JRF JOSEPH ROWNTREE FOUNDATION

INSPIRING SOCIAL CHANGE

BUILDING SUSTAINABLE HOMES

Building sustainable homes is important in reducing global environmental impact and promoting health and well-being at local level. Sustainability has improved, but comes at a cost. Standardising energy-efficiency regulations leads to cost-efficient delivery, but wider sustainability can be achieved only by responding to local needs.

Key points

- Improving energy efficiency to zero-carbon levels could cost an estimated 2.5 to 12.9 per cent per dwelling onsite. Depending on dwelling type, this equates to onsite costs of around £35 to £60 per m^2 for simple building fabric solutions or around £110 to £160 per m^2 for more significant fabric solutions. Offsetting through 'allowable solutions' (reducing carbon emissions in other places rather than all on one site) would reduce this cost.
- However, increasing the supply of land with planning consent by a fifth would boost housing supply by over 3.5 per cent while achieving these higher levels of sustainability.
- Onsite provision plus allowable solutions is currently the most efficient carbon-reduction method. Local authorities need to take the lead in ensuring that allowable solutions respond to local conditions and prioritise tackling fuel poverty.
- Building regulations need to include a single 'as built' performance standard for energy-efficient building.
- Investment in training and skills is required to meet skills shortages at all levels from housing design to construction. Training needs to focus on the skills required to improve energy-efficient building, including Modern Methods of Construction (MMC).
- MMC needs support through favourable tax treatment to kick-start the market by increasing volume and reducing costs.
- Local authorities have a key role in ensuring the promotion of sustainable places. Matters such as flood resilience and urban design should inform disposal of publicly owned land, based on analysis of local conditions.

The research
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BACKGROUND

This study asked "how can we build sustainable homes more cheaply?" It identified the multifaceted nature of sustainability, while recognising energy efficiency and tackling greenhouse gas emissions as key elements of government policy and emphasis for those delivering new housing. The research examined various approaches to cost-efficient delivery of sustainable housing, and included a survey, case studies and interviews with practitioners.

Cost and supply of sustainable homes

The cost of improving sustainability to zero-carbon levels would vary depending on the methods used. Achieving zero carbon onsite with a mix of simple building-fabric solutions and technology could increase costs by about 2.5 to 4.0 per cent. More significant changes in fabric to achieve zero carbon onsite without use of technology could cost around 13 per cent. Unsurprisingly, the mix of simple fabric measures and technology was the most favoured improvement route. Government measures announced in June 2014 will allow offsetting of part of the carbon savings against 'allowable solutions' (reducing carbon emissions in other places rather than all on one site), giving a combined cost estimated at less than either of the above onsite-only approaches.

Modelling the effect on supply of increasing sustainability to 2016 standards onsite showed only a small reduction in supply of between 1 and 2 per cent; including allowable solutions would mean an even smaller reduction. Regarding the impact of increased market concentration (the number of firms making up total production in the industry) and increased land supply with planning permission, the latter would have a more significant impact. An increase of 20 per cent in planning permissions would potentially increase the supply of homes by over 3.5 per cent, more than compensating for the loss in supply due to increased sustainability.

Regulation and standards

Regulation drives housing sustainability standards. Developers have kept pace with the phased introduction of stricter building regulation (particularly Part L, conservation of fuel and power). Nevertheless, in December 2013 all private developers surveyed and four-fifths of registered social landlords (RSLs) believed the 2016 zero-carbon target to be unrealistic.

The additional cost of building more sustainably is not reflected in increased house prices. This puts pressure on building regulations and compliance standards, as these become the determinants of sustainability to which developers adhere; developers mostly build to minimum standards. RSLs are generally more likely to innovate, but scheme appraisal based on upfront capital cost means that most RSL homes are built to minimum Homes and Communities Agency (HCA) standards; these tend to be higher than building regulations. Introducing a scheme appraisal system taking whole-life costs into account could give RSLs scope to focus more on sustainability. Local authorities can and often do impose development conditions requiring standards above building regulations as a condition of planning consent.

The Code for Sustainable Homes (CSH) has been the reference point for local authorities and the HCA in setting sustainability standards above minimum building regulations. However, as a result of the 2014 Standards Review, the CSH will no longer be available as a separate standard for energy efficiency.

Other standards, notably Building for Life (latest version, BfL12), support wider aspects of sustainable design relating to neighbourhood and place. Such standards cannot be set nationally without reference to local context. A new tool could be developed, perhaps drawing on CSH and BfL, to assist in setting locally relevant sustainability guidance.

