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Research to identify early lessons emerging from the Innovative Housing Programme: Summary

1. About the Innovative Housing Programme

- 1.1 Initiated in 2017, the Welsh Government's Innovative Housing Programme (IHP) is supporting innovation in housing delivery in Wales. It is targeting innovations in three key elements of the housing supply process: construction techniques; delivery pathways; and housing models. The programme aims to:
- increase the supply of affordable housing in Wales.
 - support the seven goals enshrined in the Well-being of Future Generations (Wales) Act 2015 (WFGA).
 - address cost and value in new homes, and develop housing that meets current and future housing needs.
 - support innovators through the use of alternative approaches and demonstrate the benefits of such approaches to encourage uptake.
 - harness opportunities to deliver jobs, skills training, and develop local industry.
 - publicly disseminate key findings and maximise learning.

2. About the research

- 2.1 In March 2020, the Welsh Government commissioned the Centre for Regional Economic and Social Research (CRESR) to undertake research into the lessons emerging from the first year of the IHP. The aim of this research was to understand the early construction messages emerging from the IHP, including those relating to the planning process, construction challenges and benefits, costs, materials and timescales.

2.2 The research focused on housing schemes funded in the first year of the IHP (2017-18) only. The research involved qualitative interviews with housing developers¹ (in this case, mostly Registered Social Landlords) leading the 18 schemes funded during year one of the IHP and, where possible, their construction partners². The research took place between March and June 2020 and was guided by four key research questions, as follows:

1. What are the early messages emerging from the scheme, including in relation to:

- planning barriers?
- construction (challenges and benefits)?
- workforce skills (challenges and benefits)?

2. How does the IHP compare to more typical build programmes, in terms of:

- build costs?
- availability of materials/supply chains?
- waste materials during construction?
- sustainability of production?
- timescales/pace of build?
- energy performance (according to SAP calculations) and affordability?

3. Have any specific challenges been encountered in association with:

- the different methods of construction exemplified?
- different types of site?

4. Are the projects delivering the outcomes and outputs they intended to, at the following stages:

- the planning and construction phase?
- up to practical completion?

2.3 This executive summary provides an overview of the key findings and learning points identified through the research. The learning identified will be of relevance to future rounds of the IHP; to the development of innovative housing schemes more broadly; and to policies and initiatives that seek to promote them. Some of the points identified are of a very practical nature and some are of more relevance to policy.

¹ A housing developer is anyone who develops land or redevelops existing property to provide housing. All developers participating in year one of the IHP were either social housing providers or local authorities.

² In this context, construction partners are those contracted by the housing developers funded through the IHP to construct the planned properties on their behalf.

2.4 Some of the lessons identified are specific to the innovative nature of the schemes pursued in year one of the IHP, whereas others relate to general challenges that may be encountered in relation to most developments. The primary focus of this summary is on drawing out the learning of greatest relevance to the IHP.

3. Early stage challenges and benefits: planning, construction and workforce

3.1 This section focuses on the lessons identified through the interviews with developers and their construction partners in relation to the early stages of mobilising the funded schemes, including obtaining planning permission and navigating the planning process; assembling an appropriately skilled workforce and getting construction underway.

Navigating the planning process

3.2 Early dialogue between developers and local authority planning teams (in good time ahead of the submission of a planning application) can help to resolve tensions between the importance of high quality place making versus the operational objective, held by many social housing providers, to maximise the number of units provided at a time of housing shortage.

3.3 Early dialogue with local residents living in the vicinity of proposed schemes will also be important in avoiding objections relating to the potentially unconventional appearances of innovative schemes and the type of tenants they are aimed at.

3.4 A number of developers felt that aiming for a traditional appearance even when adopting an innovative approach to construction successfully reduced concerns amongst local residents.

3.5 Applying for planning permission in advance of identifying a preferred construction approach or working within an existing planning permission is unlikely to speed up the development process. The construction approach should be factored in from the outset.

