioners and constructors.

Different delivery pathways and construction techniques could lead to more diverse housing that is better quality, more fit-for-purpose, more affordable and more sustainable. Further benefits could include the growth of employment in Wales, a national supply chain, greater long term resilience, and renewable energy infrastructure as a source of income.

The creation and maintenance of sustainable communities could provide a new focus for post-industrial Wales, facilitating joined-up development that works at a local level.

If Wales is to rise to the challenge of the housing crisis by constructing a legacy of homes that future generations consider to be a blessing and not a burden, the correct standards, incentives and monitoring must be put in place to encourage all existing pathways, along with some that do not yet exist, to produce more, better housing.

*The More | Better report is available in full at orca.cf.ac.uk/98055/
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