Design and construction

Construction has been adapted to meet current building regulations, but at increased costs. No technique, construction or production process in itself will enhance sustainability at reduced cost. Additionally, the 'performance gap' between schemes 'as designed' and 'as built' complicates sustainability evaluation, since standards and actual sustainability performance are not the same thing. There is little point in increasing the regulatory design standard and not achieving the intended performance level. Therefore, 'as built' standards ought to be incorporated into building regulations. This is not a simple matter and would require research into appropriate methods of performance assessment. Implementation would also cost money at various stages: product specification, design and onsite.

Constraints on achieving sustainability and mitigating cost are complex, and solutions potentially expensive. Investment in training is needed to combat skills shortages at all levels from housing design to construction. Process innovation is also poorly developed. Most developers continue to use traditional construction methods. Modern Methods of Construction (MMC), including off-site manufacture and prefabrication, are seen as risky and not generally financially attractive; their use is limited, despite their ability to improve 'fabric efficiency', the preferred route to lower carbon emissions. MMC shown to be most effective in delivering improved sustainability ought to be supported, perhaps through the tax system.

Significantly, MMC are also a means of improving sustainability performance through addressing site-based performance gap concerns. MMC processes of manufacturing and fabrication in a quality-controlled environment limit the loss of sustainability between design and onsite installation associated with traditional construction processes. MMC would also address the skills shortage problem, which was a recurring theme in the case studies.

Impact of scale

Volume creates viable markets and reduces risk and uncertainty for suppliers, leading to cost efficiencies. Increasing volume is therefore key to mainstreaming product and process innovation and associated cost efficiency. Unnecessary local variation in requirements which inhibits the development of standard components and processes therefore needs to be avoided.

However, appropriate local control of sustainability measures, including urban design, is also important. The advantages of further market concentration are limited; in particular places, especially inner-city brownfield and rural exceptions sites, it is advantageous for niche providers of innovative or strongly vernacular development to gain access to land and funding. In addition, the UK self-build sector is weak; the government is exploring scope for expanding it to help meet the shortfall in housing supply.

Land

Availability and cost of land are key to housing supply and sustainability. Consistency and transparency of planning and other regulatory requirements can create a level playing field for those bidding for land, so that the price bid by a developer seeking to maximise sustainability is not undercut by another for whom sustainability is a lower priority. In addition to increasing the supply of land with planning permission, the use of publicly owned land to improve sustainability is recommended. Publicly owned land could also be used to facilitate development of sustainable places by promoting sustainable transport, flood resilience, accessibility, urban design, mix and density. Based on analysis of local needs and conditions, sustainability could inform disposal of publicly owned land through master planning and sustainability-based competition.

Householder costs and poverty

Sustainable homes are cheaper to live in than less energy-efficient housing. Addressing fuel poverty and the affordability of living in a home are key motivations for RSLs to build sustainably. Enhanced neighbourhood sustainability is also expressed in longer-term 'lettability', shorter void periods and reduced rent arrears. In most cases, private developers do not find similar advantages because buyers do not tend to pay more for sustainable homes.

Energy efficiency and cost savings for householders are greatest where efficiency does not depend on residents using equipment correctly. This reinforces the appeal and benefits of building-fabric solutions over technology. Nevertheless, residents still need information on how to get the best out of their energy-efficient homes to keep fuel bills down.

Conclusion

Increasingly sustainable homes cannot currently be built more cheaply. Regulation is key, and a mixed approach of near carbon-free housing onsite and allowable solutions offsite may be the most cost-efficient way to reduce carbon emissions. A single energy standard would allow large-volume production for increased sustainability. Local authorities need a continuing role in ensuring that allowable solutions are used effectively and that sustainable places are promoted.

About the project

The study used qualitative and quantitative methods to explore constraints and opportunities for building sustainable homes, including engaging with practitioners through an online survey and interviews across seven case studies in England. Working with Thomas Bethune Property and Construction Consultants, the research team developed a sustainability performance matrix to capture the technical specification and associated costs of various pathways to improved sustainability. Drawing on this matrix and interviews with practitioners, econometric modelling considered the impact of increased sustainability, firm-specific factors and the flow of planning permissions on the supply of new homes.

FOR FURTHER INFORMATION

This summary is part of JRF's research and development programme. The views are those of the authors and not necessarily those of JRF. The main report, **Building sustainable homes** by James Morgan, Graeme Bowles, Chris Leishman, Chris McWilliams, Andrew Peacock and Filip Sosenko, is available as a free download at www.jrf.org.uk

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