3.6 Unconventional forms of development may face additional challenges in the planning process or represent uncharted territory (i.e. container homes³) and there may be learning to do on the part of local planning authorities to prepare for such applications. Developers can help with this through early dialogue with planners and planning committee members, providing detailed information about their preferred construction approach and the advantages it offers.

³ Homes constructed using repurposed metal shipping containers.

- 3.7 The planning stage of the development should be led by someone with experience of the planning system - construction partners are not always well positioned to do this.
- 3.8 Having the status of an IHP funded scheme could be helpful in the planning process as local planning committees appeared sympathetic to the aims of the programme.

Construction challenges

- 3.9 IHP funding has given participating developers the confidence and financial 'safety net' to adopt more innovative approaches to what would otherwise have been traditionally constructed schemes.
- 3.10 In the absence of prior experience or reliable data on which to base decisions about which construction approach to pursue, many developers opted for approaches which inspired them. This mostly worked well in terms of raising their ambitions and empowering them to take more risks.
- 3.11 There was a clear preference amongst developers for traditional approaches to construction with more innovative technological additions to boost environmental performance. Passivhaus approaches were also popular ostensibly chosen because they're relatively well established (albeit outside of the UK) and potentially offer substantial energy savings.
- 3.12 In practice, Passivhaus was considered a challenging option to pursue and many of those who attempted it aren't minded to do so again.
- 3.13 Many developers experienced difficulties with supply chains for specialist construction materials and also had to work hard to identify construction partners and contractors with the appropriate experience to deliver their innovative schemes.
- 3.14 In the first year of the scheme developers were required to secure land, planning permission and building contracts in a short space of time, sometimes reducing the time available to identify the most appropriate construction partners and suppliers.
- 3.15 Despite these difficulties, 11 of the year one schemes (out of a total of 18 schemes) did manage to appoint locally based construction partners but others were forced to look further afield.
- 3.16 However, once the immediate pressure to deliver the schemes was off, some developers were able to conduct more detailed research into supply chains and contractors and, through this, many identified local suppliers that they could use in future.

- 3.17 Many developers concluded that they should have spent more time scoping local supply chains at the outset of the project, before they imported materials or deferred to their architects to identify suppliers on their behalves.
- 3.18 Off-site manufacture⁴ can help to reduce the impact of poor weather on the build process, but high winds and poor ground conditions can still frustrate progress. Thorough and early site investigations conducted jointly by developers and contractors and detailed contingency planning can help reduce delays.
- 3.19 Some construction partners had to rapidly rectify shortcomings in the detailed design of schemes whilst on site and as such called for detailed designs for innovative schemes to be kept as simple as possible to enable a smooth construction process.
- 3.20 The more unconventional schemes (i.e. Barnhaus; Passivhaus etc.) pursued tended to suffer the most complications during construction whereas the more traditionally constructed schemes presented few challenges aside from issues around innovative components. Modular products were felt to cause the least complications.
- 3.21 Construction partners were positive about the opportunities available under the IHP to prepare for the construction approaches of the future and felt that, on the basis of what they had learnt through the scheme, they could deliver the same schemes more quickly and cheaply in future. Developers were less inclined to want to repeat highly innovative approaches citing concerns about unknown defect levels and long term maintenance.

Workforce challenges

- 3.22 Developers strived to identify suitable contractors operating locally or at least within Wales but time constraints limited efforts to find suitably skilled contractors locally. These difficulties were most pronounced in relation to the more specialist construction approaches such as Barnhaus,⁵ Passivhaus⁶ and use of shipping containers. Responses from participants included taking a chance on local companies; rapidly upskilling in-house construction teams; or looking outside of Wales, with the former two options yielding the best outcomes.

⁴ Off-site manufacturing refers to the fabrication and sometimes also the assembly of key building components in a factory setting rather than on the building site.

⁵ Barnhaus construction involves the use of straw bales to insulate a property. The properties are also usually clad in metal sheets which give the appearance of a farm building.

⁶ Passivhaus construction is an approach which aims to achieve significant improvements in a building's energy performance using minimal technology and instead building a simple highly insulated property with high levels of air tightness and which maximises opportunities for natural heating from the sun.

- 3.23 The size and value of the IHP schemes plus the additional requirements around innovation were felt to limit interest from construction partners and contractors. It was suggested that the developments being pursued were too large for a local SME to fulfil but not big enough for a large company to consider.
- 3.24 Some suppliers of specialist components insisted on providing their own workforce to assemble the components on site. This reportedly led to issues around the quality of workmanship and undermined opportunities for local teams to upskill.
- 3.25 Many of the workforce problems reported are not specific to the IHP and relate to the need for the design and construction industries to rapidly upskill. However, the tight timescales associated with the IHP in its first year reduced the amount of time available to identify suitable local partners.
- 3.26 Apprenticeships and partnerships with local colleges provided specialist labour for some schemes and also supported local employment aims.
- 3.27 Some construction contractors have established ways of working that are informal and rely on tacit knowledge rather than detailed planning- this was particularly problematic in relation to highly specialised construction techniques which require contractors to follow tightly defined processes.

4. How does the IHP compare to typical build programmes?

- 4.1 This section uses the data gathered through the interviews with developers and construction partners to make a comparison, as far as is possible, between the experiences of delivering housing through the IHP and doing so through more 'typical' build programmes. This section considers the similarities and differences in relation to: build costs; building pace; construction waste and energy performance.

Build Costs

- 4.2 Most respondents felt that the IHP schemes had cost more to build than traditional methods. Many reported encountering unanticipated costs during the building process often associated with difficulties sourcing specialist materials and resolving issues with the detailed design whilst on site.
- 4.3 These unpredictable costs underline the importance of IHP funding in incentivising developers to proceed with innovative (and more financially risky) schemes and developing their experience.

- 4.4 High and unpredictable build costs may act as a disincentive to developers delivering innovative schemes at scale in the short term, although it was accepted that build costs are likely to come down as innovative approaches are mainstreamed and processes become refined.
- 4.5 Some developers were considering setting higher rent levels for more energy efficient housing to cover higher build costs and because such properties theoretically offer lower energy bills. However, it was difficult for them to reach a firm position on this without reliable indications of likely running costs.
- 4.6 Life-cycle costs associated with innovative housing may be of equal importance to upfront capital costs when considering the viability of innovative housing. Some respondents believed that significantly reduced energy costs over the lifecycle of homes could fundamentally shift housing association finances, yet institutional frameworks do not yet allow for these longer-term forecasts.
- 4.7 Whilst likely defect levels associated with innovative methods were a concern for developers, several respondents identified fewer defects with their innovative builds to date than they would expect from traditional construction. This was attributed to the greater level of quality control possible through off-site manufacture.

Timescales and pace of build

- 4.8 Although most schemes reported faster completion times than would have been expected for a traditional build, many schemes struggled to meet projected timescales primarily due to delays in appointing appropriate contractors, sourcing specialist materials and the need to modify detailed designs once on-site.
- 4.9 Overall, there was a feeling that delays would be much reduced if these approaches were repeated in future and that the detailed designs now in place, after modifications made on site, could be utilised on future schemes.
- 4.10 It was felt that where designs were kept as simple as possible this enabled faster construction and conserved materials. For more technical construction, off-site manufacturing improved the quality of components thus speeding up construction.
- 4.11 Challenges were also reported around mastering a new order to the build process, which often involved making structures weather tight before installing insulation material.
- 4.12 Delays were also reported around agreeing contracts with construction partners underlining the importance of engaging contractors as early in the development process as possible.

- 4.13 Securing statutory connections added significantly to build time in several cases, undermining the potential for IHP schemes to realise faster build paces. Beginning these statutory processes as early as possible was felt by participants to be key.

Waste materials

- 4.14 Respondents struggled to be specific about construction waste levels but generally reported good outcomes in comparison to traditional builds.
- 4.15 Timber offcuts were the greatest source of waste materials for those schemes using timber frames and there appeared to be little incentive for external contractors to minimise timber waste.
- 4.16 High levels of waste were reported in relation to: plasterboard, dry lining and the tape and paper backing left from Passivhaus construction.
- 4.17 Pulped paper insulation (pumped into cells within a modular unit) was praised for generating virtually no waste compared to insulation sheets and straw bale insulation was also found to be a low waste option.

Energy performance (Standard Assessment Procedure or SAP performance) and affordability

- 4.18 Residents' proficiency in operating their new homes in the post occupancy period and when properties are re-let was a concern for some developers and many had planned a period of intensive resident engagement and support in the post-occupancy period.
- 4.19 A number of developers assumed that pursuing low energy designs would result in the SAP rating necessary to achieve an EPC A rating. This was not always the case and in some instances it had been necessary to add in additional renewable energy sources to achieve EPC A.
- 4.20 The need for careful orientation of properties to maximise the potential for solar gain and ensure optimal performance of photovoltaics resulted in complications during the detailed design phases as well as sometimes reducing the number of units it was possible to deliver on site compared to traditional designs and layouts.

5. Progress against outcomes

- 5.1 This section offers some tentative insights into outcomes associated with the year one schemes. However, in most cases, it was too early to comment with any conviction about outcomes in terms of energy performance and the outcomes experienced by tenants (many of whom had not yet moved in or had been in their properties only a short time). It is

possible, however, to offer some insights into outcomes in terms of speed of delivery; build costs and the role of the IHP in shifting norms in the development and construction industry.

Outcomes in terms of speed of delivery

- 5.2 Most schemes experienced some level of delays during the planning and construction phases and these related to appointing suitable contractors; navigating planning challenges and sourcing materials. These delays undermined the potential gains in build pace made possible by some innovative methods.
- 5.3 Modern Methods of Construction (MMC) were considered a faster approach to development when compared to traditional methods but progress was still hampered by challenges around securing utility connections and adverse weather conditions.
- 5.4 As a general rule, the more innovative schemes encountered the most delays but construction partners stressed that many of these delays could be avoided in future.

Outcomes in terms of build costs

- 5.5 For many the final financial position regarding their schemes was not yet clear.
- 5.6 Developers and their construction partners found it difficult to accurately cost schemes that they had no prior experience of delivering. However, access to IHP funding reduced the risks associated with uncertain build costs. Several commented that they would have more certainty over costs in future as a result of the knowledge gained in year one of the Programme.
- 5.7 Several developers thought their schemes would come in on budget and regarded this as a major success in the context of an experimental scheme. Partly this was due to a cautious approach to budgeting by developers.
- 5.8 Construction partners could all see scope for efficiencies in the construction process in future and were confident that they could deliver the same scheme at a lower cost in future.

Outcomes in terms of shifting norms in the development and construction industry

- 5.9 Participation in year one of the IHP had evidently shifted attitudes towards innovative approaches to construction amongst both developers and construction partners. They were proud of the products they had delivered and felt the standards achieved through the IHP had set the bar higher for future schemes.
- 5.10 Developers and construction partners were making significant contributions to preparing the sector for future construction challenges through provision of training; hands on experience;

apprenticeships; scoping out new supply chains for sustainable materials and in some cases, setting up their own off-site manufacturing plants or timber frame workshops.

5.11 There was also evidence of developers and construction partner teams moving very quickly to apply their learning from year one and also scaling up provision of some of the approaches trialled.

Outcomes for occupants

5.12 Initial anecdotal indications of resident satisfaction (collected by the developers? themselves) were promising, with residents responding positively to their new homes in spite of unconventional features. However, this wasn't verified as part of this research project.

5.13 Developers who had opted for more unconventional construction approaches reported facing some challenges around convincing tenants that their properties would make good homes - this was particularly an issue for unusual looking properties (i.e. Barnhouses) and container homes.

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Views expressed in this report are those of the researchers and not necessarily those of the Welsh Government

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